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- The public is encouraged to comment via email to pced@cityofanacortes.org, via written comment addressed to PCED, P.O. Box 547, Anacortes, WA 98221, or via e-comment (<https://www.anacorteswa.gov/700/Watch-Meetings> - click on meeting you wish to provide comment and in upper right corner is an option to include Public Comment). Public comments received prior to 3:00 p.m. the day of the meeting will become part of the record for the meeting, just as if presented in person.
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ANACORTES PLANNING COMMISSION

June 14, 2023

AGENDA

6:00 PM

A. Roll Call

B. Minutes

- 1) Minutes of 05/24/2023

C. Correspondence

D. New Business

E. Old Business

- 1) Continuation of Open Record Public Hearing and Decision for Shoreline Substantial Development Permit SDP-2023-0002 Port of Anacortes 2nd Street and Curtis Wharf

The City of Anacortes encourages people with disabilities to participate in public meetings. For assistance with special needs, please contact the City Clerk at 360-299-1960 in advance of the meeting.

Anacortes Planning Commission Minutes - May 24, 2023

Roll Call

Minutes

Minutes of May 8, 2023

The minutes from May 8, 2023 were approved as submitted.

Correspondence

New Business

Appoint new vice chair.

The vice-chair vacancy needs to be filled. Chairperson Mackenzie asked if there are any volunteers or if anyone wanted to make a motion to nominate. Commissioner Jeretzy nominated Commissioner Martin, Commissioner Stoneman seconded. All ayes.

Open Record Public Hearing and Decision for Shoreline Substantial Development Permit SDP-2023-0002 Port of Anacortes 2nd Street and Curtis Wharf project.

Chairperson MacKenzie pointed out that there have been some new developments with this item. The applicant has informed staff that they would like the meeting to be continued.

Grace Pollard presented the application from the Port of Anacortes. She reviewed the site description and photos and stated that the zoning is manufacturing and shipping. The proposal overview is for a street improvement project including excavation, adding fill, updating stormwater facilities, new asphalt and a new access gate with chain link fencing for security, which is a requirement from the Coast Guard Maritime Security requirements. This is a Type 3 Planning Commission review and decision. The preapplication meeting was held on January 31st and a neighborhood meeting on March 9th. The public comment period ended on May 11th with no public comment received. Grace reviewed the background: there is a ROW use agreement between the City and the Port for 2nd Street at O Avenue towards the water, which was signed on February 16th, 2022. The City agreed to close the 2nd St ROW and grant the Port exclusive use of the ROW with the terms outlined in the agreement. Ms. Pollard pointed out that the Shoreline Master Program (SMP) applies to this project. The SMP outlines goals and policies, and regulates all development within the shoreline area. The SMP Chapter 4 contains the goals that apply to this development. Chapter 5 of the SMP includes the designations / zoning which determines the uses allowed, governs height limits and setbacks. The subject property is Urban Maritime with water-dependent, water-oriented and water-related uses, such as those associated with the Port of Anacortes. She highlighted the uses that this proposal triggers and noted that all of them are permitted uses. Chapter 6 of the SMP includes the environmental protection guidelines. Staff has no concern for this proposal regarding Chapter 6. The proposal does not impact beyond the existing developed area. Chapter 7 of the SMP is the shoreline access, which requires that the general public is allowed to reach and touch the shores' edge. There are various ways to accomplish this; including docks, piers, boat launches, pathways, trails, viewpoints, etc. The gate and chain link fencing are linked to this section. She stated that there is more detail in the staff report.

Chairperson Mackenzie asked if there were any questions from the commissioners on the material presented so far.

Commissioner Martin referenced SMP Chapter 7, section 5.13 quoting the requirement for alternative access of an equal or greater benefit. She asked if the intent is to have greater public access from the park on N Avenue. Grace thanked Commissioner Martin for that question. She said staff tried to address that in the conditions of approval.

Commissioner Martin asked if the Planning Commission would review the access plan that is a requirement of

this proposal.

Grace clarified that is currently an internal review process, but the Planning Commission can request to review it.

Commissioner MacKenzie asked if the City received compensation for the vacation of the street.

Ms. Pollard clarified that is within the ROW agreement in Section 3.9. It had to do with the environmental cleanup and stormwater improvements.

Darcy Swetnam, City Attorney, stated that this agreement doesn't vacate the ROW, but the City was clear that there is potential use in the future. This was developed as a use agreement. After the 50-year term is up, the City will retain it's interest in the ROW.

Commissioner Mackenzie referenced the fencing that is being presented as required for security. He asked if the Port designated that area as a MARSEC requirement. There's a suggestion requiring public access that can be prevented for security and safety purposes.

Grace said the Port will need to clarify.

Commissioner Mackenzie asked if a representative from the Port was in attendance.

Libby said there is not one online, nor did they attend in person.

Chairperson MacKenzie opened the Public Hearing at 6:21 p.m. There was no public comment received.

Commissioner Martin asked if the Planning Commission can review the public access plan instead of an internal review at the Planning Department.

Commissioner MacKenzie pointed out that there was a concept drawing in the packet.

Grace clarified that the Commission can request that review and include it in the conditions for approval.

Chairperson MacKenzie continued the meeting until June 14th with the public hearing open. He adjourned the meeting at 6:23 p.m.

Old Business



Planning Commission Agenda Bill

Meeting Date: June 14, 2023 **Agenda Item:** E.1.

Subject: Continuation of Open Record Public Hearing and Decision for Shoreline Substantial Development Permit SDP-2023-0002 Port of Anacortes 2nd Street and Curtis Wharf

Staff Contact: Grace Pollard

Approved for Submittal to Commission by

Grace Pollard
LIBBY GRAGE
John Coleman

Action Type

Public Hearing

Summary Statement: This is the continuation of the May 24th Open Record Public Hearing for SDP-2023-0002. The applicant has requested a shoreline substantial development permit (SSDP) for the asphalt paving of approximately 18,500sf of existing gravel surface at 2nd Street and the entry to Curtis Wharf. The project also includes stormwater improvements consisting of new catch basins and conveyances. Additionally, the project includes the installation of a new rolling gate and chain-link fencing to secure the site. The area of work is located within the Urban Maritime Shoreline Environment Designation and is zoned Manufacturing & Shipping (MS).

Background: See the attached staff report.

Previous Action: N/A

Competing Viewpoints Considered: A written public comment period and public hearing are required as part of the application processing procedures.

Recommended Motion: I move to approve Shoreline Substantial Development Permit SDP-2023-0002 subject to the revised recommended conditions in Exhibit 21.

Alternative Actions: I move to approve Shoreline Substantial Development Permit SDP-2023-0002 subject to the revised recommended conditions in Exhibit 21 with the following changes...

Attachments (listed in order presented):

1. 1-Staff Report
2. 2-Site Plan
3. 3-Master Land Use Permit Application_signed
4. 4-Shoreline Permitting Checklist
5. 5-2nd Street paving SSDP Narrative
6. 6-2nd Street ROW Use Agreement
7. 7-CivilStructural 30% Design Curtis Wharf
8. 8-Quiet Cove_Geotechnical Assessment_BD-redline
9. 9-Quiet Cove_Geotechnical Assessment_Figures

10. 10-SEPA Exemption_2nd Street Pave
11. 11-Cultural Resources Report of Quiet Cove
12. 12-Curtis Wharf Drainage Report_FINAL_Combined_Signed
13. 13-FINAL DRAFT Quiet Cove Interim Action Work Plan_w_appendices
14. 14-N_ave Beach Background
15. 15-Port of Anacortes Agreed Order no DE11346
16. 16-Port of Anacortes Quiet Cove Final RIFS Work Plan
17. 17-Noticing
18. 18-Comments
19. 19-Port of Anacortes Integrated Approach to Marine Public Access 2003
20. NEW 20-Port's Ltr to City Planning Commission - Curtis Wharf
21. NEW 21-STAFF REVISED RECOMMENDATIONS



Anacortes Planning, Community & Economic Development Department

904 6TH Street / P.O. Box 547, Anacortes, WA 98221

360.299-1984 - Office Hours: Mon-Fri 8:00 AM – 5:00 PM

SHORELINE SUBSTANTIAL DEVELOPMENT PERMIT: STAFF REPORT

File Number	SDP-2023-0002	Date of Report	May 18, 2023
Project Title	MRT-64 2 nd Street and Curtis Wharf Improvements	Related File(s)	PRE-2023-0002
Project Location	Second Street west of the east side of O Avenue and the Curtis Wharf access to the north, adjacent to 116 O Avenue.		
Request	The Port of Anacortes has requested a shoreline substantial development permit for the installation and construction of approximately 18,500 square feet of new asphalt at 2 nd Street and the entry to Curtis Wharf. Proposed work includes excavation of existing gravel surface and base materials, backfilling and compaction of clean imported fill and base course materials, installation of updated stormwater conveyances and BMP facilities, paving with asphalt four inches in depth, and installation of a new rolling access gate and an additional length of chain-link fence connecting existing security fence at Quiet Cove and Curtis Wharf. The applicant has stated the new fence and gate is a measure to limit potential conflicts between the public and industrial use tenants at Curtis Wharf. No footprint expansion is proposed under this proposal, all work will be done within existing disturbed/ developed areas. This Shoreline Substantial Development Permit application does not include a proposal to expand an existing use or establish a new use.		
Landowner/Applicant	Port of Anacortes 100 Commercial Ave Anacortes, WA 98821		

SITE INFORMATION

Zoning	Manufacturing and Shipping (MS)	Comprehensive Plan Designation	Manufacturing / Shipping (MS)
Present Use of Property	Port facility including a commercial/industrial pier and 2 nd Street right-of-way.		
Critical Areas	Pursuant to Chapter 6 and Appendix "A" of the Shoreline Master Program (SMP) regulating critical areas, the subject development was reviewed for proximity to critical areas. SMP A-1: Frequently Flooded Areas Based on FEMA's National Flood Hazard Mapping, the subject property is located within FIRM panel 5303170040A. A Flood Development Permit has been		

	submitted to the City (FLD-2023-0001) and will be required to be obtained prior to the beginning of construction. SMP A-3: Geologically Hazardous Areas Based on the City mapping system, the subject property is in an identified area of tsunami hazard and seismic hazard area; however, the proposed street paving and fence does not have a risk of hazard. Therefore, the provisions of this section would not apply. SMP A-5: Fish and Wildlife Conservation Areas Based on the City mapping system, the subject property is adjacent to an identified Critical Areas Habitat Group for smelt spawning and Dungeness Crab; however, the proposed street paving and fencing will not exceed the existing developed footprint of the site, no encroachment into critical areas are proposed or permitted. It is determined that no net loss of critical habitat area will occur.
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PROJECT LOCATION & SURROUNDING USES



	Zoning / Comprehensive Plan	Property Use
North	Manufacturing & Shipping (MS)	Port owned – industrial maritime facility
South	Manufacturing & Shipping (MS)	Port owned – industrial maritime facility
West	Light Manufacturing (LM)	Port owned – industrial maritime facility
East	Manufacturing & Shipping (MS)	Port owned – industrial maritime facility

PROCEDURAL

- Type of Review.** According to AMC 19.20.030(1) and 18.16.100(B), shoreline substantial development permit applications for projects valued less than \$1 million are considered a Type 3 review. For Type 3 reviews, the Planning Commission holds the public hearing and renders the final decision regarding the proposed shoreline substantial development permit.
- Project History.**
 - A mandatory preapplication meeting was held on January 31, 2023, with the mandatory preapplication neighborhood meeting held on March 9, 2023.
 - The Port of Anacortes has obtained a Right of Way Use Agreement from the City of Anacortes for this portion of 2nd Street lying westerly of the west line of “O” Avenue (AFN 202206240050). (Exhibit 6)
 - The project site is adjacent to a known cleanup site, Quiet Cove, in-water and sediment remediation are proposed in the next five (5) years and will be conducted in accordance with all applicable requirements. The Port of Anacortes has an Agreed Order with Department of Ecology (No. DE11346) (Exhibit 15)
 - The City of Anacortes’ Shoreline Master Program adopted by reference the *Port of Anacortes Integrated Approach to Marine Public Access, October 2003* plan (Exhibit 19)
- Environmental Review.** The Port of Anacortes, as lead agency, determined the scope of work to be categorically exempt from SEPA Review per WAC 197-11-800(2)(d)(vii) and (2)(d)(viii). (Exhibit 10)
- Public notice and reviewing departments/agencies.** A notice of application with a 30-day public comment period was published in the Anacortes American, posted on the project site and mailed to property owners within 300 ft. (Exhibit 17)

Application Submitted	February 27, 2023
Determination of Completeness	March 10, 2023
Notice of Application & Public Hearing	April 12, 2023
Open Record Public Hearing (Planning Commission)	May 24, 2023

- Reviewing departments/agencies.** The project application was routed for review to applicable agencies and City departments.

REVIEWING DEPARTMENTS & AGENCIES			
City of Anacortes	Local Agencies	State & Federal	Other

• Building • PW – Operations • PW – WWTP • PW – Engineering • PW – Water	N/A	• USACE • DAHP • DOE • WDFW • WA DNR	• Samish Indian Nation • Sauk-Suiattle • Skagit System Cooperative • Stillaguamish Tribe • Swinomish Tribe
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6. **Consideration of written comments and applicant responses.** The notice of application public comment period ended May 11, 2023. In making its recommendation, the Department considered timely received written comments and the applicant’s responses, if any, as required in AMC 19.20.130(C).

6.1. Comments from Public Works Engineering were relayed to the applicant a copy of which can be found in (Exhibit 18).

6.2. No public or agency comments, other than the referenced above, were received for the proposal.

DEPARTMENT REVIEW – FINDINGS OF FACT

1. **Right of Way Use Agreement 2nd Street from “O” Avenue to Shoreline** (AFN 202206240050). This agreement between the City of Anacortes and the Port of Anacortes is for the conveyance of property interest from the City to the Port. Under this agreement the City grants to the Port exclusive use of the 2nd Street right-of-way for the term of the agreement described in Agreement Section 8 which includes the right of use over, under, upon and across the 2nd Street right-of-way including, without limitation vehicle access, product storage operations, restricting public traffic and access to the 2nd Street right-of-way, and constructing any improvements the Port deems necessary. Also included in Agreement Section 8 is stated the Port and its contractors use of the 2nd Street right-of-way shall comply with all applicable federal, state, and local laws, ordinances, orders, rules, and regulations. The Port is responsible for all necessary permits, licenses, certificates, or approvals required by applicable laws, ordinances, and regulations necessary to use the 2nd Street right-of-way. (Exhibit 6)

2. **The City of Anacortes Shoreline Master Program (SMP)** contains many goals, policies, and development regulations. Not all are applicable to each Shoreline Substantial Development Permit project proposal. Below, staff has listed some of the goals, policies, and regulations believed to be the most relevant, however all applicable regulations apply even if not noted below.

3. **SMP Chapter 5: Shoreline Environments & Associated Policies and Regulations.** This section contains the shoreline environment designations. The intent of designating shoreline environments is to encourage development that will enhance the present or desired character of the shoreline. Management policies are an integral part of the environment designations and are used for determining uses and activities that can be permitted in each environment. Specific development regulations specify how and where permitted development can take place within each shoreline environment.

3.1. The subject property is located within the **Urban Maritime** shoreline environment designation.

3.1.1. The purpose of the Urban Maritime designation is to preserve a variety of water-dependent, water-oriented, and water-related public, commercial, and industrial uses such as those associated with the Port of Anacortes.

3.2. Management Policies:

- 3.2.1. Use Policy 5.11.1 Encourage expansion of water-dependent and water-related uses.
- 3.2.2. Use Policy 5.11.6 Industrial and commercial development along Urban Maritime shorelines should provide protection of existing ecological functions where practicable and mitigated. It should also provide public access opportunities only where appropriate and where public safety would not be compromised and alternative off-site provision has been made.
- 3.2.3. Public Access Policy 5.11.7 Where desirable and practicable, industrial, and commercial facilities should be designed to facilitate pedestrian waterfront activities. *The Port of Anacortes' Integrated Approach to Marine Public Access, October 2003* is incorporated by reference, and substitutes for uniform public access requirements on individual port actions.

3.3. Development Regulations:

- 3.3.1. DR-5.11.5 Redevelopment and renewal of substandard, degraded, or obsolete urban shoreline areas shall be encouraged in order to make maximum use of the available shoreline resources and to accommodate future water-oriented uses.
- 3.3.2. DR-5.11.7 Ensure that, where applicable, improvements are reviewed for consistency with Design Standards codified in the zoning code.
- 3.3.3. DR-5.11.10 Developments consisting of water-dependent scientific, historical, industrial, commercial, cultural, or educational research uses, public access, water-oriented recreation and ecological restoration are not required to meet the setback requirements, nor are piers, ramps, or docks.

3.4. Shoreline Uses and Modification Matrix and Development Standards:

- 3.4.1. Section 5.12(A)(5) If any part of a proposed development is not eligible for Shoreline Exemption, then a Substantial Development Permit is required for the entire proposed development project.
- 3.4.2. Section 5.12(A)(9) Except as otherwise stated, the comprehensive plan, zoning regulations, subdivision regulations, health regulations, and other adopted regulatory provisions apply within shoreline jurisdiction. In the event the provisions of this SMP conflict with provisions of other responsible local government regulations, the more protective of shoreline resources shall prevail.
- 3.4.3. Per Table 5.1 Shoreline Use and Modification Matrix the following uses are permitted in the Urban Maritime environment designation.
 - 3.4.3.1. Transportation Facilities (i.e. roads and associated facilities i.e. storm drainage); permitted.
 - 3.4.3.2. Industrial and Port Facilities – Water-dependent; permitted.
Industrial and Port Facilities – Water-related; permitted.
 - 3.4.3.3. Fill – upland; permitted.

3.4.4. Per Table 5.2 Shoreline Development Standards Matrix non-water-dependent structures have a minimum twenty-five-foot (25') setback from the ordinary high water mark (OHWM). Water-dependent structures have a zero-foot (0') setback requirement.

4. **SMP Chapter 6: Environmental Protection General Regulations.** The intent of these regulations is to provide policies and regulations that protect the shoreline environment as well as the critical areas found within the shoreline jurisdiction. The Shoreline Management Act (SMA) mandates the preservation of the ecological functions of the shoreline by preventing impacts that would harm the fragile shorelines of the state.
 - 4.1. DR-6.4.2 All shoreline permits shall contain provisions that require developers to comply with all applicable state law requirements regarding preservation of archaeological and historic resources, including provisions to stop work and notify the appropriate agencies should protected resources be uncovered during excavation.
 - 4.2. DR-6.4.9 Chemical pesticides using aerial spraying techniques within the shoreline jurisdiction, including over waterbodies shall be prohibited unless specifically permitted by the Washington Departments of Agriculture or Public Health.
5. **SMP Chapter 7: Shoreline Public Access.** Shoreline public access is the physical ability of the general public to reach and touch the water's edge or the ability to have a view of the water and the shoreline from upland locations. There are a variety of types of public access, including docks and piers, boat launches, pathways and trails, promenades, street ends, picnic areas, beach walks, viewpoints, and others. Inarguably, the economic vitality of the City is bolstered by the public access to and enjoyment of these shorelines.
 - 5.1. General Policy 7.3.1 Seek to maintain and enhance public access, both physical and visual, throughout the City's shoreline. Access should be provided for a range of users including pedestrians, bicyclists, boaters and, to the extent feasible, people with disabilities. Access opportunities should be varied, ranging from urban water walks to viewing platforms of natural areas. Encourage the use of public access facilities to actively educate and inform the public on the importance of environmental protection of the shoreline jurisdiction. Work in partnership with local entities (e.g., Skagit Marine Resources Committee, and others) to implement this policy.
 - 5.2. General Policy 7.3.5 Require new development that impacts public access to mitigate through the provisions of on-site visual and physical public access, unless such access is shown to be incompatible due to reasons of safety, security, or impact to the shoreline. In lieu of on-site improvements, the Shoreline Administrator may allow for off-site improvements if said improvements would provide a greater public benefit.
 - 5.3. General Policy 7.3.7 Incorporate public access provisions into the review and approval of all public and private development projects. Exceptions may be considered for the following: (b) Where deemed inappropriate due to health, safety, security, incompatible uses, constitutional or other legal limitations and environmental concerns. In these cases, alternate methods of providing public access shall be considered such as off-site improvements, viewing platforms, separation of uses through site planning and design, and restricting hours of public access; and (c) Where a more effective integrated public access plan exists.
 - 5.4. Street Ends Policy 7.3.9 Encourage the use of street ends and other publicly owned or controlled lands to increase public access to shoreline areas.

- 5.5. Street Ends Policy 7.3.10 Develop street end access and viewpoints. Improvements to and linkages between these street-ends should be determined by the physical characteristics of the shorelines, existing development patterns, potential for structural improvements, and other factors relevant to developing a continuous pedestrian system.
- 5.6. Street Ends Policy 7.3.11 Ensure that use of street ends for parking does not physically block public access to the shoreline or degrade the scenic qualities of the City. (See Parking Facilities, Section 8.9 Chapter 8)
- 5.7. Design Policy 7.3.14 Public access improvements should be designed and constructed to: (a) Look and “feel” welcoming to the public and be usable by the greatest number and diversity of people including, to the extent possible the physically handicapped. (b) Connect to public areas, street-ends and other pedestrian or public thoroughfares. (e) Enhance the character of Anacortes, including the historic and economic activity of downtown, marine business and industry, Port activity, and natural areas. (f) Avoid conflicts with water-dependent uses. (h) Require low maintenance design.
- 5.8. Development Regulation (DR) 7.4.1 Developments, uses, and activities shall be designed and operated to avoid significantly blocking, reducing, or adversely interfering with the public’s visual or physical access to the water and the shorelines.
- 5.9. DR-7.4.2 Except as provided in regulations 7.4.4 and 7.4.5, shoreline substantial developments or conditional uses shall provide public access where any of the following conditions are present: (b) Where a development or use will interfere with an existing or potential public access way, the development or use shall apply mitigation sequencing principles and provide public access to address the impact. (e) Where a development or use is located on public land or is managed by a public entity, unless access is incompatible with safety, security, or environmental protection.
- 5.10. DR-7.4.3 Required public access shall include the preservation of shoreline views, the establishment of public access easement to and along the shoreline, enhancement of an adjacent street-end or park, or other consideration commensurate with the degree of impact caused by the development.
- 5.11. DR-7.4.4 Public access is not required if the applicant can demonstrate to the satisfaction of the City that constitutional and or statutory limitations would be violated by the provisions of such access.
- 5.12. DR-7.4.5 Alternatives to on-site, physical access to the shoreline may be approved if the applicant can demonstrate to the satisfaction of the City that one or more of the following conditions exist: (a) Unavoidable health or safety hazards to the public exist which cannot be prevented by any practical means; (c) Inherent security requirements of the proposed development or use cannot be satisfied through the application of alternative design features or other solutions; (d) The cost of providing on-site access, easement, or an alternative amenity is unreasonably disproportionate to the total long-term cost of the proposed development; Provided further, that the applicant has first demonstrated and the City has determined that all reasonable alternatives have been exhausted, including, but not limited to: (g) Regulating access by such means as limiting hours of use to daylight hours, or allowing public access to only a portion of the site. (h) Designing separation of uses and activities, using such means as terracing, hedges, and landscaping.
- 5.13. DR-7.4.6 When on-site public access is not required under DR-7.4.5, alternative shoreline access must result in an equal or greater public benefit. Alternatives may include but are not limited to:

(b) Off-site public access, such as improvements to a nearby street end, an offsite, or a trail system, purchase of land or an easement at a location appropriate for future access improvements. (c) A payment in lieu agreement with the City in accordance with RCW 82.02.020 (relating to fees associated with development).

5.14. DR-7.4.7 Off-site public access, when required, must meet the same standards and requirements as on-site public access.

5.15. DR-7.4.9 When required, public access sites shall be fully developed and available for public use at the time of occupancy or use of the development or activity, except where the decision maker determines an appropriate mechanism for delayed public access implementation is necessary for practical reasons.

5.16. DR-7.4.15 Future actions by the applicant or other parties shall not diminish the usefulness or value of the public access site.

5.17. DR-7.4.18 Public access landscape design shall use native vegetation in the shoreline setback and predominantly native vegetation (i.e., 80% or greater) in the remainder of shoreline jurisdiction, particularly drought-resistant and, along marine shorelines, saline-tolerant plant species, Landscape plantings may be required where desirable to provide public/private space separation.

6. **SMP Chapter 8: Specific Use Policies and Development Regulations.** This chapter provides specific policies and regulations for specific uses. The performance standards contained herein augment standards established through other land development regulations. Where conflict arises between these and other applicable controls, the regulations that provide more protection to the shoreline area shall apply.

6.1. Industrial and Port Facilities

6.1.1. Policy 8.6.1 Reserve shorelines that are particularly suitable for water-dependent and water-related industrial and port development for these uses.

6.1.2. Policy 8.6.3 Require new industrial and port development to provide physical and visual access to shorelines whenever possible, consistent with constitutional and statutory limitations, and provided such access does not interfere with industrial operations or endanger public health and safety.

6.1.3. Policy 8.6.4 Encourage cooperative use of docks, cargo handling, storage, parking, and other accessory facilities among private or public entities in shoreline industrial and port areas.

6.1.4. Policy 8.6.5 Ensure that land transportation and utility corridors serving ports and water-related industry follow the guidelines provided under the sections dealing with utilities and transportation.

6.1.5. Policy 8.6.6 Only water-dependent industrial and port uses shall be permitted on shorelands with direct frontage on and practical access to navigable waterways.

6.1.6. Policy 8.6.7 Opportunities for public access to the water are required at port and industrial sites, unless such access would interfere with operations or endanger public health and safety, or the proponent otherwise provides for equivalent access elsewhere in the City.

6.1.7. Policy 8.6.9 Industrial uses and redevelopment are encouraged to locate where environmental cleanup and restoration can be accomplished.

6.1.8. Development Regulations (DR) 8.6.8 Port and industrial facilities shall provide public access to shoreline areas in accordance with Chapter 7, *Public Access*, taking into consideration constitutional and statutory limitations, public safety, health, and security. Where industrial use is proposed for location on land in public ownership, public access shall be required in the general vicinity of the impact. Such provisions could be the preservation of shoreline views, the establishment of public access easements across and to the shoreline, enhancement of an adjacent street-end or park or other consideration commensurate with the degree of impact caused by the development. In this regard the *Port of Anacortes' Integrated Approach to Marine Public Access, October 2003* is incorporated by reference into this SMP.

6.2. Transportation Facilities

- 6.2.1. Policy 8.13.12 Design of new roadways or redesigned roadways shall use Low Impact Development provisions when practicable.
- 6.2.2. Development Regulation (DR) 8.13.6 All roads and drainage systems shall be maintained to prevent erosion and/or water quality degradation.
- 6.2.3. DR-8.13.8 Herbicides used for maintenance along roads and drainage systems shall follow the performance standard outlined in Section 6.4.
- 6.2.4. DR-8.13.9 To the greatest extent practicable, organic, nontoxic, methods and BMPs should be utilized for maintenance along roads and drainage systems in the vicinity of critical fish and wildlife habitats.

6.3. Fill

- 6.3.1. Policy 9.7.2 Fill landward of the ordinary high water mark should be permitted when necessary to support permitted uses, and when significant impacts can be avoided or mitigated.
- 6.3.2. Policy 9.7.5 Perimeters of fill should be protected by shoreline stabilization or other design measures, unless it can be demonstrated that there will be environmental or public benefit for not employing any of these methods.
- 6.3.3. Development Regulation 9.7.2 Fill shall be permitted only when in conjunction with a proposal or activity otherwise permitted under the SMP.

CONCLUSIONS OF LAW

1. Via the signed and recorded Use Agreement with the City, the Port has exclusive use of the 2nd Street right-of-way for the term of the agreement described in Agreement Section 8 which includes the right of use over, under, upon and across the 2nd Street right-of-way including, without limitation vehicle access, product storage operations, restricting public traffic and access to the 2nd Street right-of-way, and constructing any improvements the Port deems necessary to support its use.
2. Public access to the shoreline is referenced multiple times in the SMP. The street end of 2nd Street exits onto Q'elech'ilhch Park ("N" Avenue Beach), the Port has received City permission to restrict public traffic and access to this portion of 2nd Street via the Use Agreement, the Port's use of the 2nd Street right-of-way also requires them to comply with all applicable federal, state, and local laws, ordinances, orders, rules, and regulations. The Port is responsible for all necessary permits, licenses, certificates, or approvals required by applicable laws, ordinances, and regulations necessary to use the 2nd Street right-of-way. Shoreline Master Program Development Regulation 8.6.8 states: Where

industrial use is proposed for location on land in public ownership, public access shall be required in the general vicinity of the impact. Such provisions could be the preservation of shoreline views, the establishment of public access easements across and to the shoreline, enhancement of an adjacent street-end or park or other consideration commensurate with the degree of impact caused by the development.

3. Road improvements including stormwater facilities is a permitted action.
4. The shoreline permit was reviewed for conformance with all applicable Shoreline Master Program regulations, including but not limited to, the above list.
5. The subject proposal is consistent with the Washington State's Shoreline Management Act, City of Anacortes' 2010 Shoreline Master Program and development regulations listed therein for developments within the Urban Maritime shoreline environment designation.
6. Any Finding of Fact that is more correctly a Conclusion of Law is hereby incorporated as such by this reference.
7. Staff reserves the right to supplement the record of the case to respond to matters and information raised subsequent to the writing of this report.

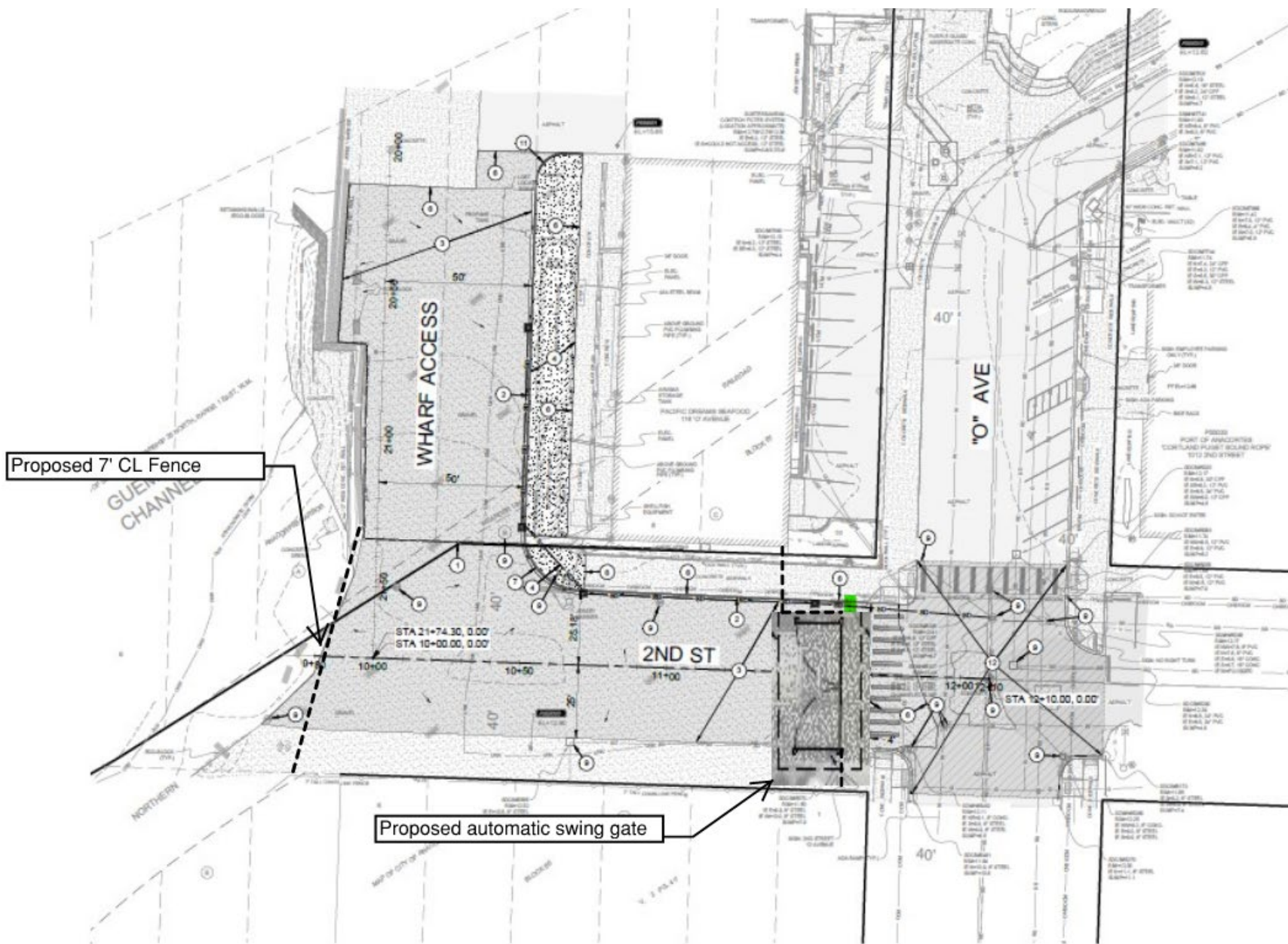
RECOMMENDATION

Based upon the application, Findings of Fact, and Conclusions of the staff report, staff recommends that the Planning Commission approve the shoreline substantial development permit subject to the following conditions of approval:

1. The Port shall provide and submit an Alternative Public Access Improvement Plan for review and approval by the Planning Department to include but not be limited to provisions for wayfinding and improvements to the pedestrian link between Commercial Avenue and Guemes Channel at Q'elech'ilhch Park ("N" Avenue Beach). Improvements to the pedestrian connection to Q'elech'ilhch Park should include items such as street trees, pedestrian scale lighting, public art, etc.
2. The required Alternative Public Access Plan shall be submitted to the Planning Department prior to subject project completion and shall be installed within one (1) year of plan approval.
3. The Port shall obtain a fence permit for the proposed rolling gate at 2nd Street as well as the additional chain-link fencing along the shoreline. Permit application shall show the fence and gate designed to preserve visual access down 2nd Street to the shoreline and shall be constructed to meet the standards of AMC 19.66.040.
4. The Port shall obtain construction permits for the street improvements and stormwater facility, shall comply with all applicable codes, manuals, and standards, and shall be reviewed and approved by the Public Works Engineering Division.
5. The Port and the subject project shall comply with all applicable state law requirements regarding preservation of archaeological and historic resources, including provisions to stop work and notify the appropriate agencies should protected resources be uncovered during excavation.
6. Removal of or relocation of all discarded materials including concrete blocks in upland areas beyond the fenced enclosure must be complete prior to completion of the subject project.
7. The scope of the project shall not exceed that as set out in the shoreline permit application and shall be valid only for the improvements described within the application materials, except as modified

by this decision or other jurisdictional agencies. This permit does not include review or approval of any use.

8. All applicable permits (local, state, & federal) shall be secured before any construction activities begin onsite and copies provided to the City of Anacortes' PCED. This includes a local City of Anacortes Flood Development Permit.
9. The applicant/landowner shall comply with federal statutes including but not limited to: Endangered Species Act, Clean Water Act, Marine Mammal Protection Act, and other federal statutes.
10. The project shall comply with all applicable Shoreline Master Program regulations, including but not limited to those listed above.
11. Development shall comply with AMC 18.16.130 regulating the time limit for shoreline permits as follows:
 - 9.1. *Construction, or substantial progress toward completion, must begin within two (2) years after approval of the permit. Substantial progress toward construction shall include, but not limited to, the letting of bids, making of contracts, purchasing of materials involved in development, but shall not include development or uses which are inconsistent with the Shoreline Management Act or the city's master program. In determining the running two-year period hereof, there shall not be included the time during which development was not actually pursued by construction and the pendency of litigation reasonably related thereto made it reasonable not to so pursue; provided, that the city may, in its discretion, extend the two-year time period for a reasonable time based on factors, including the inability to expeditiously obtain other governmental permits which are required prior to the commencement of construction.*
 - 9.2. *5-Year Permit Authorization: If construction has not been completed within five years of approval by the City of Anacortes, the city will review the permit, with prior notice to parties of record, and, upon showing of good cause, either extend the permit for one additional year, or terminate the permit. Prior to the city authorizing any permit extensions, it shall notify any parties of record and the Department of Ecology. Note: Only one single extension is permitted.*




PLANNING, COMMUNITY, & ECONOMIC DEVELOPMENT DEPARTMENT
Mailing Address: P.O. Box 547, Anacortes, WA 98221
Office Location: 904 6th Street, Anacortes WA 98221
Phone: (360) 299-1984

MASTER LAND USE PERMIT APPLICATION

TYPE OF APPLICATION (check all that apply):		
☐ Binding Site Plan (Preliminary)** ☐ Boundary Line Adjustment (BLA)** ☐ BLA: Lot Consolidation** ☐ Conditional Use Permit (CUP) ** ☐ Critical Areas Exemption** ☐ Critical Areas Permitted Alteration** ☐ Critical Areas Reasonable Use Exception/Variance** ☐ Cottage Housing Development**	☐ Eligible Facility Request** ☐ Essential Public Facility ☐ Home Occupation Permit** ☐ Long Subdivision (Preliminary)** ☐ Plat Amendment /Modification ☐ SEPA Environmental Review** ☐ Shoreline Conditional Use Permit** ☐ Shoreline Exemption** ☒ Shoreline Substantial Development Permit**	☐ Shoreline Variance** ☐ Short Plat (Preliminary)** ☐ Site Plan Review ** ☐ Site-Specific Rezone Authorized by the Comprehensive Plan ☐ Stormwater Management Manual Adjustments & Exceptions ☐ Variance ** ☐ Wireless Conditional Use Permit (WCUP)** ☐ Wireless Service Facility (WSF) Permit**
**Permit type has supplemental checklist that must be submitted with Master Land Use Permit Application		
PROJECT & SITE INFORMATION:		
SITE ADDRESS: 116 O Ave, Anacortes, WA 98221		PROJECT NAME: MRT-64 2nd Street & Curtis Wharf Improvments
PARCEL NUMBER(S): P55360 P55361		SECTION, TOWNSHIP, & RANGE S 13 T 35 R 01
LOT SQUARE FOOTAGE & ACREAGE: Total of parcels 47,504 sf		PROJECT VALUATION: \$400,000
LEGAL DESCRIPTION: ANACORTES LOT 10 BLK 67 FRACTIONAL LOTS 7 TO 10		PRESENT ZONING: MS
PRESENT USE OF PROPERTY: Commercial Pier and Access Road		CUT & FILL (CY) PROPOSED: Cut 60 cy, Fill 100 cy
PRE-APPLICATION CONFERENCE HELD?: ☒ Yes, the City file # is <u>Pre-2022-000</u> ☐ No		WATER SOURCE: ☒ City of Anacortes ☐ Private Well ☐ Community Well

SEWAGE DISPOSAL: ☒ City of Anacortes ☐ Septic		ROAD ACCESS: ☒ City Road ☐ State Highway ☐ Private Road	
CRITICAL AREAS OR BUFFERS ON SITE OR WITHIN 300 FEET: ☒ Yes* ☐ No ☐ Unknown <i>*If yes, please complete the Critical Area Identification Form</i>		SHORELINES WITHIN 200 FEET: ☒ Yes / Name: <u>Guemes Channel</u> ☐ No	
FLOODPLAIN: Flood Zone: FIRM Panel # Date of Panel:			
LOT COVERAGE AREA CALCULATIONS: Existing Square Footage: 18,450 Proposed Square Footage: 18,450			
IMPERVIOUS SURFACE AREA CALCULATIONS: Existing Impervious Square Footage: 18,450 New Impervious Surface: 18,450			
DESCRIPTION OF SUBJECT PROPOSAL: ☒ Additional pages attached			
PROPOSED WORK: _____ The Port proposes paving approximately 18,500 sf of existing gravel surface at 2nd Street and the entry to Curtis Wharf with hot mix asphalt. The project would also include improvements to stormwater systems including new catch basins and conveyances. Finally, the project would install a new rolling access gate to replace the existing rolling gate and an additional length of chain-link fence to connect the security fences at Quiet Cove and Curtis Wharf (approximately 85 ft.) The proposed project would improve access and security at Curtis Wharf and 2nd Street.			
PROPERTY OWNER INFORMATION: ☐ Multiple owners attached			
NAME: Port of Anacortes		MAILING ADDRESS: 100 Commercial Ave	
CITY, STATE, ZIP: Anacortes, WA 98221		PHONE #: 360-770-5194	
FAX #:		EMAIL ADDRESS: kevin.anderson@portofanacortes.co	
APPLICANT INFORMATION: ☒ Same as property owner			
NAME:		MAILING ADDRESS:	
CITY, STATE, ZIP:		PHONE #:	
FAX #:		EMAIL ADDRESS:	
CONTACT PERSON: ☒ Same as property owner ☐ Same as applicant			
NAME: Kevin Anderson		MAILING ADDRESS:	
CITY, STATE, ZIP:		PHONE #:	
FAX #:		EMAIL ADDRESS:	

ACKNOWLEDGEMENTS & SIGNATURE	
Read and initial each of the following statements prior to signing this application:	
KDA	I understand that land use and/or planning permits do not authorize earth disturbing activities, the removal of vegetation, or the construction of buildings. I understand that additional permits will be required after my land use and/or planning permitting process is completed. I understand that no earth disturbing activities (including the removal of vegetation) may take place until after my land use and/or planning process is complete, and only after I have received additional permits such as Fill & Grade, Building Permit, or Right-of-Way permit(s).
KDA	I understand that if critical areas (wetlands, streams, steep slopes, etc.) are found on or near my property I am not authorized to impact these areas in any way and will be required to leave an undisturbed buffer area around the critical area, as determined according to the City's critical areas regulations.
KDA	I understand that depending on the size and scope of my project, I may be required to provide maintenance and/or performance bonds for items such as landscaping, critical areas, public roads and/or public utilities that I construct or install.
KDA	I understand that I am solely responsible for providing complete and accurate information to the City. I understand that if my application is missing information or if inaccurate materials are submitted, my permits will be delayed. I understand that depending on how inaccurate and how incomplete my application is or becomes, the Department may require an entirely new application be submitted. I understand that when and if conditions change from that which my application originally represented, I am responsible for letting the City staff person assigned to my project know.
KDA	I understand that I am applying for permits from the City of Anacortes only; and that additional permits from other Federal, State, and Local agencies could be required. I understand that the City of Anacortes cannot advise me of permits that are required from other agencies, and that I must contact these agencies to make sure I comply with their requirements. These agencies include (but are not limited to): Corps of Engineers, Department of Natural Resources, Department of Fish & Wildlife, Department of Ecology, and Northwest Clean Air Agency.
KDA	I understand that I will be responsible for paying consultants that the City may deem necessary to review certain aspects of my application. I understand that these consultant reviews could include special inspections, traffic concurrency, critical areas, landscaping, stormwater, etc.

Signature required on next page.

By affixing my signature hereto, I certify that I am the owner, or am acting as the Owner's authorized agent*, and that the application and documents contained with this submittal are complete and accurate to the best of my knowledge and abilities.

If your title report lists a company, partnership or other owners, you must submit evidence that you are authorized to sign on behalf of the entity or others that are listed.

Please attach additional signature sheets if there is more than one owner.

Under penalty of perjury, I certify that the information, statements, answers above regarding the subject application(s) are true and correct to the best of my knowledge and belief.

Property Owner Signature: Kevin Anderson Digitally signed by Kevin Anderson
Date: 2023.02.24 14:07:33 -08'00'

Printed Name: _____

Date: _____

Authorized Agent Signature*: _____

Printed Name: _____

Date: _____

***If you are an authorized agent (and not the property owner) you must submit a signed, notarized [Agent Authorization Form](#).**


PLANNING, COMMUNITY, & ECONOMIC DEVELOPMENT DEPARTMENT

Mailing Address: P.O. Box 547, Anacortes, WA 98221

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Phone: (360) 299-1984

SHORELINE PERMITTING

SHORELINE SUBSTANTIAL DEVELOPMENT PERMIT, SHORELINE CONDITIONAL USE PERMIT, OR SHORELINE VARIANCE

Applicant Checklist	Shoreline Permitting Submittal Checklist See the following section for information about each submittal item listed below.	PERMIT TYPE:			OFFICE USE ONLY
		Shoreline Substantial Development Permit	Shoreline Conditional Use Permit	Shoreline Variance	
☒	Master Land Use Permit Application	✓	✓	✓	
☐	Agent Authorization Form	✓	✓	✓	
☐	JARPA	✓	✓	✓	
☒	Project Narrative	✓	✓	✓	
☒	Pre-Application Meeting & Neighborhood Meeting	✓	✓	✓	
☒	Habitat Assessment	✓	✓	✓	
☒	Critical Areas Report, <i>if applicable</i>	✓	✓	✓	
☒	Site Plan	✓	✓	✓	
☒	Clearing & Grading Plans, <i>if applicable</i>	✓	✓	✓	
☐	SEPA Environmental Checklist, <i>if applicable</i>	✓	✓	✓	
☐	Provide copies of Federal, State, and Local Permits and Approvals*	✓	✓	✓	
Submit Application Please send applications in PDF format to pced@cityofanacortes.org . An email with a link to a file share site is also acceptable. Paper copies may be requested after initial review.		Application Fee See the Land Use Permit Fee Schedule Fees will be invoiced to you after receipt of your application.			

*If your project is to occur on state-owned aquatic land managed by WA Dept. of Natural Resources (DNR), project acknowledgment from DNR is required **prior** to application with the City of Anacortes.

More information may be found here: https://www.dnr.wa.gov/publications/em_fs11_025.pdf

SUBMITTAL REQUIREMENT DETAILS

Additional details on certain submittals are provided below to ensure Applicants are fully aware what City staff will be looking for when an application is submitted to the City.

- a. **MASTER PERMIT APPLICATION:** Use this form to indicate all requested land use permits and other key information about your proposed project.
- b. **AGENT AUTHORIZATION FORM:** Use this form to authorize someone other than the property owner to apply for permits.
- c. **JARPA:** If the proposed scope of work is occurring below the Ordinary High Water Mark (OHWM) or if another agency permit is required, a JARPA is needed.
- d. **PROJECT NARRATIVE:** The narrative should include the following, the work proposed; construction /work methods; type of equipment to be used; project time frame; proposed cut & fill volumes; source & composition of cut & fill; proposed clearing; location of sanitary sewer, potable water, stormwater; access; location of critical areas on the subject property or within 300 feet of it. In the narrative also list the underlying shoreline environment/designation and provide details as to how your project achieves consistency with the Shoreline Master Program (SMP), policies, and development regulations (DR).
 - For **Shoreline Conditional Use Permits**, provide a detailed explanation of how you meet each criteria of approval as listed in Section 3.1(D) of the SMP.
 - For **Shoreline Variance** requests, provide a detailed explanation of how you meet each criteria of approval as listed in Section 3.2(C) of the SMP.
- e. **HABITAT ASSESSMENT:** All new overwater and near shore developments require habitat assessments of site and adjacent beaches to determine that no net loss of ecological function and value would occur; mitigation may be required. Such assessment must be prepared in accordance with SMP Appendix A-5.2.
- f. **CRITICAL AREAS REPORT:** In general, Critical Area reports are required when wetlands, streams, habitat conservation areas, geologically hazardous areas, shorelines, or aquifer recharge areas are located on or near a site, as identified in SMP Appendix A.
- g. **SITE PLAN:** This should be drawn to scale and include:
 - Property and project site boundaries
 - Location, identification, dimensions and size of all existing and proposed buildings and other structures, including the setbacks
- h. **CLEARING & GRADING PLANS:** This should include the development proposal, including grading and clearing limits and areas of proposed impacts to critical areas and/or buffers (include square footage estimates). Depending on the scope of the project, stormwater management plans may be required.
- i. **SEPA CHECKLIST:** Unless a project is categorically exempt, an environmental checklist is required to be completed and submitted. Inquire with staff to determine if needed.



Libby Grage, Planning Manager
Planning, Community, and Economic Development Department
PO BOX 547
Anacortes, WA
98221
2/23/2023

Exhibit #5

Dear Ms. Grage,

The Port of Anacortes (Port) submits this project narrative as part of our Shoreline Substantial Development Permit Application for MRT-64 2nd Street and Curtis Wharf Entry Paving.

Narrative Introduction:

The Port operates Curtis Wharf, a commercial pier, on the shores of the Guemes Channel. Currently, Curtis Wharf is used by a variety of commercial vessels and users. These include a seafood processor, lifeboat training company, and a mariculture venture. Curtis Wharf is accessed exclusively via 2nd Street, a City ROW that the Port has an exclusive use agreement for 30 years. Both 2nd street and the entry drive to Curtis Wharf are gravel surfaced roads. These roads are subject to potholing and erosion and are generally not up to the current road standards for the City of Anacortes. The Port proposes paving these roads with asphalt (approximately 18,500 sf) and installing updated stormwater handling facilities including new lines, catch basins, and BMP facilities. These updates will improve access to Curtis Wharf and the Quiet Cove laydown area to the south. The new roadways will better handle stormwater and provide treatment prior to discharge into the Guemes Channel. These improvements will also include provision of a security fence and gates to meet USCG MARSEC requirements. The fence will run generally along the western terminus of the ROW.

Project construction will commence once permits and approvals are issued, and weather is suitable for ground preparation activities. Best estimates for construction to start are late winter/early spring 2023. Construction of the project will utilize equipment and methods typical for construction of this type, including excavators, compactors, paving equipment and dump trucks. The duration of the construction phase of the project will last less than a month. Approximately 160 cubic yards of materials (sub base materials, crushed rock, etc.) will be imported to the site with an equal amount of existing fill being removed.

Shoreline Jurisdiction:

The proposed paving will occur within shoreline zone. The site is zoned Marine Shipping (MS) and within the Urban Maritime (UM) shoreline environmental designation. Curtis Wharf is an active commercial pier and part of the Port's marine terminal, serving maritime commerce. The proposed paving will improve access, reduce annual maintenance needs, better handle stormwater, and reduce water quality impacts.

Critical Areas:

No critical areas or environmentally sensitive areas are within the project footprint. The site is a FEMA mapped flood hazard zone; however, the proposed improvements are flood resistant and allowable within the floodplain. A Flood Plain development permit will be submitted and received prior to construction. The site is also listed at being at risk geological hazards, but the proposed improvements are permissible.

Special note on Policy 4.4.5 and DR-6.5.8, the City is requesting that the Port, potentially in collaboration with the City, install native riparian vegetation within 15 feet of the OHWM.

Special Note on DR 6.4.22:

Chapter 4	MASTER PROGRAM ELEMENTS	RESPONSE
4.7.1	Preserve, protect, enhance and restore critical areas and shoreline ecological processes and functions through regulatory and non- regulatory means that may include required vegetated shoreline setbacks, acquisition of key properties, regulation of development, and incentives to encourage ecologically sound design and maintenance.	<i>The project site is a highly modified industrial site with mapped critical areas directly to the west. The project will not impact existing shoreline vegetation.</i>
4.7.3	Achieve no net loss of shoreline ecological functions. This shall be accomplished by the use of Mitigation Sequencing, as defined in this master program, and as provided by WAC 173-26-201(2)(e).	<i>The project will not result in the loss of shoreline ecological functions. The project may reduce impacts to shoreline function by reducing pollutant loads in stormwater.</i>
4.7.4	Identify unique and sensitive shoreline areas for permanent protection.	<i>No known unique or sensitive areas will be impacted.</i>
4.7.7	Develop and design performance standards which will minimize detrimental impacts of development upon the shoreline.	<i>Applicable performance standards will be followed.</i>
4.7.8	Encourage study and monitoring of waters and shoreline habitats; maintain awareness of existing conditions and future alterations.	<i>Beyond the scope of this project.</i>
4.7.11	All soils disturbed by use activities, and which are potentially erodible or unstable should be stabilized through seeding, mulching, terracing or other effective means.	<i>TESC measures will be used to prevent sedimentation of the construction runoff during construction of the project.</i>
4.7.12	Development on unique or fragile shoreline areas should be avoided unless it can be shown in the proposal that development will not degrade the shoreline, or that the development will enhance public use of shoreline resources while fully mitigating for impacts to fragile areas.	<i>The scope of the work does not extend to the shoreline. The site clearing limits are separated from OHW and will not degrade unique or fragile shoreline areas. Existing shoreline vegetation will be protected.</i>
4.7.13	Shorelines are to be kept free of discarded waste materials.	<i>Contractors will practice good housekeeping BMPs and keep the project area clean and prevent waste from reaching the shoreline.</i>
4.7.14	Existing street rights-of-way or utility easements which offer physical or visual access to the shorelines or water body should be maintained in public ownership for resource conservation and as a recreational and public view resource.	<i>Access to N Avenue beach will be maintained from the N Avenue road end.</i>
4.7.18	The maximum width for either the wetland buffer or the shoreline setback must be applied for the portion of the wetland that lies within the shoreline setback.	<i>The project area, including the shoreline, does not contain any wetlands or wetland buffers.</i>

CHAPTER 5	URBAN MARATIME SHORELINE ENVIRONMENT DESIGNATION	RESPONSE
5.11.1	Give preference to water-dependent transportation, shipping, Port, and manufacturing uses due to their proximity to deep shipping berths and channels and to navigable waters.	The project supports is part of a Port sponsored project in support of water dependent shipping and transportation uses.
5.11.2	Encourage expansion of water-dependent and water-related uses.	<i>The project is support of water dependent uses.</i>
5.11.6	Industrial and commercial development along Urban Maritime shorelines should provide protection of existing ecological functions where practicable and mitigated. It should also provide public access opportunities only where appropriate and where public safety would not be compromised and alternative off-site provision has been made.	<i>The site is a highly modified industrial site with negligible ecological function. The project will not impact existing shoreline ecology or processes.</i>
5.11.7	Where desirable and practicable, industrial and commercial facilities should be designed to facilitate pedestrian waterfront activities. The Port of Anacortes Integrated Approach to Public Access, October 2003 is incorporated by reference, and substitutes for uniform public access agreements.	<i>Public access to the site are neither appropriate nor desirable because of maritime and public safety concerns.</i>
DR 5.11.2	Require, where applicable, new development and/or redevelopment to include environmental cleanup (e.g., removal of contaminated soils) and restoration of the shoreline in accordance with state and federal requirements.	<i>Project site is adjacent to a known cleanup site, Quiet Cove, in-water and sediment remediation are proposed in the next five years and will be conducted in accordance will all applicable requirements.</i>
DR 5.11.3	No net loss of shoreline ecological function shall result from new development.	<i>The project will not impact ecological function of the shoreline from its construction or operation. The site is highly modified with no vegetation or natural substrates. BMPs will be used during construction to prevent erosion and sedimentation (See 6.3.2).</i>
DR 5.11.5	Redevelopment and renewal of substandard, degraded, or obsolete urban shoreline areas shall be encouraged in order to make maximum use of the available shoreline resources and to accommodate future water-oriented uses.	<i>The project will provide improve site access to an active marine terminal that supports water dependent uses.</i>

DR 5.11.9	New, permanent buildings and structures shall be set back a minimum of twenty-five (25) feet from the ordinary high water mark. Setbacks are measured landward, on a horizontal plane, perpendicular to the shoreline. Shoreline setback requirements shall apply to non-water- dependent	The proposed curb supports water dependent industrial uses. See DR 5.11.10 below.
DR 5.11.10	Developments consisting of water-dependent scientific, historical, industrial, commercial, cultural, or educational research uses, public access, water-oriented recreation and ecological restoration are not required to meet the setback requirements, nor are piers, ramps or docks.	The proposed project supports water dependent industrial uses and is exempt from 5.11.09.

CHAPTER 6	ENVIRONMENTAL PROTECTION IMPACTS, MITIGATION, BONDING	RESPONSE
6.3.1	Protect the environment through implementation of this Master Program including the use of the AMRRCM mitigation sequence.	<i>Acknowledged</i>
6.3.2	Minimize the adverse impacts of shoreline developments and activities on the shoreline environment during all phases of development (e.g., design, construction, operation, and management).	<i>TESC measures will be implemented during construction. The project will provide updated stormwater treatment to improve water quality. The site will have operations source control BMPs in place to prevent ongoing impacts.</i>
6.3.3	Assure, at a minimum, that development and use within shoreline jurisdiction results in no net loss of ecological functions necessary to sustain shoreline natural resources. Development activities shall protect existing ecological functions and ecosystem-wide processes.	<i>The site has limited ecological value and the scope of the work will not result in a net loss of ecological function.</i>
DR - 6.3.1	All shoreline development and activity shall be located, designed, constructed, and managed in a manner that avoids, minimizes and/or mitigates adverse impacts to the environment. The preferred mitigation sequence (avoid, minimize, rectify, reduce, or compensate for the environmental impact) shall follow that listed in WAC 173-26-201((2) (e), see also definition of "Mitigation" listed in this Master Program, Chapter 12).	<i>Acknowledged. The project is sited to avoid impacts to critical areas and sensitive habitats.</i>
DR - 6.3.2	In approving shoreline developments, the City of Anacortes shall ensure that shoreline development, use, and/or activities will result in no net loss of ecological functions necessary to sustain shoreline resources, including loss that may result from the cumulative impacts of similar developments over time to the extent consistent with constitutional and statutory limitations on the regulation of private property. To this end, the City may require modifications to the site plan and/or adjust or prescribe project dimensions, intensity of use, and screening as deemed appropriate. If impacts cannot be avoided through design modifications, the City shall require mitigation commensurate with the project's adverse impacts.	<i>Acknowledged, the proposed curb is continuation of the existing use of the site and will not result in a net loss of ecological function. The site is already highly modified from the natural state and the improvements will be entirely within the footprint of the ROW and Pier.</i>

6.4.1	Protect against adverse impacts to the public health, to the land and its vegetation and wildlife, and to waters of the state and their aquatic life. In-stream structures that protect and preserve ecosystem-wide processes, ecological functions, and cultural resources, including, fish and fish passage, wildlife and water resources, shoreline critical areas, hydrogeological processes, and natural scenic vistas are of particular importance.	<i>Acknowledged.</i>
DR-6.4.2	All shoreline permits shall contain provisions that require developers to comply with all applicable state law requirements regarding preservation of archaeological and historic resources, including provisions to stop work and notify the appropriate agencies should protected resources be uncovered during excavation.	<i>The site is not of known cultural resource or historic value. An inadvertent discovery plan will be implemented for the construction phase of the project.</i>
DR-6.4.3	Archaeological sites located both in and outside shoreline jurisdiction are potentially subject to chapter 27.44 RCW (Indian graves and records) and chapter 27.53 (Archaeological sites and records) and chapter 25.48 WAC (Archaeological excavation and removal permits) as well as the provisions of this section.	<i>The site is not of known cultural resource or historic value.</i>
DR-6.4.4	Where archaeological or historic sites have been identified, the City may require public access consistent with constitutional and statutory limitations, provided the development is consistent with the provisions for public access and provided further it is determined that public access to the site will not damage or reduce the cultural value of the site.	<i>The site is not of known cultural resource or historic value.</i>
DR-6.4.5	All shoreline uses and activities shall be located, designed, constructed and managed to minimize interference with beneficial natural shoreline processes such as littoral drift, sand and gravel movement, erosion, and accretion. For projects proposing clearing and grading see Section 6.5 Vegetation Conservation, Chapter 9 Specific Modification Policies and Development Regulations.	<i>This project's construction and operation will not affect shoreline processes as designed.</i>
DR-6.4.6	Gravel and sand bars and other accretion shore forms are naturally unstable environments. They are valued for recreation and in some cases may provide habitat. Therefore, new development on these shore forms is prohibited and modification shall be allowed only to protect existing occupied structures. Furthermore, developments that could disrupt the processes benefiting these shore forms shall be carefully evaluated and allowed only when the impacts of such disruption can be adequately mitigated, and where there is a demonstrated public benefit.	<i>Project will not extend to or below the OHW mark.</i>
DR-6.4.7	An erosion and sedimentation control plan shall be submitted with a permit application for activities that involve the removal of vegetation, stockpiling of earth or other materials, or any activity that could result in shoreline erosion or siltation. Said program shall conform to the City of Anacortes' Engineering Design Standards and shall at minimum, utilize Best Management Practices (BMPs) to prevent shoreline erosion and siltation.	<i>A detailed TESC plan is included on the site plans.</i>

DR-6.4.8	Noise emanating from a shoreline use/activity shall be muffled so as to not to interfere with the designated use of adjoining properties. This determination shall take into consideration ambient noise levels, intermittent beat, frequency, and shrillness. Shoreline developments/activities shall comply with the maximum permissible noise levels and time limits set forth in Anacortes Municipal Code Chapter 17.54. Exception: This regulation does not apply to fog horns, tsunami warning or other emergency warning systems	<i>Construction noise associated with a variety of construction equipment would occur for the duration of the project. This could include truck engines, generators and other small engines, excavators, backhoes, and other equipment. Construction noise would occur during daylight hours as permitted by City of Anacortes noise ordinances. The expected noise levels are not significantly different than those from the uses at Curtis Wharf or Quiet Cove.</i>
DR-6.4.15	All shoreline developments shall be located, designed, constructed, and operated so as not to be a hazard to public health and safety.	<i>The project as designed is unlikely to be a public health hazard.</i>
DR-6.4.22	All development activities approved under this Shoreline Master Program shall be designed and maintained consistent with the City's Stormwater Management Plan and Engineering Design Standards.	<i>Acknowledged.</i>
6.5.2	Limit alteration of the natural landscape to the minimum necessary to accommodate the shoreline development or a landscape plan developed in conjunction with the shoreline development, or to remove invasive vegetation.	<i>The site is highly modified and far removed from its natural state; there is no vegetation on site presently.</i>
6.5.4	Tree removal is to be minimized on City shorelines. Place priority on retention of snags and live trees that provide nesting or perching for eagles, other raptors, or priority species.	<i>No trees at the site.</i>
6.5.5	Use best management practices (BMPs) during clearing and grading to control erosion.	<i>TESC BMPs will be used during construction per the TESC plan.</i>
DR-6.5.3	All clearing and grading activities shall be limited to the minimum necessary for the intended development.	<i>Acknowledged. Clearing and grading are expensive enterprises and we will limit these activities to the largest degree possible.</i>
DR-6.5.4	Exposed soils shall be immediately developed or revegetated to prevent erosion.	<i>TESC BMPs will be used during construction per the TESC plan. Scheduling will avoid exposure of bare soils to rainfall to prevent erosion to the largest degree possible.</i>

DR-6.5.11	All shoreline development and activity shall use effective measures to minimize increases in surface water runoff that may result from clearing and grading activity. The applicant must implement best management practices in compliance with Chapter 5, Clearing, Grading, and Erosion Control under the City's Engineering Design Standards. Submittal requirements may include a plan addressing species removal, revegetation, irrigation, erosion and sedimentation control, and other methods of nearshore/riparian corridor protection in accordance with the City's Engineering Design Standards.	<i>Construction of the project will follow a TESC plan that meets all applicable requirements.</i>
6.6.1	Protect unique, rare, and fragile environments, including wetlands and fish and wildlife habitat conservation areas, from impacts associated with development.	<i>The project will not impact any unique, rare, or fragile environments. None of these are within the project footprint.</i>
6.6.2	Locate and design development to minimize risks to people, property and other critical areas associated with geologically hazardous areas, frequently flooded areas, and tsunamis.	<i>The project is located within the frequently flooded areas (see attached memo on the floodplain mapping) and proposed use is appropriate for the degree of geological hazard.</i>

Chapter 9	FILL	RESPONSE
9.7.1	Fill should be located, designed, and constructed to protect shoreline ecological processes and functions.	<i>Minor structural fill will be imported as needed to support on-site use and will not interrupt shoreline processes.</i>
9.7.2	Fill landward of the ordinary high water mark should be permitted when necessary to support permitted uses, and when significant impacts can be avoided or mitigated.	<i>Fill is needed to support the current uses on subject property.</i>
9.7.3	Fill waterward of the ordinary high water mark should be permitted only by Shoreline Conditional Use Permit when necessary to accommodate water-dependent uses; public access; expansion or alteration of transportation facilities of statewide significance currently located on the shoreline and then only upon a demonstration that alternatives to fill are not feasible; a transportation facility, utility, or navigational structure with no feasible alternative; cleanup and disposal of contaminated sediments as part of an interagency environmental clean-up plan; disposal of dredged material considered suitable under and conducted in accordance with the Dredged Material Management Program of the Department of Natural Resources, Department of Ecology and U.S. Army Corps of Engineers; and public access.	<i>No fill waterward of OWH is proposed.</i>
DR-9.7.1	Fill for water-dependent uses and for public use shall be given priority.	<i>Acknowledged. The proposed curb will support water dependent uses at Curtis Wharf and Quiet Cove.</i>
DR-9.7.2	Fill shall be permitted only when in conjunction with a proposal or activity otherwise permitted under the SMP.	<i>Curtis Wharf is an allowable water dependent use within the MS zone and urban maritime SED.</i>
DR-9.7.3	Fill waterward of the ordinary high water mark is permitted by Shoreline Conditional Use Permit only when necessary	<i>No fill waterward of OHWM is proposed.</i>

	to accommodate water-dependent uses, and for maintenance and repair of existing structures; expansion or alternation of transportation facilities of statewide significance currently located on the shoreline and then only upon a demonstration that alternatives to fill are not feasible; a transportation facility, utility, or navigational structure with no feasible alternative; cleanup and disposal of contaminated sediments as part of an interagency environmental clean-up plan; disposal of dredged material considered suitable under and conducted in accordance with the Dredged Material Management Program of the Department of Natural Resources; mitigation or compensation actions and ecological restoration including beach nourishment or enhancement projects when significant impacts can be mitigated; and public access.	
DR-9.7.4	Projects shall be located and designed to minimize the area of fill necessary to accommodate the use.	<i>Fill for the project is minimal and limited to required amounts for paving.</i>
DR-9.7.5	Applications for fill shall address impacts to wetlands and streams; aquatic habitats; flooding; sediment transport; navigation, and public access. The following information may be required: physical and biological characteristics of the fill site, source and quality of fill material, grading plan showing the site, adjacent properties and waters, method of placement and compaction, type of proposed surfacing and runoff control, method of erosion control and stabilization, and proposed use of the fill area. Fill that will result in significant adverse impacts that cannot be mitigated is prohibited.	<i>No adverse impacts will result from fill placement.</i>
DR-9.7.6	Fill shall be provided with some means for erosion control and/or shoreline stabilization consistent with the policies and regulations of Section 9.11, Shoreline Stabilization Measures and Flood Protection Works.	<i>Soil stabilization will be provided as needed. TESC measures will be in place during construction to prevent erosion on site.</i>

Exhibit #6

REVIEWED BY
SKAGIT COUNTY TREASURER
DEPUTY Lena Thompson
DATE 06/24/2022**Document Title:**RIGHT OF WAY USE AGREEMENT 2N^o STREET- FROM "O" AVENUE TO SHORELINE**Reference Number :** N/A**Grantor(s):**☐ additional grantor names on page ____.

1. THE CITY OF ANACORTES

2.

Grantee(s):☐ additional grantee names on page ____.

1. THE PORT OF ANACORTES

2.

Abbreviated legal description:☐ full legal on page(s) ____.

THAT PORTION OF PLATTED 2N^o STREET LYING WESTERLY OF THE WEST LINE OF "O" AVENUE AND BETWEEN BLOCKS 66 AND 67 AS DEDICATED ON THE PLAT OF "MAP OF CITY OF ANACORTES" ACCORDING TO THE MAP THEREOF, RECORDED IN VOLUME 2 OF PLATS, PAGES 4-7, RECORDS OF SKAGIT COUNTY, WASHINGTON. SITUATE IN THE CITY OF ANACORTES, SKAGIT COUNTY, WASHINGTON.

Assessor Parcel / Tax ID Number:☐ additional tax parcel number(s) on page ____.

P55355 / 3772-066-010-0009

After recording return to:
Office of the City Clerk
City of Anacortes
City Hall
904 6th Street
Anacortes, WA 98221-0547

DOCUMENT TITLE(S):

RIGHT OF WAY USE AGREEMENT 2ND STREET – FROM “O” AVENUE TO SHORELINE

REFERENCE NUMBER(S) FF DOCUMENTS AMENDED, ASSIGNED AND/OR RELEASED:

N/A

GRANTOR:

THE CITY OF ANACORTES

GRANTEE:

THE PORT OF ANACORTES

ABBREVIATED LEGAL DESCRIPTION:

THAT PORTION OF PLATTED 2ND STREET LYING WESTERLY OF THE WEST LINE OF “O” AVENUE AND BETWEEN BLOCKS 66 AND 67 AS DEDICATED ON THE PLAT OF “MAP OF CITY OF ANACORTES” ACCORDING TO THE MAP THEREOF, RECORDED IN VOLUME 2 OF PLATS, PAGES 4-7, RECORDS OF SKAGIT COUNTY, WASHINGTON. SITUATE IN THE CITY OF ANACORTES, SKAGIT COUNTY, WASHINGTON.

ASSESSOR PROPERTY TAX PARCEL:

N/A

**RIGHT OF WAY USE AGREEMENT
2ND STREET – FROM “O” AVENUE TO SHORELINE**

1. **AGREEMENT.** This Right of Way Use Agreement (“Agreement”) is between the City of Anacortes (“City”) and the Port of Anacortes (“Port”) for the conveyance of a property interest from the City to the Port. The City and the Port are each a “Party” and collectively “Parties” to this Agreement. The Parties agree as follows.
2. **STRUCTURE AND AUTHORITY.** This Agreement is authorized under Chapter 39.33 RCW, the Intergovernmental Disposition of Property Act.
3. **RECITALS/BACKGROUND**
 - 3.1 In 2018, the Parties and the Economic Development Alliance of Skagit County (“EDASC”) jointly developed and adopted the Anacortes Maritime Strategic Plan (the “Maritime Plan”). The Maritime Plan included goals and objectives to promote and develop a thriving and sustainable marine sector in the City’s jurisdiction. Among many goals and objectives, the Parties agreed to identify and implement policies that would ensure optimal use of industrial and commercial lands for maritime-related business.
 - 3.2 The Port developed a Marine Terminal Modernization Study in 2020 (“Terminal Modernization Study”). The Study identified that an increase in activity at Curtis Wharf will likely require that a small portion of the Second Street right-of-way from the westerly edge of “O” Ave. to its terminus near the water’s edge would require vacation or closure. See Exhibit B for depiction of area (the “2nd St. ROW”).
 - 3.3 The subject portion of 2nd St. ROW provides legal access, in part, to adjacent properties owned by the Port. The property north of the 2nd St. ROW is the Port’s Curtis Wharf Terminal. Port marine terminal operations at Curtis Wharf presently cross the 2nd St. ROW.
 - 3.4 The City’s Shoreline Management Plan (“SMP”) encourages the development of alternative public access plans where public safety is compromised by water dependent transportation shipping and manufacturing uses in proximity to deep shipper berths (see SMP Policies 5.11.1, 5.11.6, 4.5.3).
 - 3.5 Port is engaged in an environmental clean-up of the Quiet Cove environmental site (Washington State Department of Ecology (“Ecology”) Facility Site ID: # 20859; Cleanup Site ID: 12482) (the “Site”). The cleanup levels selected for the Site are based on an unrestricted future land use standard. The Port and Ecology have entered into an Agreed Order providing for site remediation activities, including a portion of the 2nd St. ROW that is included within the Quiet Cove Site boundary. The Port will be responsible for conducting the environmental cleanup selected by Ecology for the 2nd St. ROW that is included within the Quiet Cove Site boundary and releases the City from the costs for the same. The Agreement will enable the Port to examine and consider more permanent remedial action alternatives for the potential environmental cleanup of the 2nd St. ROW.

- 3.6 The 2nd St. ROW is used extensively by the Port and the Port's tenant trucks and vehicles. Closure of the 2nd St. ROW and redirecting the limited public vehicular and pedestrian use of the 2nd St. ROW to the primary access to the public shoreline on "N" Avenue, via 3rd St., will enhance public safety.
- 3.7 The Agreement allows for product storage south of the 2nd St. ROW on Port property and construction of conveyance equipment on the 2nd St. ROW to the Curtis Wharf Terminal to reduce risk to the public or the marine terminal operations as a result of public access within a marine terminal area.
- 3.8 Closure of this portion of the 2nd St. ROW will not affect the primary public access to "N" Avenue Park and waterfront.
- 3.9 The Parties acknowledge that the City has received full value for the property rights granted to the Port herein, which is found, in part, in the Port's release of the City from costs of and liability from environmental remediation incurred for the portion of the 2nd St. ROW located within the Quiet Cove environmental site.
4. **TERM.** This Agreement takes effect and is in force from and after the Effective Date, for a period of thirty (30) years (the "Initial Term"). The Initial Term may be extended with two (2), ten (10) - year renewal terms on mutual agreement of the Parties.
5. **EFFECTIVE DATE.** The Agreement Effective Date is the date of the last signature of the Parties, below.
6. **2nd St. ROW CLOSED - CITY GRANT TO PORT.**
 - 6.1 Under this Agreement, the City closes the 2nd St. ROW, subject to the Port's construction and management of signage and other traffic management regarding access to and use of the 2nd St. ROW.
 - 6.2 Except as set forth in Agreement Section 7, the City hereby grants to the Port, and the Port shall have exclusive use of, the 2nd St. ROW for the Term of the Agreement for the uses described in Agreement Section 8.
7. **CITY RESERVED RIGHTS.** The City reserves the right, privilege, and authority to use the subsurface portion of the 2nd St. ROW for the siting and construction of utility improvements, including a segment of an outfall connection from the City's wastewater treatment plant to Guemes Channel. Notwithstanding the City's reservation described herein, the Port may develop and/or construct improvements on the portion of the 2nd St. ROW subject to City's reservation described herein. In the event that the City constructs or causes to be constructed utility improvements beneath the ROW during the term of this Agreement, the Port shall remove from the ROW any improvements that it has installed when such removal is necessary to accommodate the City's utility construction.

8. PORT USE OF 2nd St. ROW.

- 8.1 Under this Agreement, the Port is granted the right of use over, under, upon and across the 2nd St. ROW for the support of industrial and/or commercial uses associated with Port's marine terminal facilities, including, without limitation, Pier 1, Pier 2, Curtis Wharf, and the Port's properties known as "Quiet Cove." These uses include, without limitation, (i) vehicle access; (ii) product storage operations; (iii) restricting public traffic and access to the 2nd St. ROW; and (iv) constructing any improvements the Port deems necessary to support these uses.
- 8.2 The Port and its contractors use of the 2nd St. ROW shall comply with all applicable federal, state, and local laws, ordinances, orders, rules, and regulations. The Port is responsible for all necessary permits, licenses, certificates, or approvals required by applicable laws, ordinances, and regulations necessary to use of the 2nd St. ROW.
- 8.3 Upon the termination of this Agreement, unless otherwise agreed to by the Parties, the Port shall restore 2nd St. ROW within ninety (90) days to its pre-closure state, including but not limited to removing any closure improvements such as gates, barriers, and signage. Any development of the 2nd St. ROW by the City after the termination of this Agreement shall be conducted by the City at no cost to the Port. These obligations shall survive termination of the Agreement.
- 8.4 The Port and its contractors bear all of the costs of their activities under this Agreement relating to the 2nd St. ROW. This obligation shall survive termination of the Agreement.

9. INDEMNIFICATION.

- 9.1 City's Indemnification of Port. To the extent permitted by law, City shall indemnify, save, defend, and hold harmless Port, its officers, agents, and employees from and against any and all claims, demands, judgments, losses, or liability for personal injury (including without limitation death) or property damage (collectively, "Claims") arising out of any willful misconduct or negligent act, error, or omission of City, its officers, agents, or employees in connection with the 2nd St. ROW accruing (i) prior to City's closure of the 2nd St. ROW; or (ii) after termination of this Agreement, except as the Port's restoration obligation in Agreement Section 8.3 may apply. City's obligations under this section shall apply only to the extent of the negligence or willful misconduct of City or its agents and shall not extend to Claims caused by, resulting from, or arising from the sole misconduct or sole negligence of Port, its officers, agents, or employees.
- 9.2 Port's Indemnification of City. To the extent permitted by law, Port shall indemnify, save, defend, and hold harmless City, its officers, agents, and employees from and against any and all Claims arising out of any willful misconduct or negligent act, error, or omission of Port, its officers, agents, or employees in connection with the 2nd St. ROW accruing (i) after City's closure of the 2nd St. ROW during the effective period of the Agreement; or (ii) as a result of the improvements on the 2nd St. ROW installed at Port's direction. Excepted from this section are any and all Claims

arising out of the City's exercise of its reserved rights described herein. Port's obligations under this section shall apply only to the extent of the negligence of willful misconduct of Port or its agents and shall not extend to Claims caused by, resulting from, or arising from the sole misconduct or sole negligence of City, its officers, agents, or employees.

10. **GENERAL.**

- 10.1 Binding Effect. This Agreement, and all rights associated therewith, shall be considered, and construed as covenants running with the land, and shall be binding upon, and inure and extend to the benefit of the successors and assigns of the Parties.
- 10.2 Severability. In case any one or more of the provisions contained in this Agreement shall for any reason be held to be invalid, illegal, or unenforceable in any respect, such invalidity, illegality, or unenforceability shall not affect any other provision hereof, and this Agreement shall be construed as if such invalid, illegal, or unenforceable provision had never been contained herein.
- 10.3 Jurisdiction and Venue. Jurisdiction for any action to enforce the terms of this Agreement shall be in the Superior Court for the State of Washington. Venue for any such action shall be in Skagit County.
- 10.4 Captions. The captions and paragraph headings contained in this Agreement are for the convenience of the Parties and for reference only, and in no way define, describe, extend, or limit the scope or intent of this Agreement, nor the intent of any provision hereof.
- 10.5 Waiver. No failure by either Party to insist upon the strict performance of any covenant, duty, agreement, or condition of this Agreement, or to exercise any right or remedy consequent upon a breach thereof, shall constitute a waiver of any such breach or any other covenant, agreement, term, or condition.
- 10.6 Neutral Authorship. Each of the provisions of this Agreement has been reviewed and negotiated and represents the combined work product of both Parties. No presumption or other rules of construction which would interpret the provisions of this Agreement in favor of, or against the Party preparing the same, shall be applicable in connection with the construction or interpretation of any of the provisions of this Agreement.
- 10.7 Amendments. Except as otherwise set forth herein, this Agreement may not be modified, amended, or terminated except by the written agreement of the Parties or their successors and assigns.
- 10.8 Notices. All notices, demands, requests, consents, and approvals which may, or are required to be given by any Party to any other Party hereunder, shall be in writing and shall be deemed to have been duly given if delivered personally, sent by a nationally recognized overnight delivery service, or if deposited in the United States mail, postage prepaid to:

City: City of Anacortes
Attn: Mayor
904 6th Street
P.O. Box 547
Anacortes, WA 98221

Port: Port of Anacortes
Attn: Executive Director
100 Commercial Avenue
Anacortes, WA 98221

- 10.9 Counterparts – Authority. This Agreement may be executed in counterparts and each executed counterpart shall have the same force and effect as the original instrument and as if all Parties to the counterparts had signed the same instrument. Electronic facsimile signatures and/or electronically scanned signatures shall be sufficient to demonstrate a Party's assent to this Agreement. Each individual signing this Agreement on behalf of either the City or the Port represents that (i) they have the authority to bind the Party on whose behalf they are signing; and (ii) that all steps necessary for their respective entity to execute this Agreement have been taken, including the conduct of a public hearing under RCW 39.33.020.
- 10.10 Entire Agreement. This Agreement contains the entire understanding between the Parties with respect to the subject matter hereof and supersedes and replaces all written and oral agreements previously made or existing with respect to the subject matter hereof.
- 10.11 Recording. This Agreement may be recorded for record by a Party with Skagit County, Washington at the sole cost and expense of the Port.

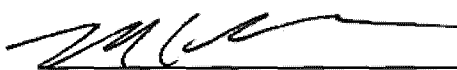
IN WITNESS WHEREOF, the parties have caused this Agreement to be duly executed as of the last date set forth below.

CITY:

PORT:

CITY OF ANACORTES

PORT OF ANACORTES




Matt Miller
Mayor

Daniel Worra
Executive Director

Date: 16 FEB 2022

Date: 2-16-22

STATE OF WASHINGTON)
) ss.

COUNTY OF SKAGIT)

On this 14 day of February, 2022, before me, the undersigned Notary Public in and for the State of Washington, duly commissioned and sworn, personally appeared **Matt Miller** to me known to be the **Mayor** of the **City of Anacortes**, the municipal corporation that executed the foregoing instrument, and acknowledged said instrument to be the free and voluntary act and deed of said district, for the uses and purposes therein mentioned, and on oath stated that he/she is duly authorized to execute the same.

GIVEN under my hand and official seal this 14 day of February, 2022.



Jennifer G. Tottenham
 Print Name: _____
 NOTARY PUBLIC in and for the
 State of Washington, residing at Skagit County WA
 My commission expires: 9.28.24

STATE OF WASHINGTON)
) ss.

COUNTY OF SKAGIT)

On this 16 day of February, 2022, before me, the undersigned Notary Public in and for the State of Washington, duly commissioned and sworn, personally appeared **Daniel Worra**, to me known to be the **Executive Director** of the **Port of Anacortes**, the municipal corporation that executed the foregoing instrument, and acknowledged said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that he is duly authorized to execute the same.

GIVEN under my hand and official seal this 16 day of February, 2022.



Jennifer G. Tottenham
 Print Name: _____
 NOTARY PUBLIC in and for the
 State of Washington, residing at Skagit County WA
 My commission expires: 9.28.24

RIGHT OF WAY USE AGREEMENT – 7

EXHIBIT "A"
LEGAL DESCRIPTION

THAT PORTION OF PLATTED 2ND STREET LYING WESTERLY OF THE WEST LINE OF "O" AVENUE AND BETWEEN BLOCKS 66 AND 67 AS DEDICATED ON THE PLAT OF "MAP OF CITY OF ANACORTES" ACCORDING TO THE MAP THEROF, RECORDED IN VOLUME 2 OF PLATS, PAGES 4-7, RECORDS OF SKAGIT COUNTY, WASHINGTON.

SITUATE IN THE CITY OF ANACORTES, SKAGIT COUNTY, WASHINGTON.



Pacific Surveying & Engineering, Inc
land surveying • civil engineering • consulting • environmental
909 Squallicum Way #111, Bellingham, WA 98225
Phone 360.671.7387 Facsimile 360.671.4685 Email info@psurvey.com

EXHIBIT ' _ '

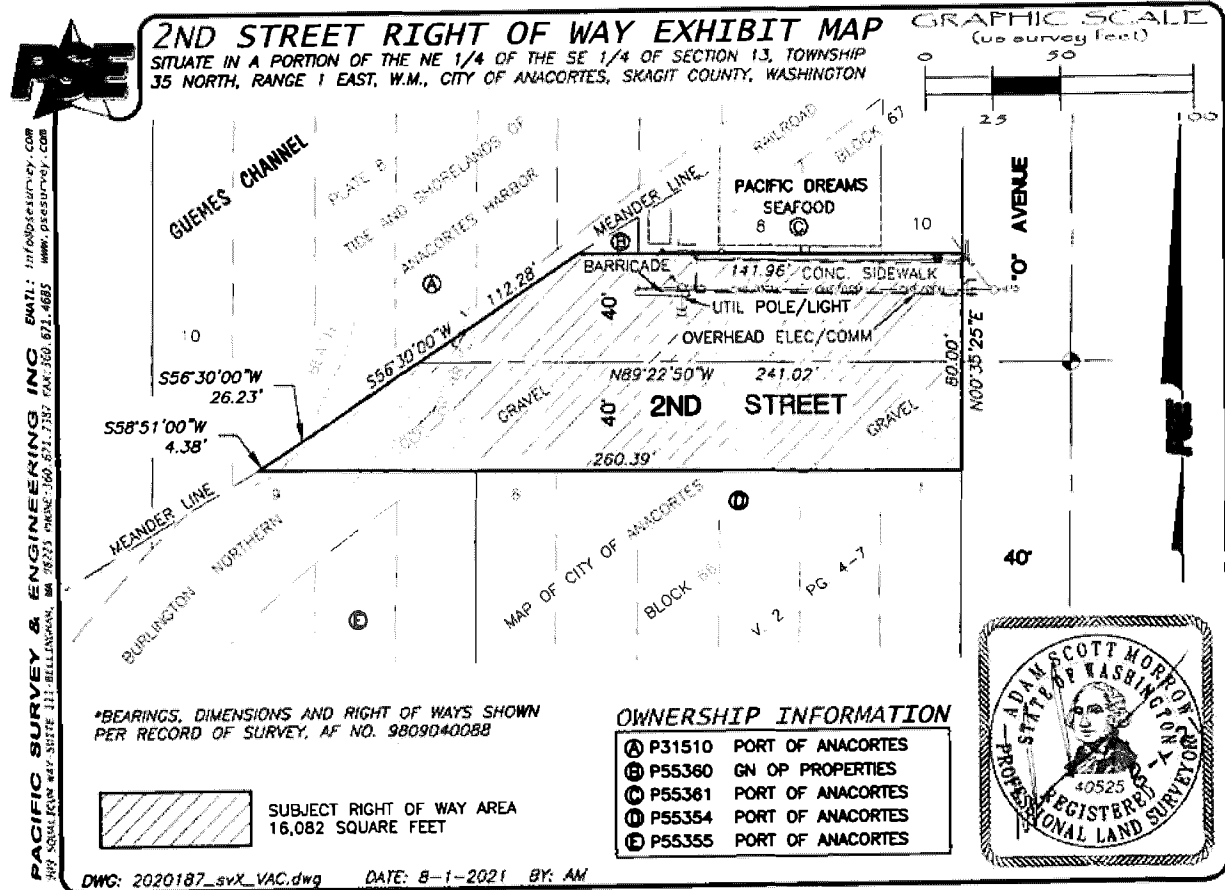
2nd STREET RIGHT OF WAY WEST OF "O" AVENUE
LEGAL DESCRIPTION

THAT PORTION OF PLATTED 2ND STREET LYING WESTERLY OF THE WEST LINE OF "O" AVENUE AND BETWEEN BLOCKS 66 AND 67 AS DEDICATED ON THE PLAT OF "MAP OF CITY OF ANACORTES" ACCORDING TO THE MAP THEREOF, RECORDED IN VOLUME 2 OF PLATS, PAGES 4-7, RECORDS OF SKAGIT COUNTY, WASHINGTON.

SITUATE IN THE CITY OF ANACORTES, SKAGIT COUNTY, WASHINGTON.

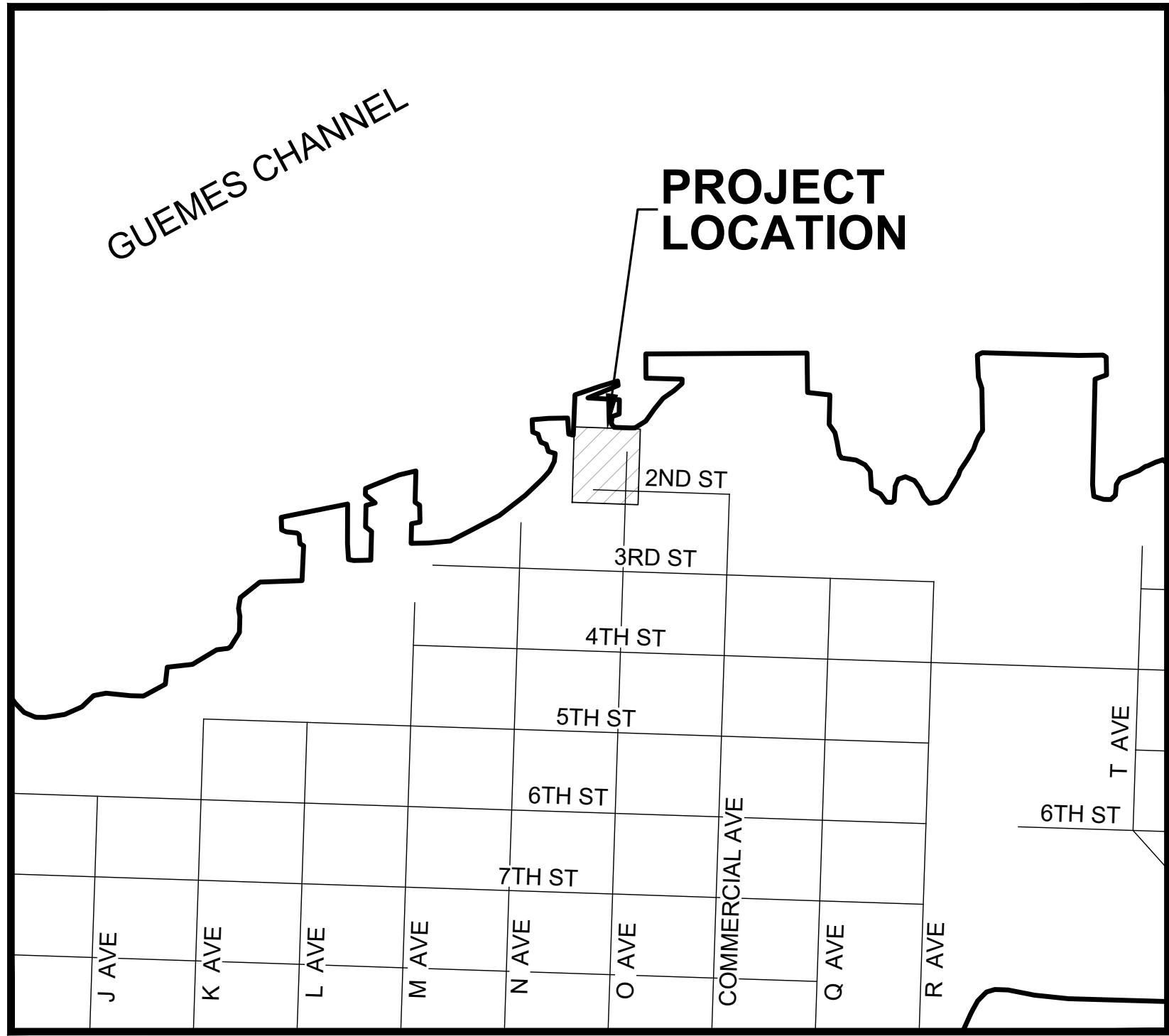


EXHIBIT "B" EASEMENT AREA DEPICTION



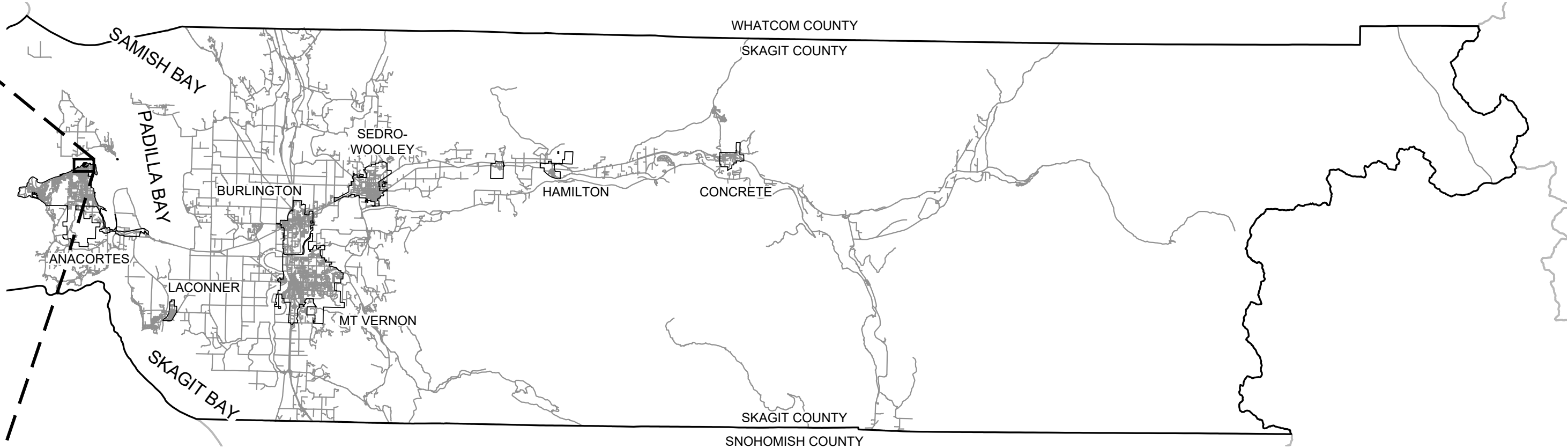
CURTIS WHARF ENTRANCE REDEVELOPMENT 2ND ST ANACORTES, WA 98221

Exhibit #7



VICINITY MAP
SCALE: 1"=500'

SHEET INDEX	
SHEET #	SHEET TITLE
C01	COVER SHEET
C02	GENERAL NOTES
C03	EX CONDITIONS, DEMO & TESC PLAN
C04	SITE PLAN
C05	GRADING & DRAINAGE PLAN
C06	ROAD & DRAINAGE PROFILES
C07	DETAILS
C08	DETAILS
C09	DETAILS
C10	DETAILS



SKAGIT COUNTY MAP
NOT TO SCALE

PROJECT INFORMATION

CLIENT/APPLICANT:

PORT OF ANACORTES
BRAD TESCH
100 COMMERCIAL AVE
ANACORTES, WA 98221
PH: 360.299.1830
BRAD.TESCH@PORTOFANACORTES.COM

CIVIL ENGINEER:

DAVIDO CONSULTING GROUP, INC.
DANNY OCHOA, P.E.
2210 RIVERSIDE DRIVE, SUITE 110
MOUNT VERNON, WA 98273
PH: 360.899.1110
DANNY@DCGENGR.COM

ENVIRONMENTAL ENGINEER:

GEO ENGINEERS, INC
2101 4TH AVE, SUTIE 950
ANACORTES, WA 98221
PH: 360.299.1830

SURVEYOR:

PACIFIC SURVEYING & ENGINEERING, INC.
909 SQUALICOM WAY SUITE 111
BELLINGHAM, WA 98225
PH: 360.671.7387
INFO@PSESURVEY.COM

ABBREVIATIONS:

- CB = CATCH BASIN
- CONC = CONCRETE
- DEMO = DEMOLITION
- EOP = EDGE OF PAVEMENT
- TESC = TEMPORARY EROSION & SEDIMENTATION CONTROL
- EX = EXISTING
- FFE = FINISH FLOOR ELEVATION
- FG = FINISH GRADE
- FH = FIRE HYDRANT
- IE = INVERT ELEVATION
- LF = LINEAL FEET
- SD = STORM DRAIN
- SDCO = STORM DRAIN CLEANOUT
- SDMH = STORM DRAIN MANHOLE
- SS = SANITARY SEWER
- SSSCO = SANITARY SIDE SEWER CLEANOUT
- SSS = SANITARY SIDE SEWER
- TOP = TOP OF PAVEMENT
- TOPW = TOP OF WALL
- TYP = TYPICAL
- UGP = UNDERGROUND POWER
- W = WATER
- WM = WATER METER

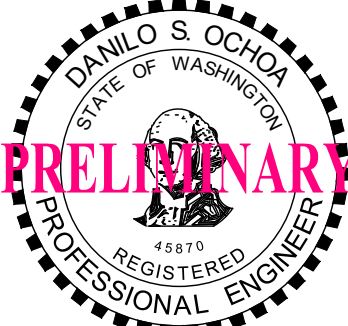
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DATE: 11/14/2023 12:26 PM - SHEET SET: XXXX - ORIGINAL SHEET SIZE: ANSI FULL BLEED D (34.375 X 22.00 INCHES)
AUTOCAD VERSION: CIVIL 3D 2013

P:\CLIENTS\CIVIL\PUBLIC\ANACORTES - PORT OF\CURTIS WHARF ENTRANCE REDEVELOPMENT DESIGN & BID SUPPORT\DWG\DRAWING\CURTIS WHARF REDEVELOPMENT.DWG
CADD FILE NUMBER: P:\CLIENTS\CIVIL\PUBLIC\ANACORTES - PORT OF\CURTIS WHARF ENTRANCE REDEVELOPMENT DESIGN & BID SUPPORT\DWG\DRAWING\CURTIS WHARF REDEVELOPMENT.DWG
DATE: 11/14/2023 12:26 PM - SHEET SET: XXXX - ORIGINAL SHEET SIZE: ANSI FULL BLEED D (34.375 X 22.00 INCHES)
AUTOCAD VERSION: CIVIL 3D 2013



P.O. Box 1132
Freeland, WA 98249

P: 360.331.4131
F: 360.331.5131
www.dcgengr.com



NO.	DATE	BY	REVISION



PORT OF ANACORTES
CURTIS WHARF
PROJECT #MRT-64

COVER SHEET

DRAWN: GR	PROJECT NO.: XXX
DESIGN: DO,SG	SCALE: AS NOTED
CHECKED: DO	DATE: 12/13/22
SHEET NO. C01	

30% DESIGN - NOT FOR CONSTRUCTION

CAD FILE NUMBER: P:\CLIENTS\CIVIL\PUBLIC\ANACORTES - PORT OF CURTIS WHARF ENTRANCE REDEVELOPMENT DESIGN & BID SUPPORT\DWG\DRAWING\CURTIS WHARF REDEVELOPMENT.DWG
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P:\CLIENTS\CIVIL\PUBLIC\ANACORTES - PORT OF CURTIS WHARF ENTRANCE REDEVELOPMENT DESIGN & BID SUPPORT\DWG\DRAWING\CURTIS WHARF REDEVELOPMENT.DWG\TAB:C02 NOTES MODIFIED BY GREG ON JAN 04, 2023 - 12:27

GENERAL NOTES:

- THE CONTRACTOR SHALL NOTIFY THE UNDERGROUND UTILITY LOCATE CENTER AT 1-800-424-5555 AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.
- THE CONTRACTOR SHALL PROTECT IN PLACE, ALL UTILITIES, STRUCTURES AND FEATURES, WHETHER OR NOT SHOWN ON THESE PLANS. ANY DAMAGE TO EXISTING UTILITIES OR FEATURES SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.
- LOCATIONS OF EXISTING FEATURES AND UTILITIES AS SHOWN ON THESE PLANS ARE APPROXIMATE AND BASED ON THE BEST AVAILABLE INFORMATION. ACTUAL LOCATIONS SHALL BE DETERMINED BY THE CONTRACTOR.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE MEANS, METHODS AND SEQUENCE OF CONSTRUCTION.
- THE CONTRACTOR SHALL BE REQUIRED TO KEEP ACCURATE AS-BUILT DRAWINGS AND DELIVER THIS INFORMATION TO THE OWNER FOR PREPARATION OF AS-BUILT DRAWINGS.
- ACCESS TO PRIVATE PROPERTY SHALL BE RESTORED DAILY.
- STREETS SHALL BE SWEEPED DAILY OR AS NEEDED.

EROSION AND SEDIMENTATION CONTROL (ESC) NOTES:

- THE CONTRACTOR SHALL MEET CITY OF ANACORTES STANDARDS AND REQUIREMENTS BY USING APPROPRIATE BEST MANAGEMENT PRACTICES (BMPs) FOR EROSION AND SEDIMENTATION CONTROL AS APPROVED BY THE COUNTY.
- EROSION ON- AND OFF-SITE. DURING AND AFTER CONSTRUCTION, THE CONTRACTOR SHALL MINIMIZE EROSION AND SEDIMENTATION ON-SITE AND SHALL PROTECT PROPERTIES AND WATER COURSES DOWNSTREAM FROM THE SITE FROM EROSION DUE TO INCREASES IN THE VELOCITY AND PEAK FLOW RATE OF STORM WATER RUNOFF FROM THE SITE.
- TRANSPORT OF SEDIMENT. THE CONTRACTOR SHALL PREVENT THE TRANSPORT OF SEDIMENT FROM THE SITE THROUGH MEASURES SUCH AS MULCHING, MATTING, COVERING, SILT FENCES, SEDIMENT TRAPS, SETTLING PONDS AND PROTECTIVE BERMS USING THE FOLLOWING BERMS: FILTER FENCE, STRAW BALE BARRIER, BRUSH BARRIER, GRAVEL FILTER BERM, SEDIMENT TRAP, TEMPORARY SEDIMENT POND, PRESERVING NATURAL VEGETATION, AND/OR BUFFER ZONES. TRANSPORT OF SEDIMENT ONTO PAVED SURFACES SHALL BE MINIMIZED, AND IF SEDIMENT IS TRANSPORTED ONTO A PAVED SURFACE, THE PAVED SURFACE SHALL BE CLEANED AT THE END OF EACH DAY IN ACCORDANCE WITH BMPs IN THE DRAINAGE MANUAL, OR APPROVED BY THE COUNTY. IN ADDITION, ACCESS ROADS MUST BE SPRAYED DOWN WITH WATER PERIODICALLY FOR DUST CONTROL PURPOSES.
- STABILIZING EXPOSED SOIL. THE CONTRACTOR SHALL PREVENT ON-SITE EROSION BY STABILIZING ALL SOILS THAT ARE TEMPORARILY EXPOSED AND NOT BEING ACTIVELY WORKED, THROUGH SUCH METHODS AS THE INSTALLATION OF SEEDING, MULCHING, MATTING AND COVERING. CONTRACTOR SHALL APPLY ONE OR MORE OF THE FOLLOWING TEMPORARY ESC BMPs: TEMP SEEDING, MULCHING AND MATTING, CLEAR PLASTIC COVERING, AND/OR DUST CONTROL.
- DENUDED AREAS SHALL BE STABILIZED AND SOIL STOCKPILES AS ESTABLISHED IN THE DRAINAGE MANUAL.
- STORM DRAIN INLETS SHALL BE PROTECTED USING BMP STORM DRAIN INLET PROTECTION. THE RECOMMENDED INLET PROTECTION ALTERNATIVES ARE TRIANGULAR SILT DIKES; BIOLOGS; EXERTS (FOSS ENVIRONMENTAL); DANDY BAGS; AND, STRAW WATTLES.
- NO MORE THAN THREE HUNDRED (300) FEET OF TRENCH MAY REMAIN OPEN AT ONE TIME. EXCAVATED MATERIAL SHALL BE PLACED ON THE UPHILL SIDE OF TRENCHES, UNLESS INCONSISTENT WITH SAFETY OR SITE CONSTRAINTS.
- MAINTENANCE AND REPAIR OF EROSION AND SEDIMENTATION CONTROL MEASURES. THE CONTRACTOR SHALL MAINTAIN AND REPAIR AS NECESSARY ALL TEMPORARY AND PERMANENT EROSION AND SEDIMENTATION CONTROL BMPs TO ASSURE THEIR CONTINUED PERFORMANCE.
- TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE MAINTAINED UNTIL FINAL SITE STABILIZATION.

STORM DRAINAGE:

- TEMPORARY EROSION/WATER POLLUTION CONTROL MEASURES SHALL BE IN INSTALLED AS NECESSARY.
- STORM DRAIN PIPE SHALL MEET THE FOLLOWING REQUIREMENTS:
 - SOLID WALL CORRUGATED HIGH DENSITY POLYETHYLENE PIPE WITH SMOOTH INTERIOR, CONFORMING TO AASHTO DESIGNATION M-252 TYPE S
 - PVC PIPE CONFORMING TO ASTM D 3034 SDR 35. PVC PIPE JOINTS SHALL CONFORM TO ASTM D 3212 WITH RESTRAINED GASKETS CONFORMING TO ASTM F 477
 - ALL PIPE JOINTS SHALL BE RUBBER GASKETED.
- ALL STORM DRAIN PIPE SHALL BE BEDDED. BEDDING MATERIAL SHALL CONFORM TO "BEDDING MATERIAL FOR RIGID PIPE" AS SPECIFIED IN SECTION 9-03.15 OF THE STANDARD SPECIFICATIONS. BEDDING SHALL BE PLACED TO A MINIMUM DEPTH OF 6 INCHES UNDER THE BARREL OF THE PIPE AND 4 INCHES OVER THE CROWN.

- TRENCH BACKFILL SHALL BE EXCAVATED NATIVE MATERIAL OR BANK RUN GRAVEL FOR TRENCH BACKFILL CONFORMING TO SECTION 9-03.19 OF THE STANDARD SPECIFICATIONS, DEPENDING ON THE SUITABILITY OF THE NATIVE MATERIAL TO COMPACTION. SUITABLE NATIVE MATERIAL SHALL BE FREE FROM MUD, MUCK, ORGANIC MATTER, BROKEN PAVEMENT, ROCKS GREATER THAN 6 INCH DIMENSION, AND OTHER DELETERIOUS MATERIAL, AND MUST BE CAPABLE OF COMPACTION TO MEET THE REQUIRED DENSITY AT THE TIME OF PLACEMENT. IF THE NATIVE MATERIAL CANNOT BE READILY COMPACTED TO THE SPECIFIED DENSITY, ONLY BANK RUN GRAVEL SHALL BE UTILIZED AND ANY INSUFFICIENTLY COMPACTED NATIVE MATERIAL SHALL BE REMOVED AND REPLACED WITH BANK RUN GRAVEL. THE NATIVE MATERIAL SHALL ONLY BE USED AND REMAIN IN PLACE IF INSITU COMPACTION TESTING PROVIDES SUFFICIENT EVIDENCE THAT THE SPECIFIED COMPACTION IS UNIFORMLY ATTAINED.

BACKFILL SHALL BE PLACED IN LIFTS NOT TO EXCEED 12 INCHES IN LOOSE DEPTH, AND EACH LIFT SHALL BE MECHANICALLY COMPACTED TO THE FOLLOWING DENSITIES:

- ALONG AND OVER THE PIPE TO A DEPTH OF ONE FOOT ABOVE THE CROWN OF THE PIPE - 90 PERCENT OF MAXIMUM DENSITY.
- ABOVE ONE FOOT ABOVE THE CROWN OF THE PIPE IN UNIMPROVED AREAS - 90 PERCENT OF MAXIMUM DENSITY.
- ABOVE ONE FOOT ABOVE THE CROWN OF THE PIPE IN AREAS TO BE PAVED (ROADWAY AND/OR SIDEWALK) - 95 PERCENT OF MAXIMUM DENSITY.

- IN NO CASE SHALL THE FOOTING DRAINAGE SYSTEM AND THE ROOF DOWNSPOUT SYSTEM BE INTERCONNECTED.
- PIPE ZONE BEDDING (MINIMUM 1' COVER) FOR STORM DRAIN PIPE PER ASTM D2321 (CLASS 1B) OR PER MANUFACTURER'S RECOMMENDATION.

- WORK HOURS
THE CITY OF ANACORTES ORDINANCE ALLOWS WORK FROM 7:00 A.M. TO 10:00 P.M. SEVEN DAYS A WEEK (COA ORD. #2316). SOMEONE IN CHARGE TO BE ON SITE AT ALL TIMES WHEN WORK IS IN PROGRESS. IF WORK IS DONE ON WEEKENDS, PLEASE INFORM THE PROJECT MANAGER SO THE CITY OF ANACORTES CAN HAVE AN INSPECTOR ON SITE. CONTRACTOR WILL BE BILLED FOR CITY OF ANACORTES OVERTIME.
- CALL 48-HOURS BEFORE THE FOLLOWING:
FOR INSPECTION CONTACT 360.299.1951.
 - PRIOR TO WORK START-UP
 - PRIOR TO ANY UTILITY CONSTRUCTION IN THE RIGHT OF WAY.
 - PRIOR TO POURING CAST-IN-PLACE CONCRETE STRUCTURES.
 - PRIOR TO PLACING ANY CRUSHED ROCK ON ROADWAY SUB GRADE.
 - PRIOR TO PLACING CURB, GUTTERS AND SIDEWALKS.
 - PRIOR TO ASPHALT PAVING.

- MATERIALS AND WORKMANSHIP:
 - ALL MATERIALS USED, MUST MEET WSDOT, APWA AND CITY OF ANACORTES SPECIFICATIONS.
 - ALL WORK AND MATERIALS THAT DO NOT MEET THE ABOVE SPECIFICATIONS MUST BE REMOVED AS DIRECTED BY THE PROJECT INSPECTOR.
 - SUBGRADE COMPACTION TESTS: WILL BE DONE BEFORE ANY C.S.B.C IS PUT IN PLACE. ALL TRENCHES WILL BE TESTED FOR COMPACTION. THE MATERIAL TESTING LAB NEEDS 24-HOUR NOTICE. USE THE TESTING PROTOCOL PROVIDED BY THE CITY. ITEMS TO BE COMPACTION TESTED WILL INCLUDE THE PIPE BEDDING (SECTION 7-08.3(1)C), BACKFILL (SECTION 7-08.3(3) AND SUB GRADE FOR SURFACING (SECTION 2-06.3(2)) AND ASPHALT (SECTION 5-04.3(10)B).
 - INSPECTION: ALL ASPECTS OF THIS PROJECT WILL BE INSPECTED INCLUDING PIPING, BACKFILL, SUB GRADE, CONCRETE AND ASPHALT, AS WELL AS FORMS, CURB, GUTTER AND SIDEWALK. IF A PORTION GETS BACKFILLED BEFORE INSPECTION, THE CONTRACTOR WILL DIG UP THAT PORTION FOR INSPECTION. 24-HOUR NOTICE REQUIRED. KNOW THE SCHEDULE AND LET THE CITY KNOW.
 - TESTING PROTOCOL: PRIOR TO CONSTRUCTION, A PROCTOR AND SIEVE ANALYSIS SHALL BE SUBMITTED, REVIEWED AND APPROVED BY THE CITY OF ANACORTES ON ALL MATERIAL USED IN THE RIGHT-OF-WAY. SEE THE CITY OF ANACORTES TESTING SCHEDULE.
 - ALL COMPACTION TEST SHALL BE APPROVED BY THE CITY OF ANACORTES ENGINEER AND PROJECT MANAGER PRIOR TO PLACING OF CRUSHED SURFACING, ASPHALT, CURB, GUTTER, SIDEWALK (INCLUDING TRENCH RESTORATION WHEN TEST MAY BE REQUIRED IN EACH LIFT).
 - CITY OF ANACORTES MAY REQUIRE ADDITIONAL TESTS ON SUB GRADE, TRENCHES, CONCRETE, OR ASPHALT. THE COSTS OF TESTING SHALL BE PAID FOR AS INDICATED IN THE CONTRACT DOCUMENTS.

- TRAFFIC CONTROL AND PUBLIC SAFETY:
 - FLAGGING: ALL FLAGGERS MUST HAVE FLAGGING CERTIFICATES AND MUST HAVE ATTENDED A FLAGGING COURSE OR AN OFF DUTY POLICE OFFICER IS REQUIRED. THE JOB WILL BE SHUT DOWN IF ANY UNCERTIFIED PEOPLE ARE FLAGGING. A STOP WORK ORDER WILL BE GIVEN AND WORK WILL NOT PROCEED UNTIL A CERTIFIED PERSON IS FLAGGING.
 - SIGNAGE: ALL SIGNAGE MUST BE PER THE MANUAL UNIFORM TRAFFIC DEVICES. BEFORE JOB IS TO BEGIN, PROPER SIGNAGE WILL BE IN PLACE WITH FLAGGERS IN PLACE IF NEEDED. EXTRA SIGNAGE MAY BE NEEDED. BE READY TO RENT SIGNS IF NEEDED.
 - TRAFFIC CONTROL PLAN: NEEDS TO BE SUBMITTED AND APPROVED BY THE ASSISTANT CITY ENGINEER PRIOR TO CONSTRUCTION START. TRAFFIC CONTROL PLAN SHALL INCLUDE THE LOCATION OF SIGNAGE, FLAGGERS, WORK ZONE, SAFE ZONE, AND TRAFFIC FLOW AND NEEDED DIMENSIONS. NO DETOURS ALLOWED WITHOUT APPROVAL FROM THE ASSISTANT CITY ENGINEER.
 - FOR STREET CLOSURE: CALL 911.
 - CONSTRUCTION SAFETY: IS THE RESPONSIBILITY OF THE CONTRACTOR.

- ROADWAY EMBANKMENT AND SUBGRADE CONSTRUCTION:
 - CRUSHED SURFACING SHALL BE COMPACTED TO 95% OF MAXIMUM DENSITY. NO RECYCLED MATERIAL ALLOWED.
 - EMBANKMENT AND SUB GRADE MUST BE COMPACTED TO 95% OF MAXIMUM DENSITY.
 - PROPER MOISTURE MUST BE MAINTAINED THROUGHOUT PLACING AND COMPACTION.
 - COMPACTION TESTING TO BE PERFORMED BY AN INDEPENDENT LAB. USE A "MODIFIED PROCTOR".
- TRENCHES IN DEVELOPED RIGHT-OF-WAY:
SEE CITY OF ANACORTES STANDARD CONSTRUCTION DETAILS AND SECTION 7 OF THE CURRENT WSDOT SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION.
 - PIPE ZONE SHALL BE COMPACTED TO 90% OF MAXIMUM DENSITY.
 - TRENCH ZONE SHALL BE COMPACTED TO 95% OF MAXIMUM DENSITY IN 12-INCH LIFTS
 - CRUSHED SURFACING SHALL BE COMPACTED TO 95% OF MAXIMUM DENSITY. NO RECYCLED MATERIAL ALLOWED.
- DRAINAGE SYSTEM CONSTRUCTION:
 - ANY PERMANENT FLOW CONTROL FACILITY USED AS A TEMPORARY SETTLING BASIN SHALL BE MODIFIED WITH THE NECESSARY EROSION CONTROL MEASURES AND SHALL PROVIDE ADEQUATE STORAGE CAPACITY. IF THE FACILITY IS TO FUNCTION AS AN INFILTRATION SYSTEM, THE TEMPORARY FACILITY MUST BE GRADED SO THAT THE BOTTOM AND SIDES ARE AT LEAST THREE (3) FEET ABOVE THE FINAL GRADE OF THE PERMANENT FACILITY.
 - OVERFLOWS, SPILLWAYS, GRAVEL FILTER WINDOWS, MUST BE CONSTRUCTED PER PLANS AND SPECIFICATIONS. NO DEVIATIONS. AS-BUILT FOR VERIFICATION REQUIRED.
 - QUARRY ROCK MUST BE SOUND "HARD" DURABLE ROCK. NO RECYCLED MATERIAL.
 - GRASS LINED SWALE SHALL BE CONSTRUCTED PER THE DETAILS PROVIDED. NO DEVIATION ALLOWED. ALL SWALES MUST BE OPERATIONAL BEFORE ACCEPTANCE.
 - CATCH BASINS MUST BE SET TO LINE GRADE USING NO MORE THAN TWO (2) ADJUSTMENT BRICKS.
 - MINIMUM 1-FOOT SEPARATION BETWEEN PIPES IN TYPE II CATCH BASINS.

- RESTORATION OF RIGHT-OF-WAY:
 - CONTRACTOR MUST LEAVE THE RIGHT-OF-WAY, EQUAL TO EXISTING OR BETTER CONDITION
 - PLACE COMPACTED TOPSOIL (SECTION 9-14.1(1), (2) AND (3)) AND SEED ALL AREAS DISTURBED BY EXCAVATION. (SECTION 9-14.2)
 - ALL DRAINAGE SYSTEMS MUST BE FULLY CLEANED, RESTORED AND OPERATIONAL BEFORE FINAL ACCEPTANCE. (SECTION 7-07.3).
- FINAL INSPECTION AND ACCEPTANCE:
SEE SECTION 1-05.11 AND SECTION 1-08.5)
 - WHEN CONTRACTOR HAS COMPLETED ALL OF THE WORK ON THE APPROVED PLANS, THE CONTRACTOR WILL:
 - COMPLETE THE "FINAL INSPECTION GUIDELINES FOR CONTRACTORS INSPECTION FORM".
 - GIVE THE COMPLETED "FINAL INSPECTION GUIDELINES FOR CONTRACTORS INSPECTION FORM" TO THE PW INSPECTOR AND REQUEST A SITE INSPECTION. ALL SITE INSPECTIONS ARE ON WEDNESDAYS BETWEEN 9 AM AND 12 PM.
 - THE PROJECT MANAGER, ENGINEER OF RECORD, INSPECTOR, CONTRACTOR AND OTHER CITY OF ANACORTES DEPARTMENTS WILL WALK THE SITE AND CREATE A PUNCH LIST. THE CONTRACTOR WILL COMPLETE THE PUNCH LIST AND CHECK OFF EACH ITEM, THEN RETURN IT TO THE INSPECTOR FOR RE-INSPECTION. THE INSPECTOR WILL VERIFY THAT ITEMS ON WALK THROUGH ARE COMPLETED.
 - THE CITY WILL NOT MAKE THE FINAL INSPECTION UNTIL THE PHYSICAL WORK REQUIRED BY THE CONTRACT AND APPROVED PLANS, INCLUDING FINAL CLEANUP AND ALL WORK ORDERED BY THE PROJECT MANAGER, HAVE BEEN COMPLETED. (SECTION 1-05.11)
 - FINAL APPROVAL OF THE PROJECT WILL NOT BE GRANTED UNTIL "AS BUILT" DRAWINGS (BOTH DIGITAL AND HARD COPY) HAVE BEEN RECEIVED AND APPROVED BY THE PROJECT MANAGER.
 - THE CONTRACTOR MUST FURNISH ALL DOCUMENTATION REQUIRED BY LAW, TO ALLOW THE CITY OF ANACORTES TO PROCESS FINAL ACCEPTANCE OF THE CONTRACT.

CURB/GUTTER AND SIDEWALK WORKMANSHIP AND AESTHETICS:

PER STR-06.5, CITY OF ANACORTES ENGINEERING DEPARTMENT CHAPTER 3:

- CURB, GUTTER, AND SIDEWALK CONSTRUCTION SHALL FOLLOW A TRUE AND UNIFORM HORIZONTAL AND VERTICAL ALIGNMENT.
- THE HORIZONTAL AND VERTICAL SURFACES SHALL BE A SMOOTH BROOM FINISH WITH NO DETECTABLE FINISHING BLEMISHES, UNDULATIONS, RIPPLES, SWELLS, WAVES, RUTS, FURROWS, GRAFFITI OR OTHER OBJECTIONABLE MARKS. THE END RESULT SHALL BE A NEAT PROFESSIONALLY FINISHED APPEARANCE. THE EDGE FINISH ADJACENT TO THE EXPANSION JOINT MATERIAL SHALL BE CLEAN AND FREE OF EXCESS SLURRY. THE EXPANSION JOINT MATERIAL SHALL BE TRIMMED TO A LEVEL EVEN WITH THE ADJACENT CONCRETE RESULTING IN A NEAT AND PROFESSIONALLY FINISHED APPEARANCE.
- THE EDGE FINISH ADJACENT TO THE EXPANSION JOINT MATERIAL SHALL BE CLEAN AND FREE OF EXCESS SLURRY. THE EXPANSION JOINT MATERIAL SHALL BE TRIMMED TO A LEVEL EVEN WITH THE ADJACENT CONCRETE RESULTING IN A NEAT AND PROFESSIONALLY FINISHED APPEARANCE.
- THE CITY ENGINEER, AT HIS/HER SOLE DISCRETION RESERVES THE AUTHORITY TO ORDER THE REMOVAL OF SECTIONS OF CURB, GUTTER AND SIDEWALK THAT DO NOT MEET THE WORKMANSHIP AND AESTHETIC STANDARD OF THE CITY OF ANACORTES.
- SECTIONS OF NEWLY CONSTRUCTED CURB, GUTTER, AND SIDEWALK, THAT EXHIBIT CRACKING FOLLOWING CURING, SHALL BE SUBJECT TO REMOVAL AND REPLACEMENT. CRACKING RESULTING FROM SUB-BASE FAILURE, OR CONSTRUCTION SITE DAMAGE SHALL BE IMMEDIATELY REMOVED AND REPLACED TO THE NEAREST EXPANSION JOINT. MINOR HAIR LINE STRESS CRACKS MAY, AT THE DISCRETION OF THE PROJECT MANAGER, BE MONITORED AND RE-EVALUATED FOR POSSIBLE REMOVAL AT THE END OF THE MAINTENANCE PERIOD.

UTILITY LOCATES NUMBER: 1.800.424.5555. REQUIRED BEFORE STARTING ANY GROUNDWORK.

ASPHALT CONSTRUCTION:

SEE SECTION 5-05 AND SECTION 9 OF THE CURRENT WSDOT SPECIFICATION FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION.

FOR NEW DEVELOPMENT AND REDEVELOPMENT, EACH PROJECT WILL BE REQUIRED TO IMPLEMENT LOW IMPACT DEVELOPMENT GUIDELINES WHERE APPLICABLE.

- ALL ASPHALT TO BE REMOVED MUST BE SAW CUT. A JACKHAMMER CAN BE USED IF A NICE EVEN CUT IS MADE. WHEEL CUTTING IS NOT AN APPROVED METHOD UNLESS APPROVED BY THE CITY OF ANACORTES ENGINEER IN ADVANCE. ANY DEVIATION FROM THIS SPECIFICATION SHALL BE IN WRITING 48-HOURS BEFORE SAW CUTTING TAKES PLACE.
- ADDITIONAL ASPHALT MAY BE REQUIRED FOR REMOVAL BY THE CITY OF ANACORTES ENGINEER OR INSPECTOR.
- ALL VERTICAL DROP-OFFS WITHIN THE TRAVELED WAY WILL BE BACKFILLED EACH NIGHT.
- ABUTTING EDGES AND CURBS MUST BE THOROUGHLY CLEANED.
- ALL ASPHALT EDGING WILL BE TACKED PRIOR TO ASPHALTING.
- ALL ASPHALT PATCHES MUST BE A SMOOTH TRANSITION. NO BUMPS OR HIGH/LOW SPOTS (SECTION 5-04.3(13)). SURFACE SMOOTHNESS MAXIMUM VARIATION IN 10-FEET PARALLEL TO THE CENTERLINE IS 1/8" AND TRANSVERSE 1/4".
- SUB GRADE WILL BE COMPACTED AND TESTED PRIOR TO ASPHALTING.
- A MINIMUM OF 3-INCH HMA PATCH TO BE COMPACTED TO 92% MAX RICE DNEISTY (SECTION 5-04.3(10)B).
- ALL FINAL JOINTS AND SAW CUTS TO BE SEALED (SECTION 5-05.3(8)B) USING A HOT POURED JOINT SEALANT (SECTION 9-04.2(1). A PREFERRED SEALANT IS AR-4000.
- IN AREAS WHERE ASPHALT HAS BEEN REMOVED AND CDF IS IN THE TRENCH CURING, A STEEL PLATE IS REQUIRED FOR COVER WHILE IT IS CURING. PROVIDE ASPHALT AROUND STEEL PLATE TO PREVENT THE PLATE FROM RATTLING. THE CONTRACTOR WILL BE CALLED OUT AT ANYTIME TO CORRECT ANY RATTLING THAT PROVIDES COMPLAINTS.
- WHERE LOCAL BUSINESSES ARE AFFECTED, NO ASPHALTING WILL HAPPEN IN THE LANE OF TRAVEL. WORK WILL PROCEED BEFORE OR AFTER BUSINESS HOURS.
- ON MAJOR STREETS WHERE TRAFFIC CONGESTION IS A PROBLEM, THE PATCH WILL BE PROTECTED WITH A 1/4 INCH STEEL PLATE UNTIL SUFFICIENTLY COOLED.

CONCRETE CONSTRUCTION:

SECTION 8-04 AND 8-14 OF THE CURRENT WSDOT SPECIFICATION FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION.

FOR NEW DEVELOPMENT AND REDEVELOPMENT, EACH PROJECT WILL BE REQUIRED TO IMPLEMENT LOW IMPACT DEVELOPMENT GUIDELINES WHERE APPLICABLE.

- CALL FOR A FORMS INSPECTION BEFORE PLACING OF CONCRETE. CALL 360.299.1951 TO SCHEDULE.
- NO MONOLITHIC POURS ALLOWED PER THE CITY OF ANACORTES CITY ENGINEER. IN OTHER WORDS, THE SIDEWALK, CURB & GUTTER, DRIVEWAYS, DRIVEWAY APRONS, WHEELCHAIR RAMPS, ETC. ARE TO BE INDIVIDUAL POURS AND SEPARATED BY A FABRIC EXPANSION JOINT.
- PROTECTING THE CONCRETE IS THE RESPONSIBILITY OF THE CONTRACTOR. NO GRAFFITI, FOOTPRINTS, FINISHING BLEMISHES OR OTHER OBJECTIONABLE MARKS ALLOWED. IF ANY OF THIS TAKES PLACE, THE SECTION THAT IS DAMAGED WILL BE REPLACED.
- CONCRETE SHALL BE A 5.5 SACK MIX WITH A 28-DAY STRENGTH OF 3000 PSI. ANY DEVIATION FROM THIS SPECIFICATION SHALL BE IN WRITING 48-HOURS BEFORE CONCRETE IS PLACED.
- THE PAN AND WINGS SHALL BE STAMPED. THE USE OF 1-INCH CONSTRUCTION FENCING ACCEPTABLE. ROLLING IS NOT AN OPTION. DURING THE FIRST 14-DAYS OF CURING, THE CONTRACTOR MUST PROTECT FROM FREEZING.

CURB/GUTTER AND SIDEWALK WORKMANSHIP AND AESTHETICS:

PER STR-06.5, CITY OF ANACORTES ENGINEERING DEPARTMENT CHAPTER 3:

- CURB, GUTTER, AND SIDEWALK CONSTRUCTION SHALL FOLLOW A TRUE AND UNIFORM HORIZONTAL AND VERTICAL ALIGNMENT.
- THE HORIZONTAL AND VERTICAL SURFACES SHALL BE A SMOOTH BROOM FINISH WITH NO DETECTABLE FINISHING BLEMISHES, UNDULATIONS, RIPPLES, SWELLS, WAVES, RUTS, FURROWS, GRAFFITI OR OTHER OBJECTIONABLE MARKS. THE END RESULT SHALL BE A NEAT PROFESSIONALLY FINISHED APPEARANCE. THE EDGE FINISH ADJACENT TO THE EXPANSION JOINT MATERIAL SHALL BE CLEAN AND FREE OF EXCESS SLURRY. THE EXPANSION JOINT MATERIAL SHALL BE TRIMMED TO A LEVEL EVEN WITH THE ADJACENT CONCRETE RESULTING IN A NEAT AND PROFESSIONALLY FINISHED APPEARANCE.
- THE CITY ENGINEER, AT HIS/HER SOLE DISCRETION RESERVES THE AUTHORITY TO ORDER THE REMOVAL OF SECTIONS OF CURB, GUTTER AND SIDEWALK THAT DO NOT MEET THE WORKMANSHIP AND AESTHETIC STANDARD OF THE CITY OF ANACORTES.
- SECTIONS OF NEWLY CONSTRUCTED CURB, GUTTER, AND SIDEWALK, THAT EXHIBIT CRACKING FOLLOWING CURING, SHALL BE SUBJECT TO REMOVAL AND REPLACEMENT. CRACKING RESULTING FROM SUB-BASE FAILURE, OR CONSTRUCTION SITE DAMAGE SHALL BE IMMEDIATELY REMOVED AND REPLACED TO THE NEAREST EXPANSION JOINT. MINOR HAIR LINE STRESS CRACKS MAY, AT THE DISCRETION OF THE PROJECT MANAGER, BE MONITORED AND RE-EVALUATED FOR POSSIBLE REMOVAL AT THE END OF THE MAINTENANCE PERIOD.

EX SYMBOL LEGEND:

- = EX MONUMENT
- = SET MAG NAIL
- = SET SPIKE
- = SET RAILROAD SPIKE
- = EX STORM DRAIN MANHOLE
- = EX STORM DRAIN CLEANOUT
- = EX CATCH BASIN
- = EX DOWNSPOUT
- = EX SANITARY SEWER MANHOLE
- = EX GATE VALVE
- = EX WATER METER
- = EX FIRE HYDRANT
- = EX HOSE BIB
- = EX FIRE STANDPIPE
- = EX IRRIGATION BOX
- = EX MONITORING WELL
- = EX BOLLARD
- = EX POST
- = EX STOP SIGN
- = EX STREET SIGN
- = EX FLAG POLE
- = EX POWER POLE W/DROP
- = EX STREET LIGHT POLE W/ DROP
- = EX GROUND GUY
- = EX DROP FROM POLE
- = EX TELEPHONE PEDESTAL/RISER
- = EX ELECTRIC METERS/SWITCH
- = SPOT ELEVATION ON EX GROUND

- = EX ASPHALT SURFACING
- = EX CONCRETE SURFACING
- = EX GRAVEL SURFACING

EX LINE LEGEND:

- = EX EDGE OF ASPHALT
- = EX EDGE OF CONCRETE
- = EX EDGE OF GRAVEL ROAD
- = EX CURB
- = EX SIDEWALK
- = EX STORM DRAIN LINE
- = EX SANITARY SEWER GRAVITY LINE
- = EX WATER LINE
- = EX OVERHEAD ELECTRIC & COMMUNICATION LINES
- = EX UNDERGROUND POWER
- = EX UNKNOWN UNDERGROUND UTILITY
- = EX UNDERGROUND COMMUNICATIONS LINE
- = EX OVERHEAD COMMUNICATIONS LINE
- = EX UNDERGROUND GAS LINE
- = EX TOP OF SLOPE LINE
- = EX TOE OF SLOPE LINE
- = EX GRADE INDEX CONTOUR
- = EX GRADE INTERVAL CONTOUR
- = EX ORDINARY HIGH WATER LINE
- = EX CHAINLINK FENCE
- = EX HANDRAIL

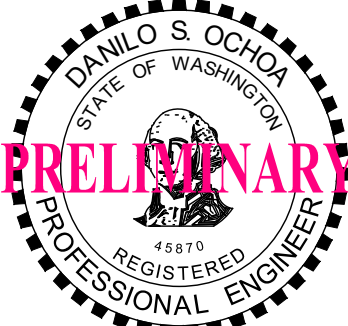
SURVEY NOTES:

- THIS TOPOGRAPHIC SURVEY WAS PERFORMED AND PREPARED IN ACCORDANCE WITH WAC 352-130-145.
- DATA FOR THIS SURVEY WAS GATHERED BY FIELD TRAVERSE UTILIZING ELECTRONIC DATA COLLECTION IN OCTOBER AND NOVEMBER 2022.
- EQUIPMENT USED: THEOMAT 00011.5' EDM: ± 2 PPM, ± 3 MM
- HORIZONTAL DATUM: NAD 83/91
- VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW) ON NOAA TIDAL DATUM EPOCH 1941-1959. BASED ON PORT OF ANACORTES SURVEY CONTROL MONUMENT "JETTY-2"
- TEMPORARY BENCH MARK: PSE CONTROL ON-SITE, AS SHOWN
- CONTOURS DEPICTED HEREON MEET OR EXCEED NATIONAL MAPPING STANDARDS FOR 1-FOOT ACCURACY TOPOGRAPHIC SURVEYS AND HAVE BEEN COMPUTER GENERATED FROM GROUND FIELD TOPOGRAPHY GATHERED FOR THIS SURVEY UTILIZING ELECTRONIC DATA COLLECTION.
- CONDUCTIBLE UNDERGROUND UTILITY LOCATES SERVICES WERE PERFORMED AND PAINTED ON-SITE BY APPLIED PROFESSIONAL SERVICES AND SURVEYED BY PSE FIELD CREWS IN NOVEMBER 2022. UTILITIES ARE KNOWN TO EXIST WITHIN THE LIMITS OF THIS SURVEY THAT WERE UNDETECTABLE. ADDITIONAL UTILITY VERIFICATION MAY BE WARRANTED IN AREAS CONSIDERED FOR CONSTRUCTION.
- UTILITY LOCATION AREAS AND LEVEL OF LOCATE ACCURACY WERE DETERMINED BY SURVEYOR AND CLIENT PRIOR TO COMMENCEMENT OF FIELD SURVEY WORK.
- THIS MAP IS NOT INTENDED TO REPRESENT A FORMAL BOUNDARY SURVEY. NOR DOES IT REFLECT ELEMENTS THAT A BOUNDARY SURVEY MAY DISCLOSE. BOUNDARY RELATED ELEMENTS DEPICTED HEREON ARE SHOWN PER AVAILABLE RECORD INFORMATION AND OR PUBLICLY AVAILABLE GIS DATA.
- A CURRENT TITLE REPORT WAS NOT PROVIDED FOR THIS SURVEY. EASEMENTS AND/OR TITLE ENCUMBRANCES MAY EXIST THAT ARE NOT NOTED THEREIN.



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NO.	DATE	BY	REVISION



PORT OF ANACORTES
CURTIS WHARF
PROJECT #MRT-64

GENERAL NOTES

DRAWN:	GR	PROJECT NO.:	XXX
DESIGN:	DO,SG	SCALE:	AS NOTED
CHECKED:	DO	DATE:	12/13/22
SHEET NO.	C02		

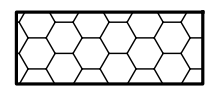
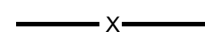
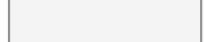
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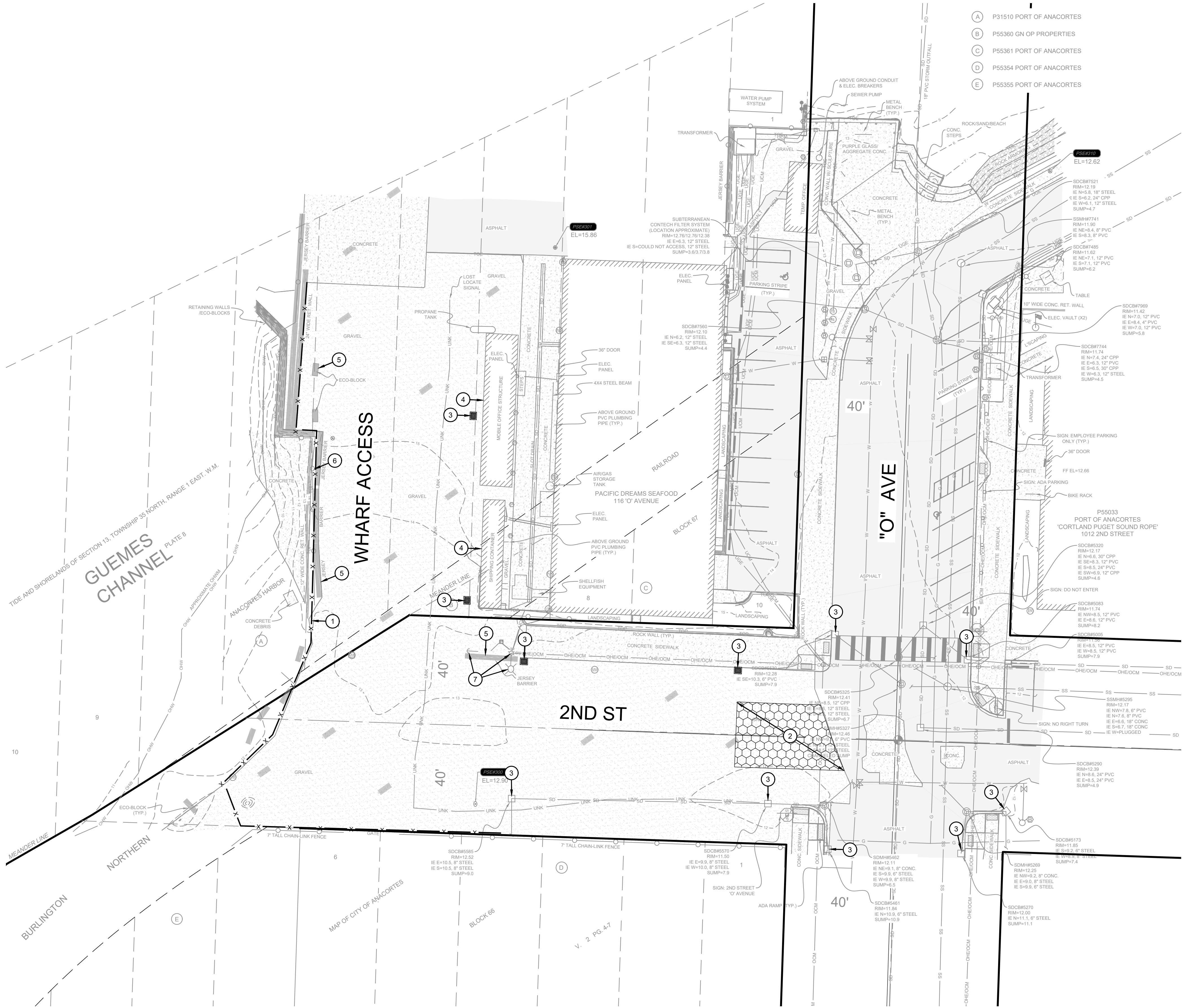
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SCALE IN FEET

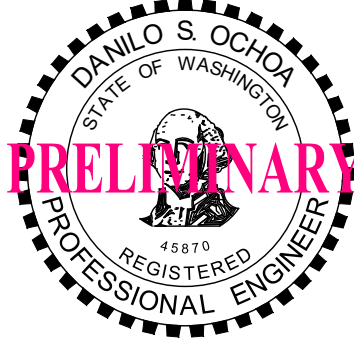
KEY NOTES		
KEY	DESCRIPTION	DETAIL/ SHEET
1	APPROX 315 LF SILT FENCING OR STRAW WATTLES AS NECESSARY BY CONTRACTOR	B/C07 & C/C07
2	STABILIZED CONSTRUCTION ENTRANCE	A/C07
3	INSTALL TEMPORARY INLET PROTECTION	D/C07
4	TEMPORARY STRUCTURES TO BE REMOVED PRIOR TO CONSTRUCTION	-
5	EXISTING ECOLOGY BLOCKS TO BE REMOVED	-
6	EXISTING FENCE TO BE REMOVED	-
7	REMOVE EX UTILITY POLE, STREET LIGHT BOOM, GUY WIRE ANCHOR AND ASSOCIATED UTILITY LINES. ESTABLISH NEW CONNECTIONS TO BUILDING AS REQUIRED	-

LEGEND:

-  STABILIZED CONSTRUCTION ENTRANCE
-  SILT FENCE OR STRAW WATTLE
-  PROPERTY LINE
-  EXISTING ASPHALT
-  EXISTING CONCRETE
-  EXISTING GRAVEL



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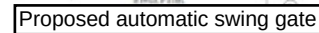
PORT OF ANACORTES
CURTIS WHARF
PROJECT #MRT-64

EXISTING CONDITIONS, DEMO & TESC PLAN

DRAWN: GR PROJECT NO.: XXX
DESIGN: DO,SG SCALE: AS NOTED
CHECKED: DO DATE: 12/13/22
SHEET NO.

C03

30% DESIGN - NOT FOR CONSTRUCTION



KEY NOTES		
KEY	DESCRIPTION	DETAIL/ SHEET
1	STA 20+60.00, 49.17' LT CB #1, TYPE 1 RIM 14.95 IE 8" (S) 12.20	F/C08
2	68 LF 8" SD @ 3.00%	K/C10
3	STA 21+28.16, 49.17' LT CB #2, TYPE 1 RIM 12.93 IE 8" (N) 10.16 IE 8" (SE) 10.16	F/C08
4	30 LF 8" SD @ 1.43%	K/C10
5	STA 10+70.88, 24.34' LT CB #3, TYPE 1 RIM 12.93 IE 8" (NW) 9.73 IE 12" (E) 9.40	F/C08
6	80 LF 12" SD @ 0.50%	K/C10
7	STA 11+50.00, 23.65' LT CB #4, TYPE 1 RIM 12.12 IE 12" (W) 9.00 IE 12" (E) 9.00	F/C08
8	60 LF 12" SD @ 0.50%	K/C10
9	EX SDMH #5327 RIM 12.46 IE 6" (NW) 9.1 IE 12" (S) 8.5 IE 12" (W) 8.70 IE 12" (N) 8.7	K/C10
10	BREAK IN VERTICAL CURB FOR GATE CHANNEL GUIDE TO PASS THROUGH. CHANNEL GUIDE FOR SLIDING GATE TO BE SET AT UNIFORM SLOPE (1.30% PER PLAN)	-
11	FLUSH/ MATCH SURFACE GRADE	-
12	RETAINING WALL (FUTURE DESIGN)	-

LEGEND:

- PROPOSED CONCRETE
- PROPOSED ASPHALT
- OPTION: REPLACE EXISTING SURFACE PAVING
- EXISTING ASPHALT
- EXISTING CONCRETE
- EXISTING GRAVEL
- PROPERTY LINE
- SD PROPOSED STORM LINE
- SD EXISTING STORM LINE
- FG XX SPOT ELEVATION
- SURFACE FLOW DIRECTION
- 13 FINISHED CONTOUR ELEVATION
- PROPOSED FENCE
- PROPOSED GRADE BREAK

NOTES:

- SEE SHEET C06 FOR PROFILES.
- SD PIPES TO MAINTAIN 2 FEET OF COVER IN PAVED AREAS. CONTRACTOR TO VERIFY WITH GRADES IN FIELD.

GRADING QUANTITY ESTIMATE:

TOTAL:
CUT: 60 CY's
FILL: 100 CY's

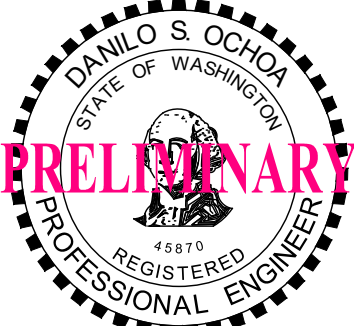
GRADING QUANTITIES GENERATED USING CIVIL 3D SOFTWARE TO COMPARE TRIANGULATED IRREGULAR NETWORKS (TINS) BETWEEN EG AND FG SURFACES. ALL EXCESS CUT MATERIAL WILL BE SPREAD ON SITE PER THESE GRADING PLANS. IMPORT OF BACKFILL MATERIALS ARE EXPECTED SUCH AS FOR UTILITY TRENCHES AND ROAD BASES SHALL BE TRANSPORTED TO THE SITE.

VOLUMES ARE FOR PERMIT ONLY. CONTRACTOR SHALL PROVIDE INDEPENDENT TAKEOFF FOR BIDDING.



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GRADING & DRAINAGE PLAN

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DESIGN: DO,SG SCALE: AS NOTED
CHECKED: DO DATE: 12/13/22
SHEET NO.

C05

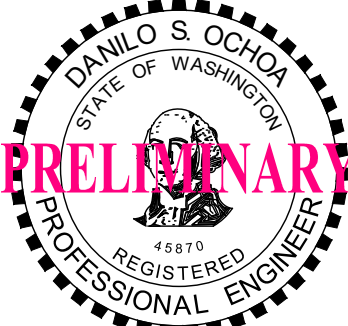
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PRELIMINARY

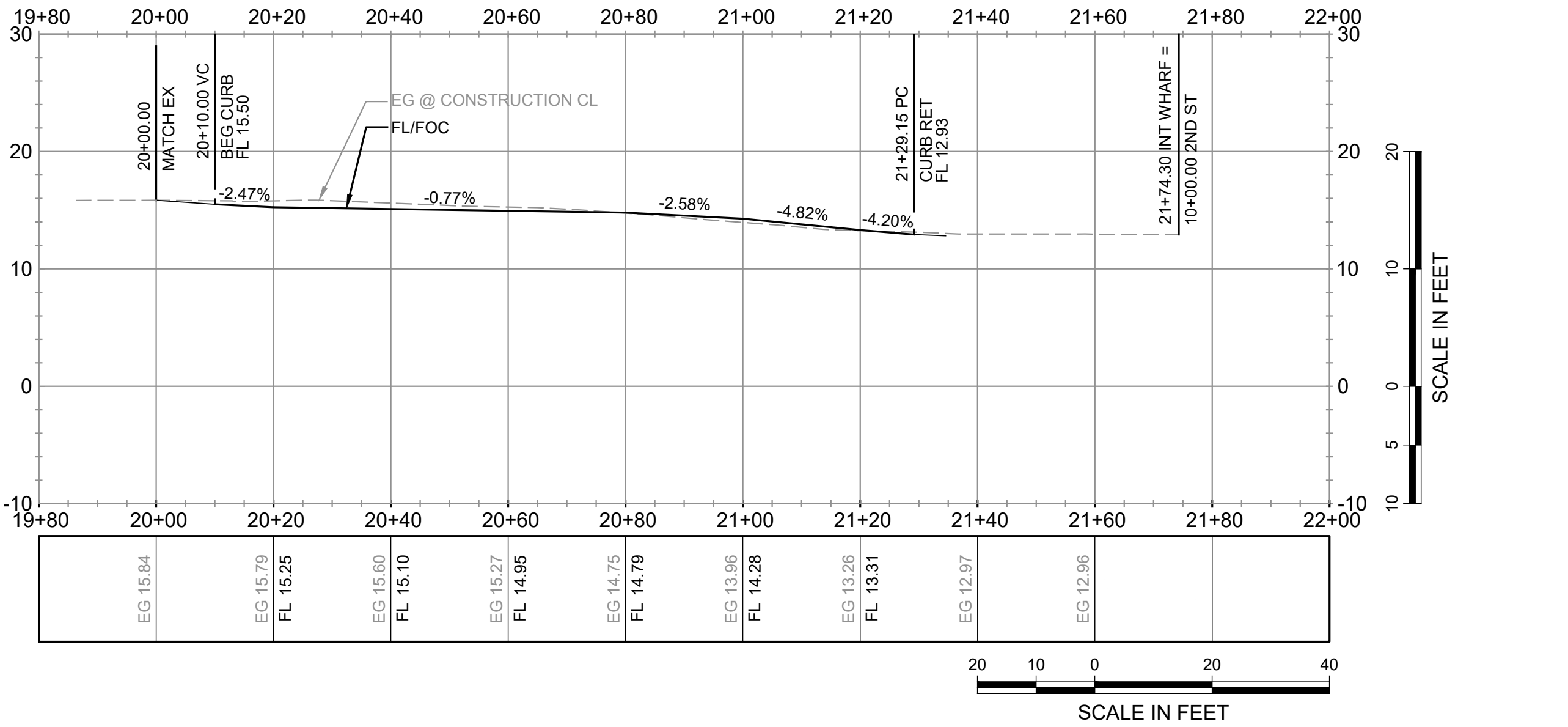
NO.	DATE	BY	REVISION



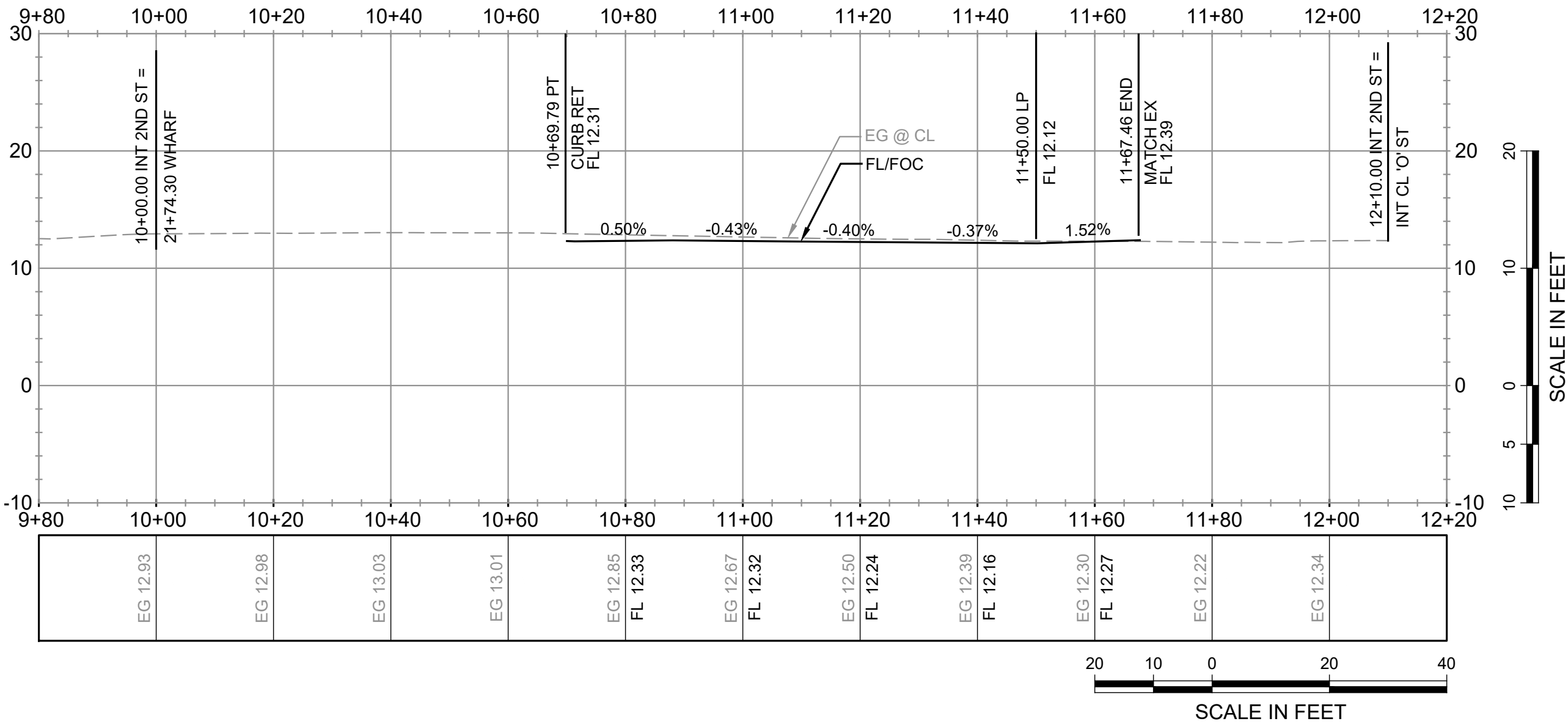
PORT OF ANACORTES
CURTIS WHARF
PROJECT #MRT-64

ROAD & DRAINAGE PROFILES

DRAWN: GR	PROJECT NO.: XXX
DESIGN: DO,SG	SCALE: AS NOTED
CHECKED: DO	DATE: 12/13/22
SHEET NO. C06	



PROPOSED WHARF PROFILE
SCALE AS SHOWN

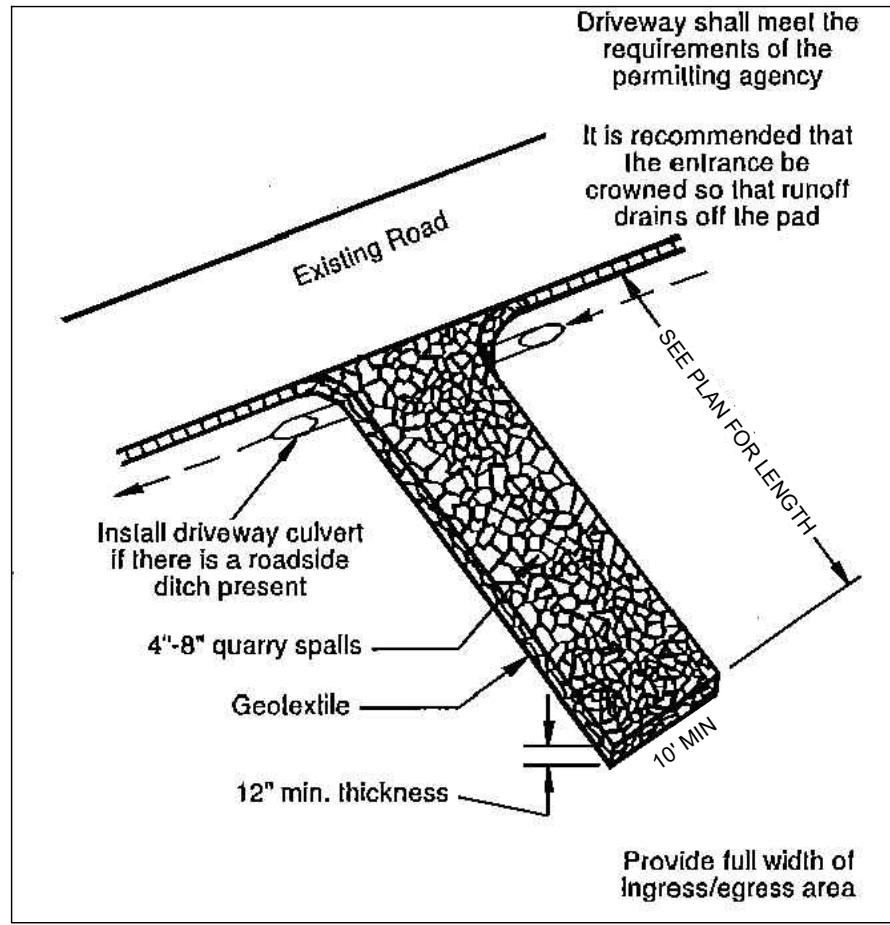


PROPOSED 2ND ST PROFILE
SCALE AS SHOWN

30% DESIGN - NOT FOR CONSTRUCTION

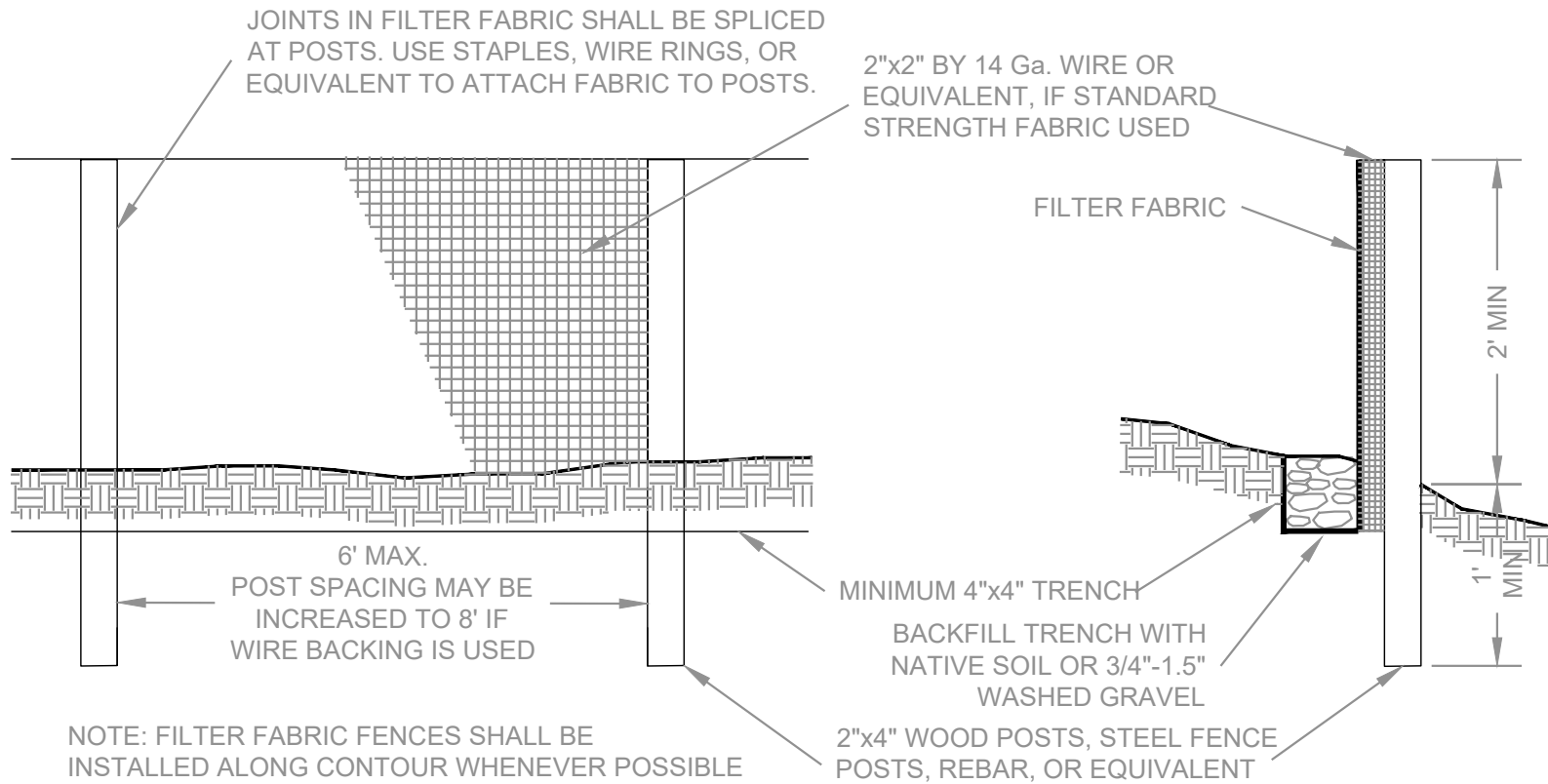
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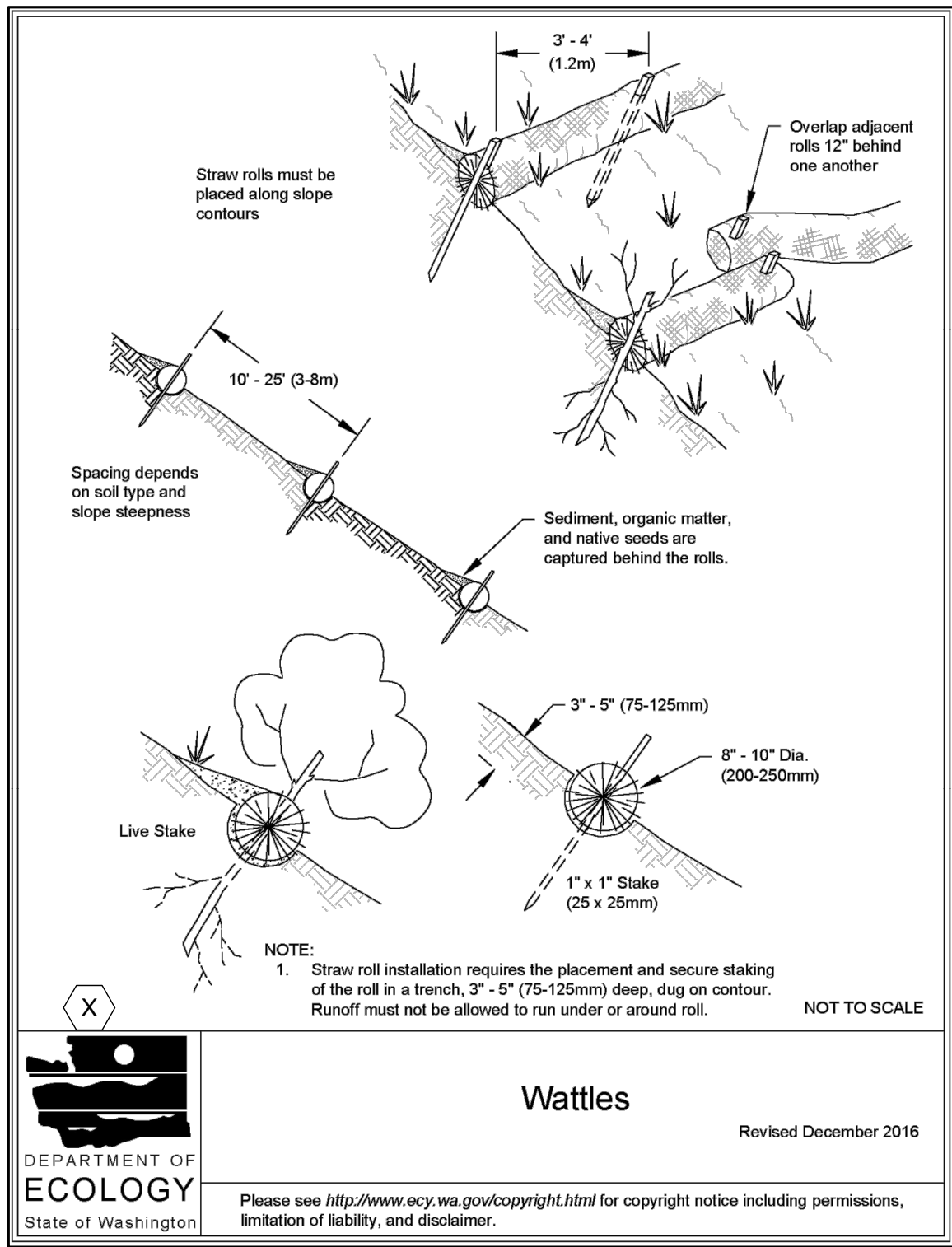
STABILIZED CONSTRUCTION ENTRANCE
PER D.O.E. FIG. 4.2
NOT TO SCALE

A
C03



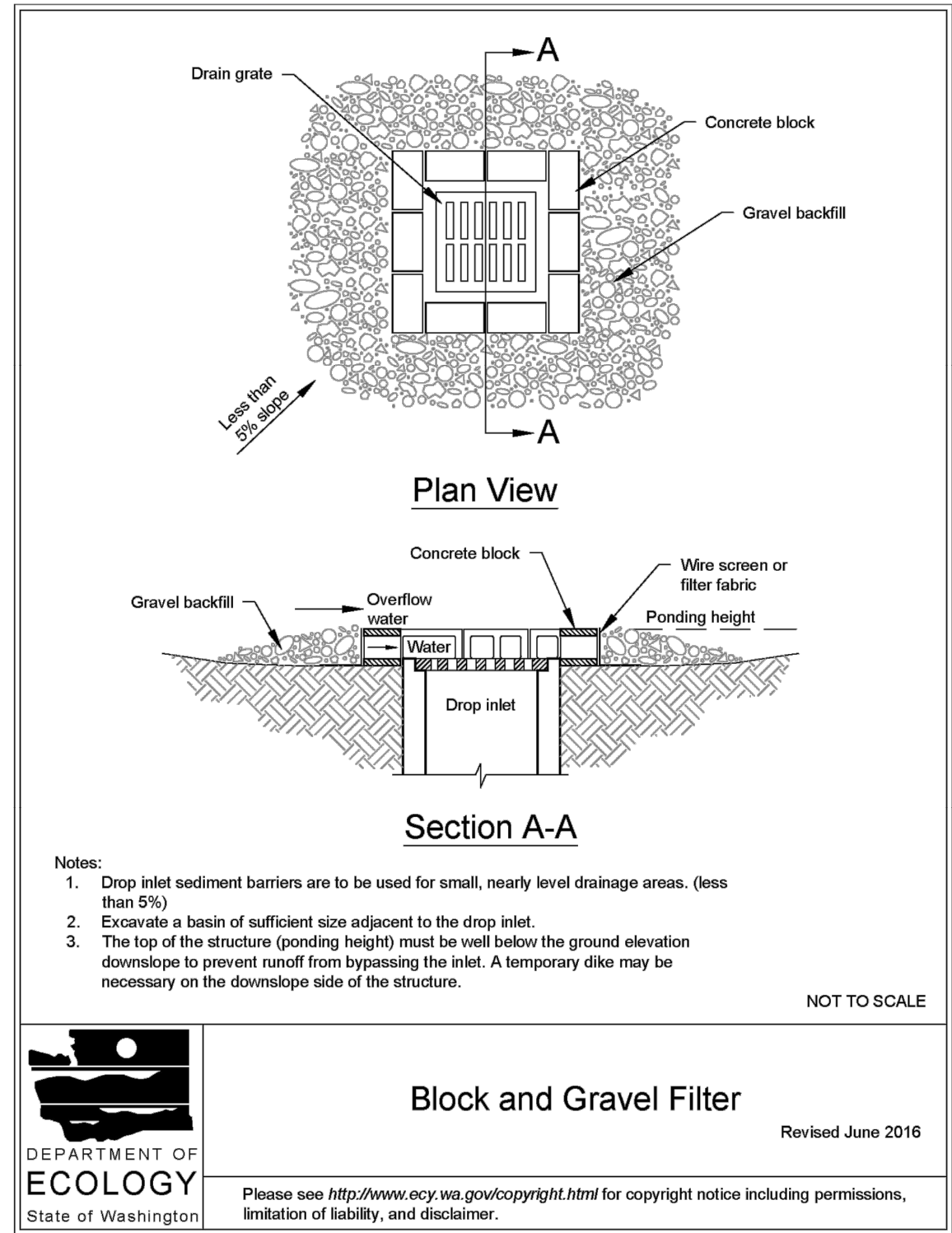
FILTER FABRIC SILT FENCE
PER D.O.E. FIG. 4.20
NOT TO SCALE

B
C03



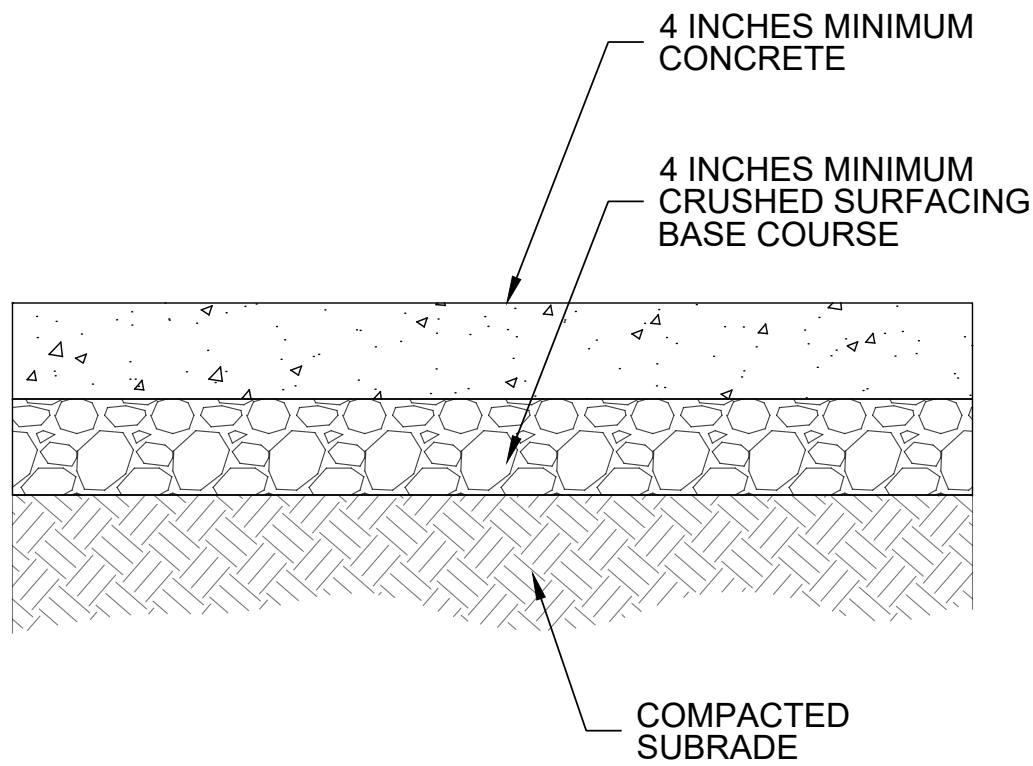
STRAW WATTLES
PER D.O.E. FIG. 3.24
NOT TO SCALE

C
C03



TEMPORARY INLET PROTECTION DETAIL
PER 2019 D.O.E. FIG. V2.3 PG 359
NOT TO SCALE

D
C03



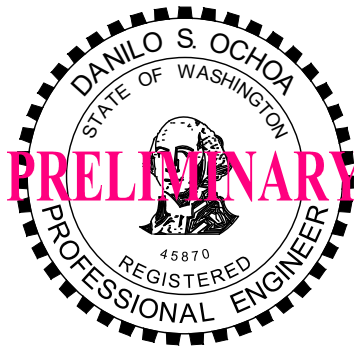
CONCRETE TYPICAL SECTION
NTS

E
C4



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FRAME AND VANED GRATE

RECTANGULAR ADJUSTMENT SECTION

PRECAST BASE SECTION

ALTERNATIVE PRECAST BASE SECTION

PIPE ALLOWANCES	
PIPE MATERIAL	MAXIMUM INSIDE DIAMETER (INCHES)
REINFORCED OR PLAIN CONCRETE	12"
ALL METAL PIPE	15"
GRSPR * (STD. SPEC. SECT. 9-05.20)	12"
SOLID WALL PVC (STD. SPEC. SECT. 9-05.12(1))	15"
PROFILE WALL PVC (STD. SPEC. SECT. 9-05.12(2))	15"

* CORRUGATED POLYETHYLENE STORM SEWER PIPE

NOTES

- As acceptable alternatives to the rebar shown in the **PRECAST BASE SECTION**, fibers (placed according to the Standard Specifications), or wire mesh having a minimum area of 0.12 square inches per foot shall be used with the minimum required rebar shown in the **ALTERNATIVE PRECAST BASE SECTION**. Wire mesh shall not be placed in the knockouts.
- The knockout diameter shall not be greater than 20" (in). Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with **Standard Specification Section 9-04.3**.
- The maximum depth from the finished grade to the lowest pipe invert shall be 5' (ft).
- The frame and grate may be installed with the flange down, or integrally cast into the adjustment section with flange up.
- The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1 : 24 or steeper.
- The opening shall be measured at the top of the **Precast Base Section**.
- All pickup holes shall be grouted full after the basin has been placed.

CATCH BASIN TYPE 1
STANDARD PLAN B-5.20-03
SHEET 1 OF 1 SHEET
APPROVED FOR PUBLICATION
Roark, Steve
Digitally signed by Roark, Steve
Date: 2020.09.01 17:52:50 -0700
STATE DESIGN ENGINEER
Washington State Department of Transportation

CB TYPE 1 W/ GRATE DETAIL
WSDOT STD PLAN B-5.20-03
NOT TO SCALE

F
C05

CONCRETE VERTICAL CURB DETAIL

NOTES:

- VERTICAL CURB WILL BE REQUIRED EXCEPT AS NOTED IN SECTION 4-04.
- CONSTRUCTION OF CURB DETAILS SHALL BE IN ACCORDANCE WITH THE STANDARD SPECIFICATION FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION AS PUBLISHED BY THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION AND THE AMERICAN PUBLIC WORKS ASSOCIATION (WSDOT/APWA SPECIFICATIONS) UNLESS OTHERWISE MODIFIED BELOW.
- ALL CONCRETE SHALL BE COMMERCIAL CLASS PER WSDOT/APWA SPECIFICATIONS.
- FORMS SHALL BE TRUE TO LINE AND GRADE AND SECURELY STAKED. STEEL FORMS ONLY SHALL BE USED ON TANGENT SECTIONS. WOOD FORMS MAY BE USED ON CURVED SECTIONS.
- FULL DEPTH EXPANSION JOINTS CONSISTING OF 3/8 INCH MINIMUM PREMOLDED JOINT MATERIAL BE PLACED ADJACENT TO CATCH BASINS, INLETS, AND AT POINTS OF TANGENCY ON STREETS AND DRIVEWAY RETURNS. MAXIMUM SPACING SHALL BE 20 FEET.
- CONTRACTION JOINTS (DUMMY JOINTS) CONSISTING OF 3/8" MIN. X 2" OF PREMOLDED JOINT MATERIAL SHALL BE CONSTRUCTED AT INTERVALS OF 10 FEET.
- ALL JOINTS SHALL BE CLEAN AND EDGED.
- FINISH SHALL BE A LIGHT BROOM FINISH.
- FINISHED CURBS AND GUTTERS SHALL BE SPRAYED WITH A CLEAR CURING COMPOUND.
- TOP OF CURB AT ACCESS POINT APPROACH.
- SUBGRADE COMPACTION FOR CURBS AND GUTTERS SHALL MEET A MINIMUM 95% OF MAXIMUM DENSITY IN ACCORDANCE WITH SECTION 2-03.3(14) OF THE WSDOT/APWA SPECIFICATIONS.

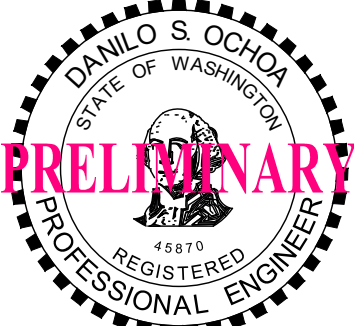
CONCRETE VERTICAL CURB DETAIL
NOT TO SCALE

G
C04



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DETAILS

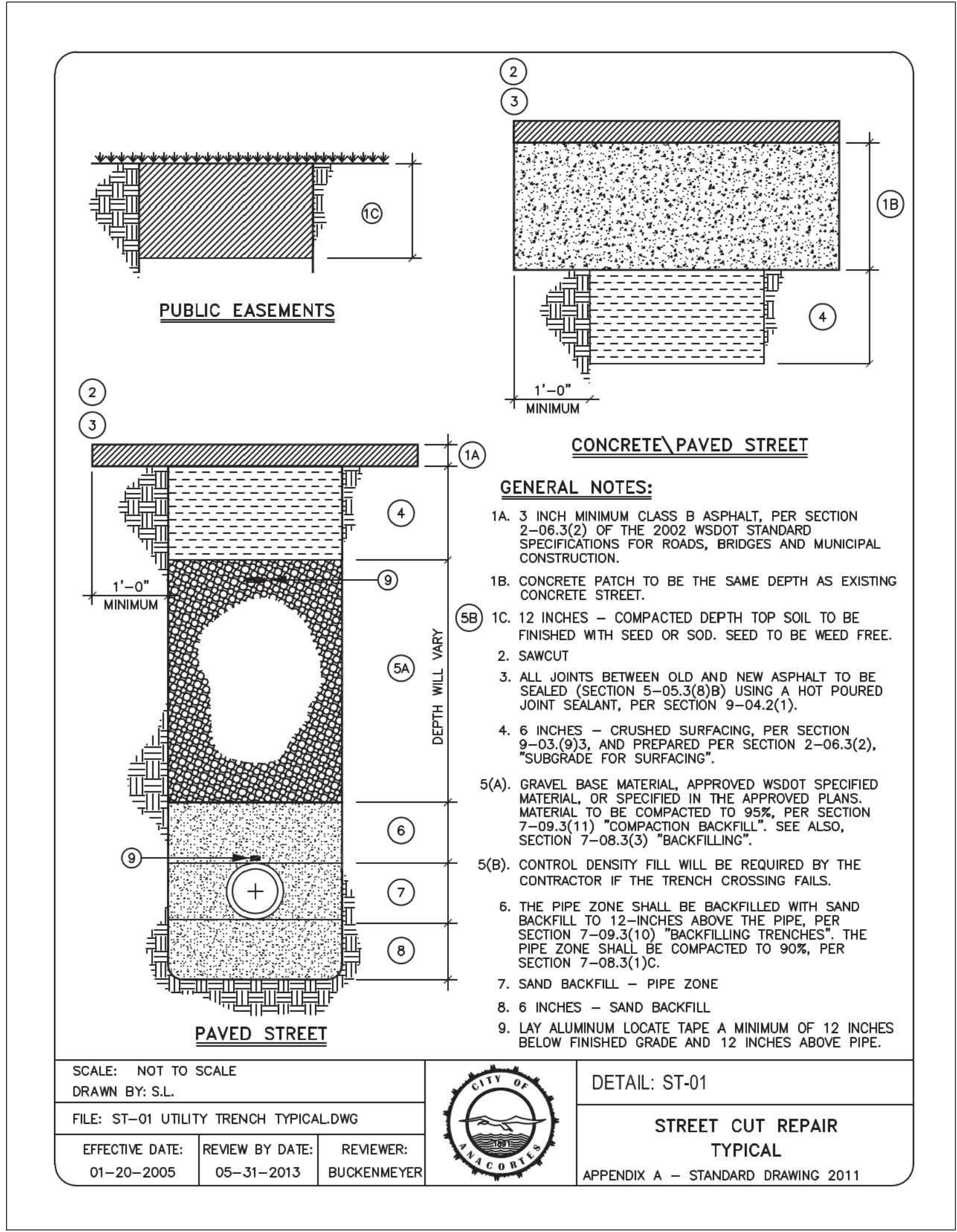
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C08

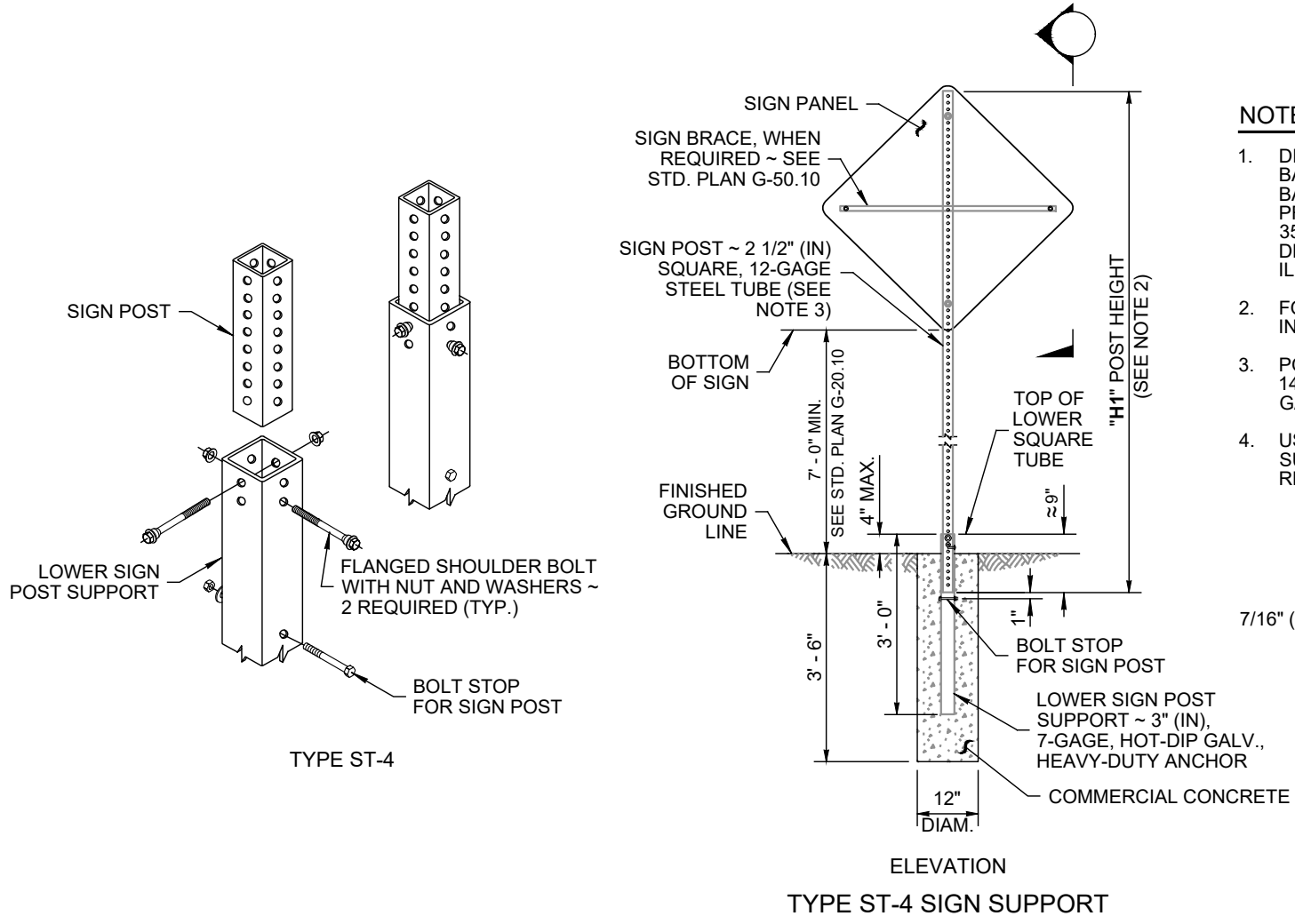
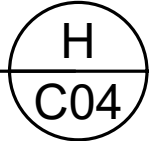
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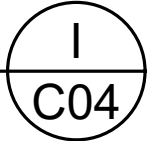
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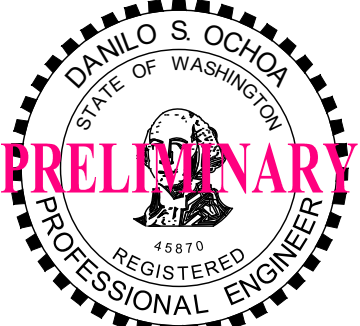
STREET REPAIR DETAIL
PER ANACORTES STD DETAIL ST-01
NTS



STREET SIGN INSTALLATION DETAIL
PER WSDOT STD PLAN G-24.50-05
NTS



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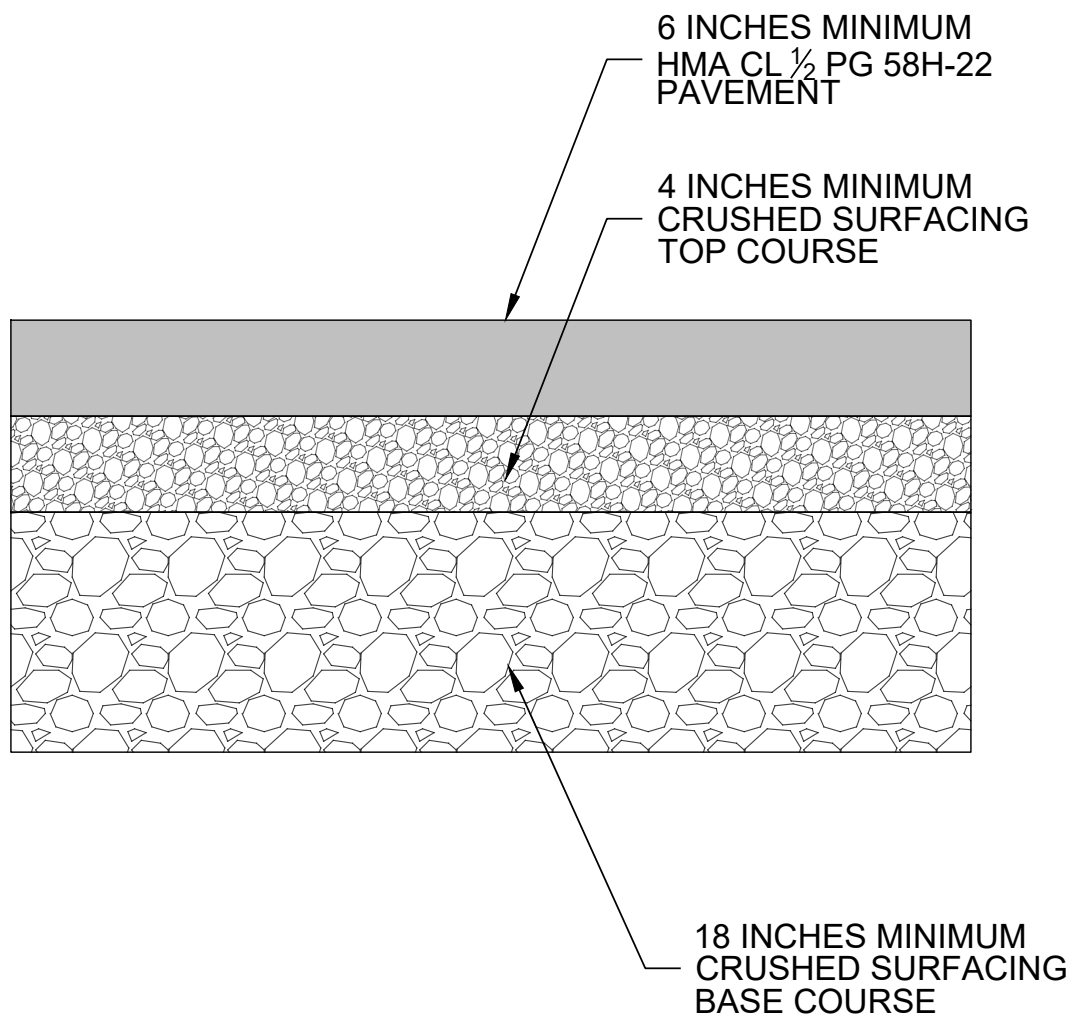
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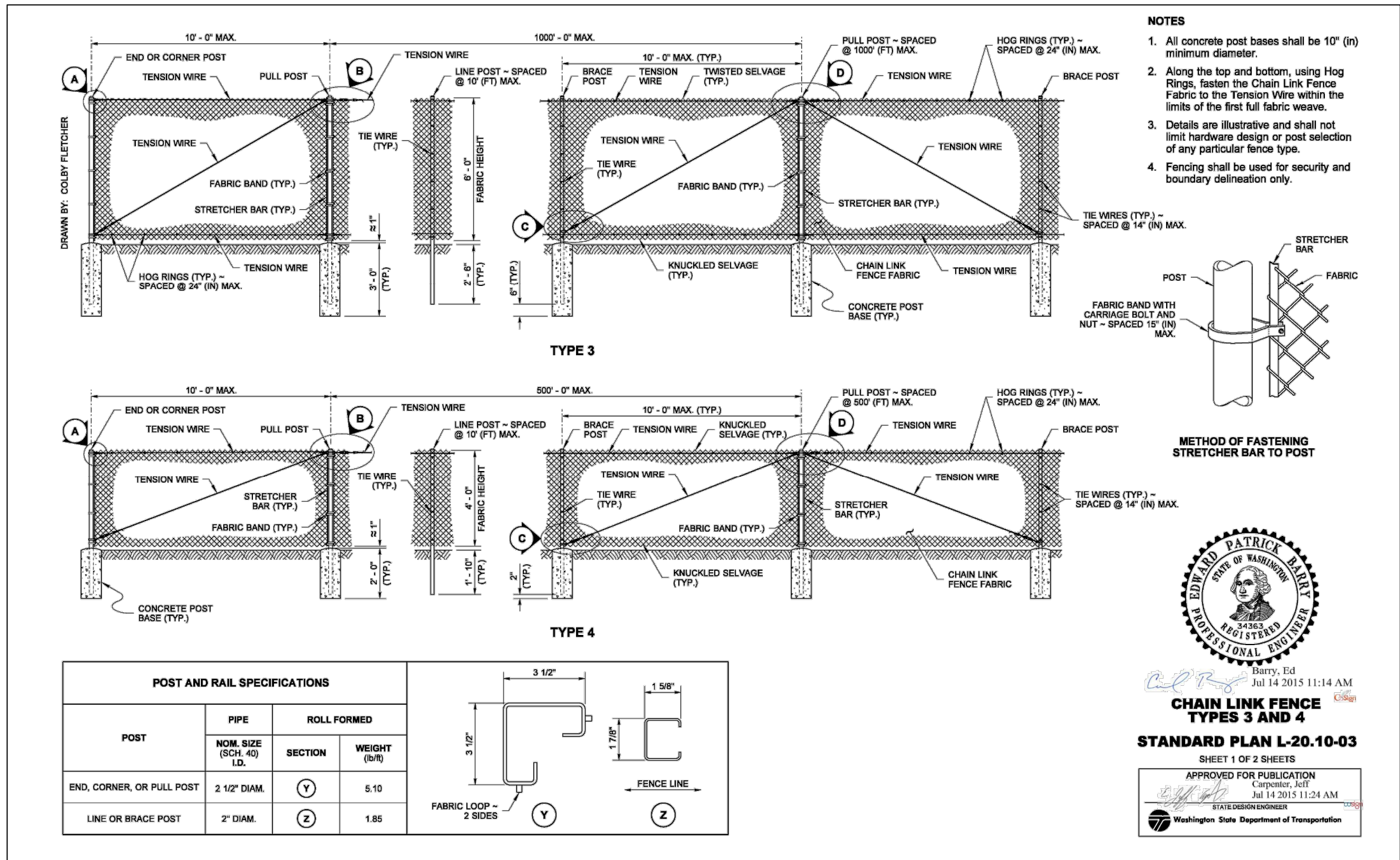
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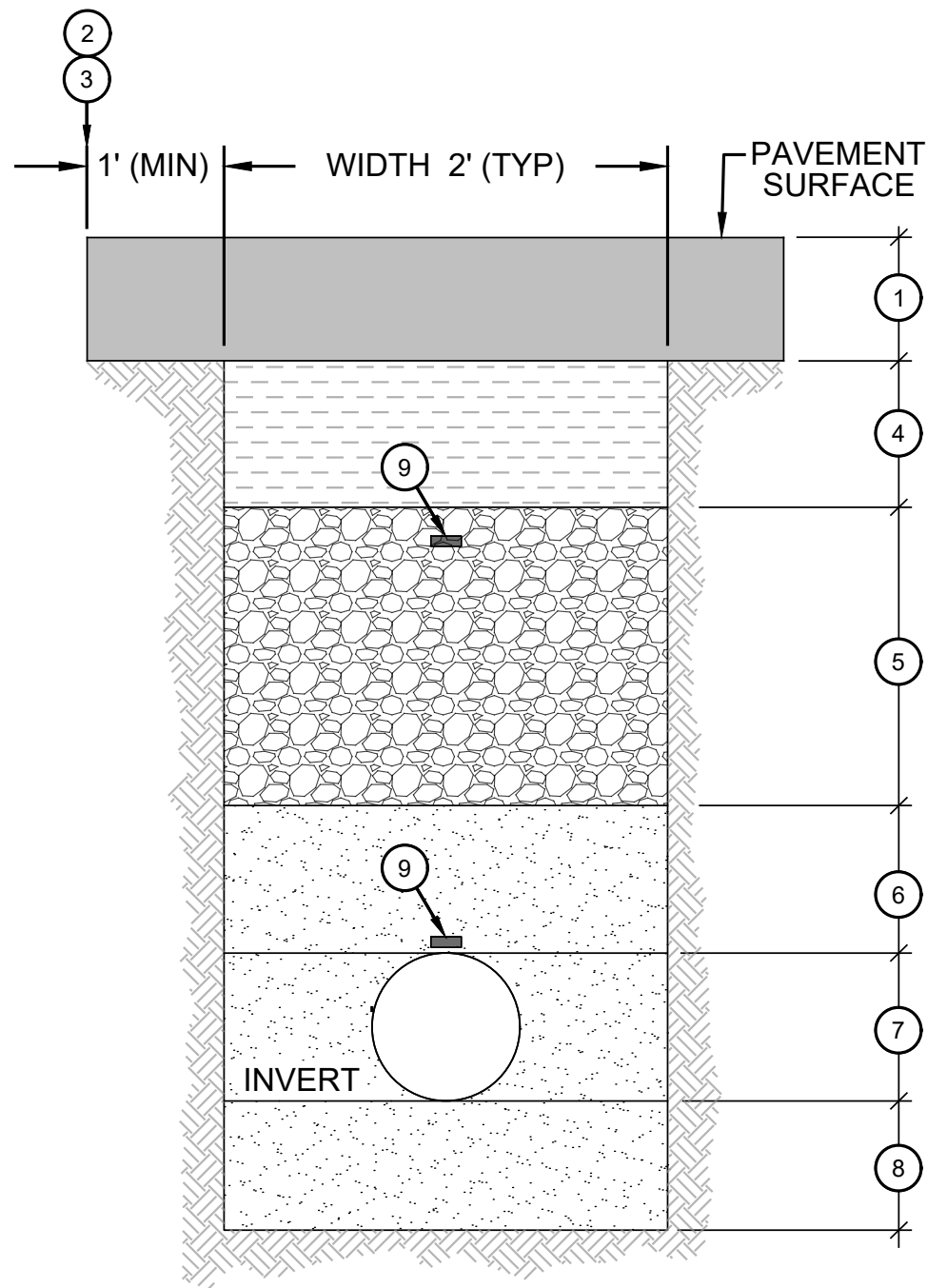
ASPHALT TYPICAL SECTION
NTS

J
C04



CHAINLINK FENCE AND GATE DETAIL
NTS

L
C04

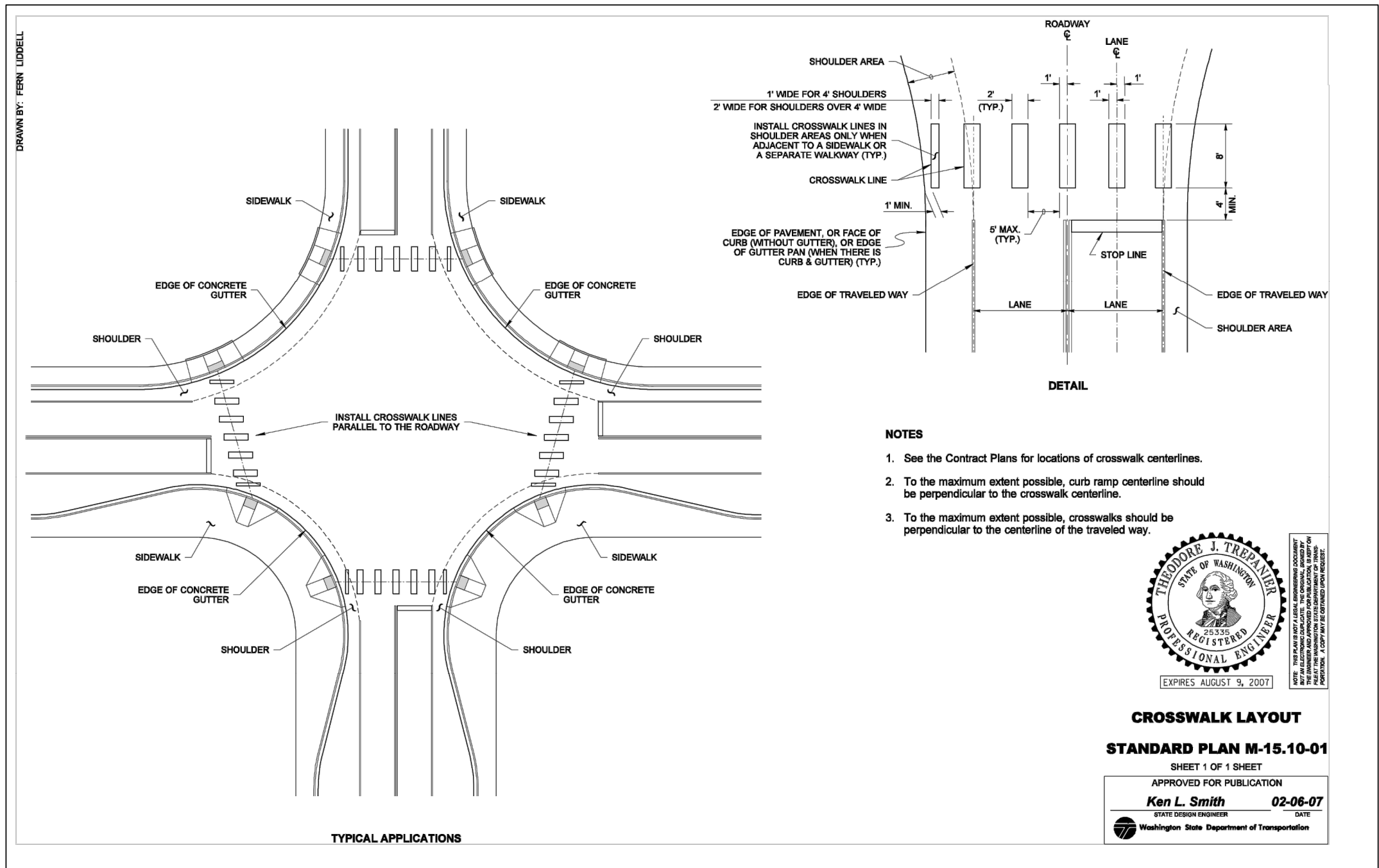


UTILITY TRENCH REPAIR
NTS

K
C05

GENERAL NOTES:

- RESTORE AS SHOWN IN DETAIL A.
- SAWCUT
- ALL JOINTS BETWEEN OLD AND NEW ASPHALT TO BE SEALED (SECTION 5-05.3(8)B) USING A HOT POURED JOINT SEALANT, PER SECTION 9-04.2(1).
- RESTORE AS SHOWN IN DETAIL A.
- BACKFILL SECTION PER DETAIL ON SHEET 10.0.
- THE PIPE ZONE SHALL BE BACKFILLED WITH SAND BACKFILL TO 12" ABOVE THE PIPE, PER SECTION 7-09.3(10) "BACKFILLING TRENCHES". THE PIPE ZONE SHALL BE COMPACTED TO 90%, PER SECTION 7-08.3(1)C.
- SAND BACKFILL - PIPE ZONE.
- 6" SAND BACKFILL.
- LAY ALUMINUM LOCATE TAPE A MINIMUM OF 12" BELOW FINISHED GRADE AND 12" ABOVE PIPE.
- SHOULD UTILITIES NEED TO BE REPAIRED OR REPLACED FOLLOW SECTION 7-08.3.



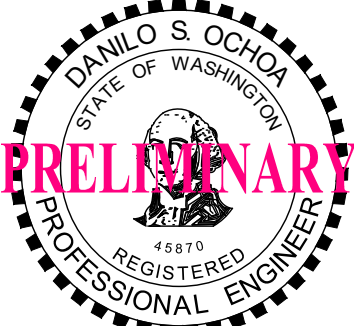
CROSSWALK DETAIL
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M
C04



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PROJECT #MRT-64

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SHEET NO.	

C10

Draft Geotechnical Assessment

Quiet Cove Property
Anacortes, Washington

for
Port of Anacortes

October 14, 2014



Plaza 600 Building
600 Stewart Street, Suite 1700
Seattle, Washington 98101
206.728.2674

Draft Geotechnical Assessment

Quiet Cove Property Anacortes, Washington

File No. 5147-024-01

October 14, 2014

Prepared for:

Port of Anacortes
100 Commercial Avenue
Anacortes, Washington 98221

Attention: Jenkins Dossen

Prepared by:

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Heidi Disla, PE
Geotechnical Engineer

John Herzog, PhD, LG
Principal

[HD:BJT:JMH]

cc:

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LIST OF FIGURES

Figure 1. Vicinity Map

Figure 2. Site Plan

ATTACHMENTS

Attachment 1. Exploration Logs

INTRODUCTION

This geotechnical assessment has been prepared for the Quiet Cove property (Site) on behalf of the Port of Anacortes (Port). The Port received an Integrated Planning Grant from Washington State Department of Ecology (Ecology) to support planning for environmental cleanup and redevelopment of the Quiet Cove Property for commercial and/or industrial use. The purpose of this geotechnical assessment is to summarize the general geotechnical considerations for redevelopment of the Quiet Cove Property.

The site is located at the northwest corner of the intersection of 3rd Street and “O” Avenue in Anacortes, Washington. The site is shown relative to surrounding physical features on the Vicinity Map (Figure 1) and the Site Plan (Figure 2). The site is rectangular in shape and bounded by 2nd Street to the north, “O” Avenue to the East, 3rd Street to the south, and a parking lot and “N” Avenue Park to the west. The site slopes gently to the northwest towards the nearby Guemes Channel. The site is currently used as a storage yard for boats, recreational vehicles and other items and contains several buildings. The majority of the ground surface of the site is paved.

At the time this assessment was written, infrastructure, building size, type, location, and use for future redevelopment of the property are unknown, and therefore, only conceptual-level geotechnical considerations have been provided. Geotechnical considerations for this assessment include potential issues stemming from organic and fill soils on site, and seismic hazards present at the site. A summary of known subsurface conditions along with preliminary geotechnical considerations related to these key issues are presented in the following sections.

GEOLOGY

U.S. Geologic (USGS) map for the project area, “Geologic Map of the Bellingham 1:100,000 Quadrangle, Washington” (Lapen 2000), shows soils in the vicinity of the property include both glacial and non-glacial processes that have occurred during the last 12,000 years. Surface soil deposits are identified as artificial fill and recessional marine (glaciomarine) drift from the Everson interstade of the Fraser glaciation.

Glaciomarine drift (GMD) consists of unsorted, unstratified silt and clay with varying amounts of sand, gravel, cobbles, and occasional boulders. Glaciomarine drift is derived from sediment melted out of floating glacial ice that was deposited on the sea floor. This material contains shells, wood, and large erratics (very large boulders) that can be present sporadically or even in a large cluster. The upper 5 to 15 feet of this unit in upland areas is typically stiff to very stiff. This is generally attributed to desiccation, although some consolidation from ice contact loading may have occurred. The stiff layer possesses relatively high shear strength and low compressibility characteristics. The stiff layer typically grades with depth to medium stiff or even soft, gray, clayey silt or clay with varying amounts of sand and gravel. In contrast to the upper portion of this unit, the medium stiff to soft glaciomarine drift possesses relatively low shear strength and moderate to high compressibility characteristics.

SUBSURFACE CONDITIONS

The subsurface conditions at the Site have been explored as part of the Focused Environmental Site Investigation. The approximate locations of the explorations are shown in Figure 2. The exploration logs for direct-push borings and monitoring wells completed are presented in Attachment 1.

The soils encountered at the site consist of relatively shallow fill overlying glaciomarine drift soils. Some of the borings also encountered layers of organic and peat soils in the upper 10 to 15 feet.

- The fill observed in the explorations typically consists of fine to coarse sand with gravel, varying silt content and occasional wood and brick debris. The thickness of fill encountered in the explorations ranged up to approximately 10 feet. The thickness, composition and density of the fill is expected to vary across the Site. Organic and peat soils were encountered within the fill soils in some of the explorations completed on the north portion of the site. The organic and peat soils, where encountered, were typically observed in the upper 10 to 15 feet. These layers were observed to be between approximately 2 to 5 feet thick.
- Glaciomarine drift was encountered below the fill. The glaciomarine drift unit consists of silt and clay with varying amounts of sands and gravels. The upper portions of this layer are sandier with layers of high gravel contents and vary in density between medium dense to dense. Below a depth of approximately 10 to 15 feet, the unit transitions to silt with lower content of sand and gravel. This unit extends to the depths explored.

Groundwater Conditions

Based on observations during drilling and direct water level measurement in monitoring wells at the Site show the groundwater level to be approximately 5 to 10 feet below the ground surface. Because of the proximity to the Puget Sound, groundwater levels are anticipated to vary as a function of factors such as location, precipitation, season and tides.

GEOTECHNICAL CONSIDERATIONS

Based on the available subsurface information, the following geotechnical considerations are appropriate for the site:

Site Seismicity

Earthquake Source Zones

The Puget Sound area is located near the convergent continental boundary known as the Cascadia Subduction Zone (CSZ). The CSZ is the zone where the westward advancing North American Plate is overriding the subducting Juan de Fuca Plate. The interaction of these two plates results in two potential seismic source zones: (1) the Benioff source zone, and (2) the CSZ interplate source zone. A third seismic source zone, referred to as the shallow crustal source zone, is associated with the north-south compression resulting from northerly movement of the Sierra Nevada block of the North American Plate.

Benioff Source Zone

Benioff source zone earthquakes are also referred to as intraplate, intraslab or deep subcrustal earthquakes. Benioff zone earthquakes occur within the subducting Juan de Fuca Plate between depths

of 20 and 40 miles and typically have no large aftershocks. Extensive faulting results as the Juan de Fuca Plate is forced below the North American Plate and into the upper mantle.

The Olympia 1949 ($M = 7.1$), the Seattle 1965 ($M = 6.5$) and the Nisqually 2001 ($M = 6.8$) earthquakes are considered to be Benioff zone earthquakes. The Benioff zone is characterized as being capable of generating earthquakes up to magnitude 7.5. The recurrence interval for large earthquakes originating from the Benioff source zone is believed to be shorter than for the shallow crustal and CSZ source zones; on average, damaging Benioff zone earthquakes in Western Washington occur every 30 years or so. The deep focal depth of these earthquakes tends to dampen the shaking intensity when compared to shallow crustal earthquakes of similar magnitudes.

CSZ Interplate Source Zone

The CSZ is an approximately 650-mile-long thrust fault that extends along the Pacific Coast from mid-Vancouver Island to Northern California. CSZ interplate earthquakes result from rupture of all or a portion of the convergent boundary between the subducting Juan de Fuca Plate and the overriding North American Plate. The fault surfaces approximately 50 to 75 miles off the Washington coast. The width of the seismogenic portion of the CSZ interplate fault varies along its length. As the fault becomes deeper, materials being faulted become ductile, and the fault is unable to store mechanical stresses.

The CSZ is considered to be capable of generating earthquakes of magnitude 8 to magnitude 9. No earthquakes on the CSZ have been instrumentally recorded; however, through the geologic record and historical records of tsunamis in Japan, it is believed that the most recent CSZ event occurred in the year 1700 (Atwater, 1996 and Satake et al., 1996). Recurrence intervals for CSZ interplate earthquakes are thought to be on the order of 400 to 600 years. Paleogeologic evidence suggests that five to seven interplate earthquakes may have been generated along the CSZ over the last 3,500 years at irregular intervals.

Shallow Crustal Source Zone

The shallow crustal source zone is used to characterize shallow crustal earthquake activity within the North American Plate. Shallow crustal earthquakes typically occur at depths ranging from 3 to 20 miles. The shallow crustal source zone is characterized as being capable of generating earthquakes up to about magnitude 7.5. Large shallow crustal earthquakes are typically followed by a sequence of aftershocks.

The largest known earthquakes associated with the shallow crustal source zone in Western Washington include an event on the Seattle Fault about A.D. 900 and the 1872 North Cascades earthquake. The Seattle Fault event was believed to have been magnitude 7 or greater (Johnson et al., 1999), and the 1872 North Cascades earthquake is estimated to have been between magnitudes 6.8 and 7.4. The location of the 1872 North Cascades earthquake is uncertain; however, recent research suggests that the earthquake's intensity center was near the south end of Lake Chelan (Bakun et al., 2002).

2012 IBC Seismic Design Information

For planning purposes, projects designed utilizing the 2012 International Building Code (IBC) should be classified as Site Class F as defined in Chapter 20 of the ASCE-7. Per section 20.3.1 from ASCE 7, this preliminary site classification is based on the presence of potentially liquefiable, organic, peat, and soft/medium stiff clay soils at the site. Per the ASCE 7, a site response analysis is required for sites classified as Site Class F. However, if the planned structures have a fundamental period of vibration

equal to or less than 0.5 seconds, the site response analysis is not required to determine the spectral accelerations for liquefiable soils, rather a site class is permitted to be determined in accordance with section 20.3 of the ASCE 7.

Ground Surface Rupture

Based on a review of the USGS fault maps, there are no known active faults that cross the site, and due to the thickness of the overburden soils at the site, it is anticipated that the risk of surface rupture at the site is low.

Liquefaction and Lateral Spreading

Liquefaction

Liquefaction is a phenomenon where soils experience a rapid loss of internal strength as pore water pressures increase in response to strong ground shaking, usually from earthquake forces. The increased pore water pressure may temporarily meet or exceed soil overburden pressures to produce conditions that allow soil and water to flow, deform, or erupt from the ground surface. Ground settlement, lateral spreading and/or sand boils may result from soil liquefaction. Structures, such as buildings, supported on or within liquefied soils may suffer foundation settlement or lateral movement that can be damaging to the buildings. In general, soils which are susceptible to liquefaction include loose to medium dense clean to silty sands which are saturated (i.e., below the water table).

Based on data obtained during site explorations, the portion of the fill soils below the groundwater table, and the upper portions of the glaciomarine drift layer that are sandier, have moderate to high liquefaction potential. Liquefaction should be evaluated during the design process. Depending on the planned development, liquefaction induced settlement mitigation may be necessary.

Lateral Spreading

Lateral spreading involves lateral displacement of large, surficial blocks of soil as the underlying soil layer liquefies. Lateral spreading can occur on near-level ground as blocks of surface soils are displaced relative to adjacent blocks. Lateral spreading also occurs as blocks of surface soils are displaced toward a nearby slope or free-face by movement of the underlying liquefied soil. Due to the presence of potentially liquefiable soils and the proximity of a free-face (Puget Sound) to the site, the risk of lateral spreading occurring at the site is moderate to high. Lateral spreading should be evaluated during the design process.

Foundation Considerations

The organic and peat soils encountered in the north portion of the site are expected to be highly compressible, and may exhibit variable settlement performance under new loads from foundations or fill. Therefore, settlement may be a concern if the organic soil is not taken into consideration during the design process. The organic and peat soils are unsuitable for foundation bearing. The portion of the fill soils below the groundwater table, and the upper portions of the glaciomarine drift layer that are sandier, have moderate to high liquefaction potential. The potentially liquefiable soils are prone to liquefaction-induced settlement after an earthquake event. Liquefaction-induced settlement should be considered to select the foundation type for the site. Typical foundation options for compressible and potentially

liquefiable soils include, removal and replacement with structural fill to support shallow foundations, deep foundations or ground improvement.

Slabs-On-Grade and Structural Slabs

Conventional slabs-on-grade may be a suitable option for the Site, provided that the subgrade soils are prepared appropriately. The exposed subgrade should be evaluated after site grading is complete. Proof-rolling with heavy, rubber-tired construction equipment should be used for this purpose during dry weather and if access for this equipment is practical. Probing should be used to evaluate the subgrade during periods of wet weather or if access is not feasible for construction equipment. The exposed soil should be firm and unyielding, and without significant groundwater. Disturbed areas should be re-compacted if possible or removed and replaced with compacted structural fill.

The slab should be founded on either undisturbed competent soils or on structural fill placed over the undisturbed competent soils. Ground improvement may be appropriate if unsuitable fill and/or organic soils are present in slab-on-grade areas. A layer of capillary break material over a suitably prepared subgrade should be considered.

Where deep foundations are used to support buildings, structural slabs should be considered if damages to the slabs are not acceptable. The mat foundation may also help reduce the seismic differential settlements after a design earthquake event and may also reduce the potential for static settlement of the slab.

Paved Areas

It is expected that typical pavement sections will be an option for future development of this site. The native soils generally consist of either silt that is relatively impermeable and very susceptible to disturbance when wet, or unsuitable fill soils. The natural moisture content of the soils is typically wet of optimum and would be susceptible to frost heave if the subgrade soils become saturated and then freeze. As such, a gravel base on the order of 8 to 12 inches thick is typically appropriate below pavement sections. Including a layer of geotextile fabric between the silty native subgrade and gravel base will help stabilize the subbase, prevent intrusion of the silt soils and provide better long-term pavement performance.→

Prior to placement of subbase materials, all pavement subgrade soils should be proof rolled and unsuitable or yielding soils should be removed or repaired per the geotechnical site representative prior to placing gravel base. The gravel base should not be placed over the native soils until a weather window will allow paving to occur without inclement weather, even in the summer time.

Drainage and Stormwater Considerations

The glaciomarine drift has a very low permeability. A seasonally perched groundwater condition occurs in the winter. It may be appropriate to include interceptor drains or edge drains in parking areas for future site development.

Based on review of existing site information, the site soils are not suitable for on-site disposal (i.e., infiltration) of stormwater because the permeability of the silt/clay does not allow for infiltration.

Site Preparation and Earthwork

Fill, topsoil, sod, or organic layers should be stripped from pavement and building areas. Lightweight construction equipment should be used to perform the stripping and keeping construction equipment off the stripped subgrades as much as possible during the wet season or when the subgrade is wet. The silty glaciomarine drift and fill soils expected at the site are highly moisture sensitive and easily susceptible to disturbance by construction equipment during wet weather. Achieving compaction specifications may be difficult during wet conditions. Whenever feasible, site earthwork should be completed during the dryer summer months to minimize grading costs.

The on-site soils would most likely be excavated using conventional earthmoving equipment, however, excavation of the stiff to very stiff native silt and clay is more efficient with larger horsepower non-standard equipment.

Prior to placement of structural fill, capillary break, or gravel base, subgrade should be compacted to a firm, non-yielding condition. The subgrade soils may need improvement (such as mixing them with cement) to achieve adequate compaction. If appropriate, the subgrade may be proof-rolled with a loaded 10-yard dump truck during dry weather. Any soft, loose, pumping, or otherwise unsuitable areas should be repaired or removed and replaced with structural fill. The depth of over-excavation should be determined by the geotechnical engineer's representative.

REFERENCES

- Atwater, Brian F. (1996). Coastal Evidence for Great Earthquakes in Western Washington. Assessing Earthquake Hazards and Reducing Risk in the Pacific Northwest, USGS Professional Paper 1560 Vol. 1: pp. 77-90.
- Bakun, W.H., Haugerud, R.A., Hopper, M.G., and Ludwin, R.S. (2002). The December 1872 Washington state earthquake. Bulletin of the Seismological Society of America, Vol. 92, No. 8, pp. 3239-3258.
- Johnson, S.Y., Dadisman, S.V., Childs, J.R., and Stanley, W.D. (1999). Active Tectonics of the Seattle Fault and Central Puget Sound, Washington: Implications for Earthquake Hazards. Geological Society of America Bulletin, vol. 111, No. 7, pp. 1042-1053.
- Lapen, Thomas J., 2000, Geologic map of the Bellingham 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources, Open File Report 2000-5, scale 1:100,000
- Satake, Kenji, et al. (1996). Time and Size of a Giant Earthquake in Cascadia Inferred from Japanese Tsunami Records of January 1700. Nature, Vol. 379, pp. 247-248.

LIMITATIONS

We have prepared this geotechnical assessment for the exclusive use of the Port of Anacortes and their authorized agents for the project site. This assessment was prepared on a very high level, without information for the future site development, therefore our conclusions and interpretations should not be

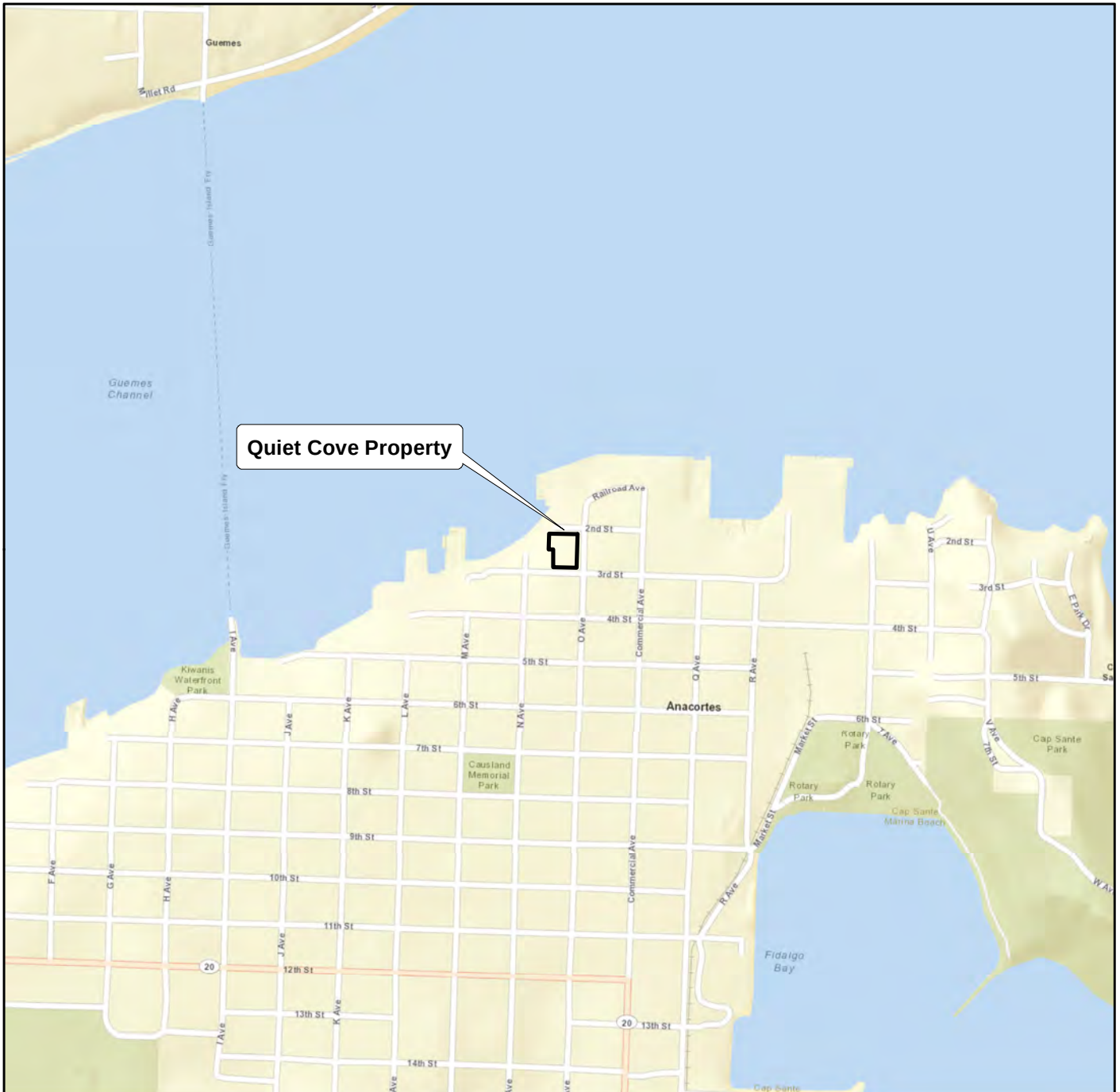
construed as a warranty of the subsurface conditions. A geotechnical study, specific to the planned development, should be completed to develop geotechnical recommendations for design.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the fields of geotechnical engineering in this area at the time this assessment was prepared. No warranty or other conditions, express or implied, should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

Map Revised: 1/28/2014 MSA

Office: Redmond Path: C:\Users\maugust\Desktop\xxxxxxx_F1_VicinityMap.mxd



Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

Data Sources: ESRI Data & Maps, Street Data 2013.

Transverse Mercator, Zone 10 N North, North American Datum 1983
North arrow oriented to grid north

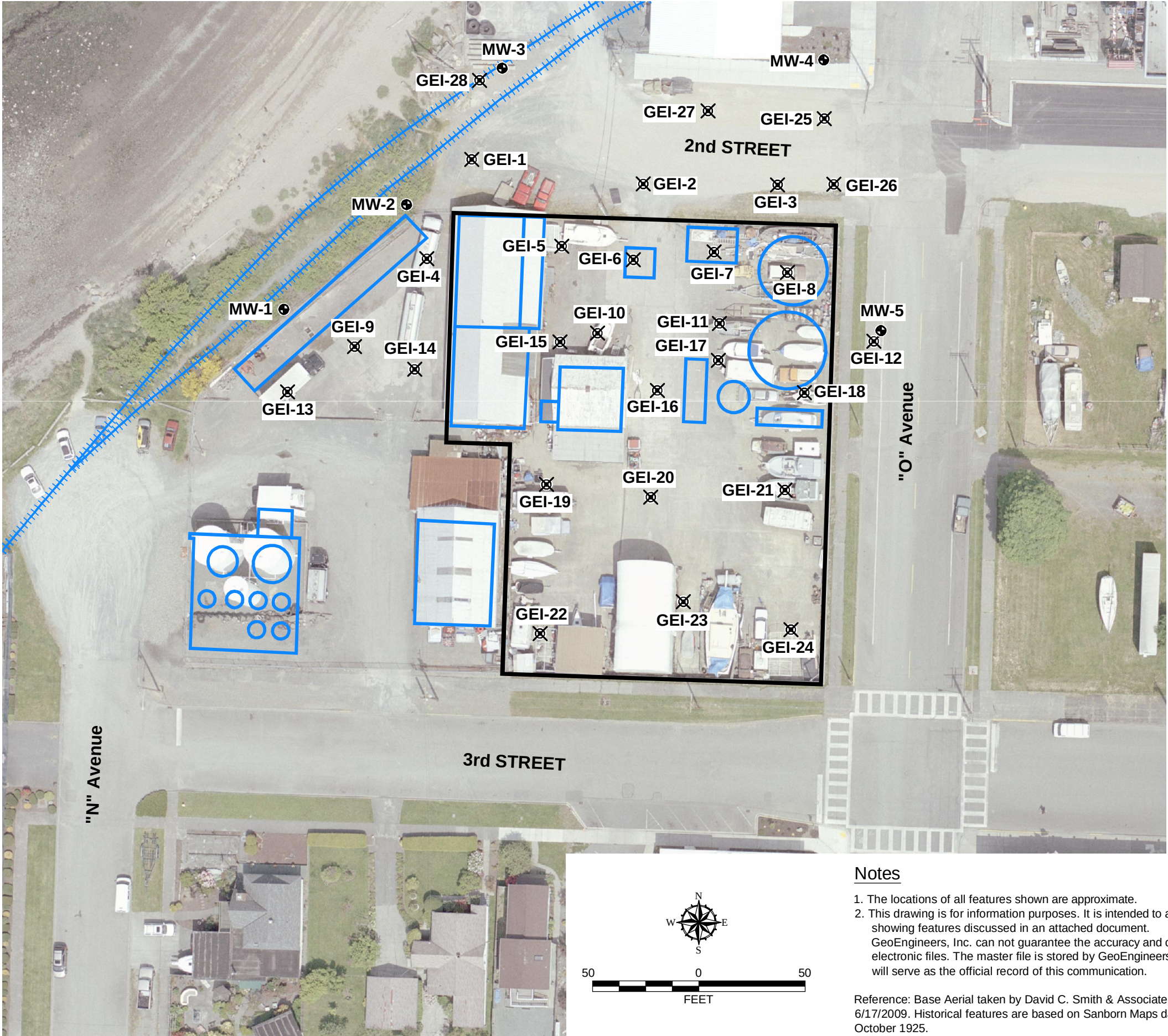
Vicinity Map

Quiet Cove Property
Anacortes, Washington



Figure 1

P:\15\167024\CAD\01\SOIL CHARACTERIZATION\5147024-01 FIG 1 SITE PLAN.DWG\TAB:LANDSCAPE MODIFIED BY TMCHAUD ON JUL 30, 2014 - 14:32



- Legend**
- Quiet Cove Property Boundary
 - Historical Features
 - ⊗ Geoprobe Boring Location
 - Monitoring Well Location

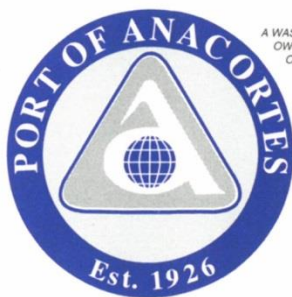
Notes

1. The locations of all features shown are approximate.
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GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Historical features are based on Sanborn Maps dated October 1925.

Site Plan	
Quiet Cove Property Anacortes, Washington	
GEOENGINEERS 	Figure 2



100 COMMERCIAL AVENUE • ANACORTES, WA 98221 USA
(360) 293-3134 • FAX (360) 293-9608 • WWW.PORTOFANACORTES.COM

Date: October 17, 2022

To: Port of Anacortes SEPA Files
From: Kevin Anderson, Environmental Specialist
Re: SEPA Exemption for Paving 2nd Street and Curtis Wharf Entry

The Port of Anacortes (Port) proposes to pave approximately 18,000 sf of the 2nd Street ROW and the entry to Curtis Wharf. The site is currently an unpaved, gravel ROW and entry drive to Curtis Wharf, a 1.4 acre commercial pier supporting maritime industries surfaced in asphalt and concrete.

Proposed work will include:

- Excavation of existing gravel surface and base materials.
- Backfilling and compaction of clean imported fill and base course materials.
- Installation of updated stormwater conveyances and BMP facilities.
- Paving with asphalt four inches in depth.
- Asphalt and stormwater updates will meet the City's engineering standards (STR-15.1).

The Port of Anacortes requires this work to improve access to Curtis Wharf and reduce maintenance requirements; the current gravel ROW needs grading and gravel replenishment and grading at least annually due to pothole formation. The improvements will also update and improve stormwater handling at the site. All required City and local jurisdiction permits will be obtained prior to demolition, grading, and paving.

The Port of Anacortes, as lead agency, has determined that this project is categorically exempt from SEPA review based on the criteria described in WAC 197-11-800 (2) (d) (vii) and (viii)

Other minor new construction. The construction or installation of minor road and street improvements by any agency or private party that include the following:

- (vii) Installation of catch basins and culverts for the purposes of road and street improvements;
(viii) Reconstruction of existing roadbed (existing curb-to-curb in urban locations), including adding or widening of shoulders where capacity is not increased and no new right of way is required . . .

DocuSigned by:

Daniel C. Worra, SEPA Responsible Official

10/17/2022

Date

DRAFT

APPENDIX P
Cultural Resources Monitoring Report

CULTURAL RESOURCES REPORT COVER SHEET

Author: Lenz, Brett R.

Title of Report: Monitoring of the Quiet Cove Cleanup, Skagit County, WA

Date of Report: March 26, 2021

County(ies): Skagit Section: 8 Township: 29 Range: 5 E

Quad: Marysville Acres: 2

PDF of report submitted (REQUIRED) ☒ Yes

Historic Property Inventory Forms to be Approved Online? ☐ Yes ☒ No

Archaeological Site(s)/Isolate(s) Found or Amended? ☒ Yes ☐ No

TCP(s) found? ☐ Yes ☒ No

Replace a draft? ☐ Yes ☒ No

Satisfy a DAHP Archaeological Excavation Permit requirement? ☐ Yes # ☒ No

Were Human Remains Found? ☐ Yes DAHP Case # ☒ No

DAHP Archaeological Site #:

Monitoring of the Quiet Cove Cleanup, Skagit County, WA

Prepared for

Geoengineers
17425 NE Union Hill Rd
Suite 250, Redmond, WA 98052

Prepared by:

Columbia Geotechnical Associates, Inc.
3405 West 46th Avenue
Kennewick, WA 99337

Authors:

Brett R. Lenz, PhD, L.E.G.
Natalie Bankuti, MA

Abstract

This cultural resource monitoring report is prepared for the Quiet Cove cleanup project. The Port of Anacortes executed the Remedial Investigation/Feasibility Study Work Plan for the Quiet Cove Property, Columbia Geotechnical Associates monitored the project. The Project is situated along the southeast shoreline of Guemes Channel at 202O Avenue (at the intersection of 2nd Street and O Avenue) in Anacortes, Washington and is part of the Washington State Department of Ecology's Puget Sound Initiative and regional cleanup efforts on Fidalgo Island. The Site is listed in Ecology's Integrated Site Information System under Facility Site Identification No. 20859 and Cleanup Site Identification No. 12482. Ecology issued Agreed Order No. DE 11346 pursuant to the authority of the Model Toxics Control Act, Revised Code of Washington (RCW) 70.105D.050(1).

Part of the investigation that the Port is required to complete includes consideration of the cultural resources that might be impacted by any cleanup effort at the Quiet Cove site. Previous studies have documented historic structures, primarily outbuildings including carriage houses, garages, woodsheds, and others of unknown use. The Quiet Cove property included two buildings that were recorded in Lenz (2019). Historic use of the property included the former Nobar Hotel and subsequently, a fueling distribution center. During the course of the cleanup, historic and prehistoric archaeological deposits were identified. This report presents the background, results and an account of materials recovered over the course of the project.

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1.0 Introduction

Project Description and Regulatory Basis for Monitoring

The Port of Anacortes executed the Remedial Investigation/Feasibility Study Work Plan for the Quiet Cove Property in Anacortes, Washington (Figures 1, 2). The Project is situated along the southeast shoreline of Guemes Channel at 202O Avenue (at the intersection of 2nd Street and O Avenue) in Anacortes, Washington (Figure 1) and is part of the Washington State Department of Ecology's Puget Sound Initiative and regional cleanup effortson Fidalgo Island. The Site is listed in Ecology's Integrated Site Information System under Facility Site Identification No. 20859 and Cleanup Site Identification No. 12482. Ecology issued Agreed Order No. DE 11346 pursuant to the authority of the Model Toxics Control Act, Revised Code of Washington (RCW) 70.105D.050(1). Under the Order, the Port is required to complete a remedial investigation, per Washington Administrative Code (WAC) 173-340-350 and WAC 173-204-560 to define the nature and extent of previously identified contamination in media of concern at the property.

Part of the investigation that the Port is required to complete includes consideration of the cultural resources that might be impacted by any cleanup effort at the Quiet Cove site. A number of Cultural Resources are known to exist in the project area, including archaeological sites, historic properties and Traditional cultural places important to Indian people. While there was no recorded archaeology at the Quiet Cove project site, the vicinity of the project area contains a relatively high number of historic structures and prehistoric sites are present within a mile of the project. Many of the historic structures are outbuildings including carriage houses, garages, woodsheds, and others of unknown use. Most of these buildings are simple, wood frame structures, with gabled or shed roofs, rustic drop siding, and simple fenestration patterns. The majority are in poor condition. The Quiet Cove property included two buildings that were recorded in Lenz (2019). Historic use of the property included the former Nobar Hotel and subsequently, a fueling distribution center.

Project Area

The proposed 0.8-acre project is located between 2nd and 3rd Streets on O Avenue and is composed of three tax parcels. Adjacent properties include a Port-owned storage yard to the west and a bulk fuel distribution facility owned and operated by Texaco/Reisner to the southwest. Guemes Channel is north and west of the Site. The Quiet Cove property is relatively flat, gently sloping to the northwest. The property and surrounding area is generally covered with buildings, concrete, gravel or asphalt with the exception of planter strips located on the 2nd and 3rd Street, and O Avenue Rights-Of-Way. Stormwater runoff at the Site is collected in catch basins that discharge to the City of Anacortes stormwater system. Currently, an office with attached warehouse (originally referred to in historic documents as the StandardOil Office/Warehouse) and a separate warehouse building referred to as the Three-stall garage, are present on the northwest portion of the property. A chain link fence surrounds the property preventing general public access. Vehicle and pedestrian access to the property is through a gated entrance south of 2nd Street.

History of Site Use

The initial commercial use of the Quiet Cove property was as a hotel site (Nobar Hotel). Subsequently, the property was used for bulk fuel storage and distribution from approximately 1909 to at least 1977. The final date when fuel operations ceased is unknown. As reported in the February 17, 1910 Anacortes American, Standard Oil erected a dock (in the general vicinity of what is now Curtis Wharf) and bulk fuel plant on the Anacortes waterfront at 2nd Street and O Avenue in November 1909 selling 40,000 gallons of oil a month. Standard Oil operated the bulk fuel facility until the late 1970s at which time the facility was decommissioned, and the aboveground tanks were removed. Skagit County Assessor records indicate that the property was sold to Thomas and Patricia Stowe in 1977. Following the purchase of the property, the Stowes began to operate a

storage yard for marine vessels and recreational vehicles, and leased office and warehouse space to various tenants for commercial purposes. In 2013, the property was purchased by the Port of Anacortes.

The approximate location of the historical features at the Site are shown on a number of historic photos and compiled on an engineer's drawing (Figure 8). A copy of the Standard Oil facility drawing dated May 31, 1921 shows the property layout while operating as a bulk fuel storage and distribution facility. According to the Standard Oil engineering drawing, the facility layout included a 280,000 gallon above ground storage tank (AST), a 158,000-gallon AST, a 56,000-gallon AST, a 43,000-gallon AST, four 20,000-gallon ASTs, a pump house, three stall garage with attached boiler room, warehouse with covered area for barrel storage and an office. Product supply lines within the property connected each of the ASTs to the central pump house. During operation, the facility received fuel delivered from vessels moored to a historical wooden pier through a series of product supply lines which were located underground south of the bulkhead. North of the bulkhead, product supply lines were hung beneath the historical wooden pier which was later demolished during the late 1990s according to historical aerial photographs. Historical aerial photographs show that the facility remained largely unchanged throughout its operational history.

The property west of the Site (P55355) is currently owned by the Port of Anacortes and was the location of a former coal storage shed presumably used to support railroad operations in Anacortes due to its proximity to the historical rail line. The property located to the southwest of the Site is currently used by Texaco/Reisner as a bulk fuel facility. Bulk fuel operations at this location began as early as 1925. Historically, the Texaco/Reisner facility also operated a fuel terminal located at the northern end of N Avenue. Based on historical aerial photographs, the Reisner Petroleum Terminal was removed between 1971 and 1977.

2.0 Background Research

An initial Cultural Resources Assessment for this remediation project was completed in 2019 (Lenz et al. 2019). Researchers conducted archaeological, ethnographic and historical literature review of local and regional source material at the Anacortes Museum, Anacortes Library, and online sources. Background record searches included a review of the historic and archaeological site files on the Department of Archaeology and Historic Preservation's WISAARD database, a review of early General Land Office maps, county atlases, early plat maps, historical aerial photographs and published local histories.

As a result of the survey, it was determined that no recorded archaeological sites existed on the Quiet Cove property, however, they might lie buried beneath historic period fill at the project site. Large midden sites representing winter villages and smaller sites related to camping and shellfish processing are common in similar settings. Several archaeological sites are recorded near the Project area but no recorded sites are known to exist on or immediately adjacent to the Quiet Cove property. In 2009, archaeological investigations associated with Port of Anacortes activities resulted in the identification of archaeological sites SK00411 and SK00410. Site SK00411 consisted of a shell midden with historic industrial features and site SK00410 included the remnants of a pre-1959 shipway used for moving ships on land (Gilpin et al. 2009). Both of these sites are three blocks due east of Quiet Cove, situated on the shoreline. In addition, the nearest recorded sites include shell midden sites 45SK13 (Bryan 1953), located at the Guemes Island ferry dock; 45SK43 (Bryan 1954a; Moura 2003; Schalk 2004; Trost 2005), located approximately 1.5 to 2 mi. southeast of the Project; 45SK44 (Bryan 1954b; Conca 1985), located just over 2 mi. southeast of the Project; and 45SK294 (Barsh 2003), located around 0.75 mi southwest of the Project.



Figure 1. USGS Topographic Map showing location of the Quiet Cove project area.

Sedimentary and Geomorphic Context

In order to understand the context of the buried materials to be monitored, we considered details of the site geologic setting. The monitoring site is located within the Puget Trough of Franklin and Dyrness (1973). The surrounding topography is typical of glaciated environments, with a broadly uneven surface that is hummocky in places and bisected by Holocene drainages. At the glacial maximum the Cordilleran ice sheet crossed the project location, emplacing glacial deposits along the northern portion of Washington State as far as the southern Puget Lowlands. The ice sheet entered the northern portion of Washington State at least five times until finally retreating approximately 13,000 years ago, roughly the same time that we begin to see the earliest archaeological sites in the Pacific Northwest.

Loading of the Cordilleran ice sheet caused subsidence of the sediment and bedrock underlying the Puget Sound to the west of the Cascade Range. Isostatic rebound has occurred there since the close of the ice-age, resulting in large tracts of land that were formerly next to Pleistocene waterways now located hundreds of feet above and several miles from the modern Puget Lowland. Stratigraphic relationships, geomorphology and radiocarbon age dating indicate that the Vashon continental ice margin was a complex boundary at the general time of colonization, during ice recession, when the basal sediments at the Site were deposited. This dynamic ice margin is the result of the interplay between glaciomarine, glaciolacustrine, ground and stagnant ice dynamics. The last Pleistocene glacial advance west of the Cascade Range occurred during the Fraser Glaciation. The Fraser Glaciation began roughly 30 thousand years before present (KBP) with the accumulation of alpine glaciers in the mountain ranges of coastal British Columbia and in the Olympic and Cascade ranges of Washington State. The Cordilleran Ice Sheet expanded into northwestern Washington from the Fraser lowlands at about 18.8 KBP (Booth et al. 2003, Porter and Swanson 1998). The Puget lobe covered the Seattle area at 14.5 KBP and reached its southernmost extension by 14 KBP, 15 miles south of the city of Olympia. The lobe began retreating just after reaching its maximum and it had receded to near the project area by approximately 13.6 KBP (Booth et al. 2003, Porter and Swanson 1998).



Figure 2. USGS map showing the location of the Project Area of Potential Effect

The interaction of isostatic rebound with eustatic sea-level rise created a complex pattern of relative sea level change during the Pleistocene-Holocene transition. Along the outer coastal areas, sea-level was significantly lower than the present day. Barrie and Conway (2002) report the earliest record of late Pleistocene sea level position as 37m below modern sea level at 14.4KBP. By 13KBP sea levels dropped to their lowest point, roughly 150m lower than today, and maintained that position until at least 12.4KBP (Barrie and Conway 1999; Fairbanks 1989, Josenhans et al. 1997). Eustatic sea level rise ensued in two marked pulses, separated by the Younger Dryas period, one between 13 and 14KBP and later between 11.5-11KBP (calendar years; Fairbanks 1989). Following this, transgression occurred until 8.8KBP when sea level stabilized roughly 15m above modern sea level (Clague et al. 1982; Fedje and Christensen 1999; Fedje et al. 2005).

Sediments directly underlying the Quiet Cove site include glaciofluvial and glaciolacustrine material unconformably overlain by beach and marsh deposits which are in turn unconformably overlain by mixed, historic debris. It is the interface zone between the deepest glacially derived sediment and the overlying eolian and historic materials that has potential to contain intact prehistoric, ethnohistoric and historic archaeological deposits. The focus of monitoring was on these deposits.

Based on previous subsurface investigations and review of the United States Geological Survey (USGS) map of the Anacortes North Quadrangle (Lapen, 2000), mapped sediments in the vicinity of the property include soils characteristic of both glacial and non-glacial processes that have occurred during the last 12,000 years. The stratigraphy of the site proper generally consists of fill material overlying native shoreline and glaciomarine deposits. Fill deposits consist primarily of fine to coarse sand with gravel and varying silt content ranging in thickness from 2 to 7 feet. Shoreline deposits consist primarily of well-sorted medium to coarse sand with occasional gravel and varying silt content. Organic deposits (peat) of varying thickness (1 to 3 feet) were observed at several boring locations; however, peat is not continuous throughout the Site and surrounding area. The underlying glaciomarine deposits consist primarily of unsorted, unstratified silt and clay with varying amounts of sands and gravels at depths greater than 14 feet below ground surface (bgs). Table 1 displays geoarchaeological units present on the project site.

Flora and Fauna

Prehistoric and Historic peoples exploited a broad variety of plants and animals in order to make a living; remains of either are potentially located within the buried deposits at the project locale. Most generally, the project is located within the Western Hemlock vegetation zone, characterized by western hemlock, cedar, and Douglas fir with a shrub-rich understory (J.F. Franklin and C.T. Dyrness 1988). The landscape has not changed significantly over the last 7,000 years. The recent to modern climate in the project vicinity is temperate, with moderate, relatively dry summers and mild, cool winters.

The natural vegetation of the area has been modified to varying degrees by logging, agriculture, and urban development since the mid-1800s. Historically, the area was covered with dense forests consisting of Douglas fir, western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*), bigleaf maple (*Acer amplum*), red alder (*Alnus rubra*), willow (*Salix L.*), and vine maple (*Acer circinatum Pursh*). Ferns, mosses, salal (*Gaultheria shallon*), Oregon grape (*Mahonia aquifolium*), ocean spray (*Holodiscus discolor*), snowberry (*Symphoricarpos*), wild rose (*Rosa L.*), red huckleberry (*Vaccinium parvifolium*), blackberry (*Rubus Eubatus*), and salmonberry (*Rubus spectabilis*) were abundant (J.F. Franklin and C.T. Dyrness 1988).

Where available, these plants continue to support a diverse range of fauna. While few species thrive in the area today, the historic period landscape would have supported a greater number of plants and animals. Black-tailed deer (*O. hemionus columbianus*), bear (*Ursus americanus*), bobcat (*felis rufus*), cougar (*Puma concolor*), wolf (*Canis lupus*), elk (*Cervus elaphus*), raccoon (*Procyon lotor*), skunk (*Mephitis*), beaver (*Castor Canadensis*), pheasants (*Phasianus colchicus torquatus*), waterfowl, heron (*Cochlearius cochlearius*), salmon and trout (*Oncorhynchus*) are some of the resources common to the area.

TABLE 1 QUIET COVE GEOARCHAEOLOGICAL UNITS

Qf	Differentiated historic fill
	Riprap, soil, sediment, rock, and solid waste material that has been added and reworked to modify topography; includes engineered and non-engineered fill. Within project boundary differentiated as:
	Qfcr Clean Recent Fill; mixed sand, silt, clay; may contain cobbles, gravel, shell; characterized by lack of or disruption of bedding planes; defined by bounding contacts with other units.
	Qfr Recent Fill; mixed sand, silt, clay; may contain cobbles, gravel, shell; contains modern landfill debris (Glass, Plastic, Metal, Wood)
	Qfs Structural fill; mixed sand, silt, clay; may contain cobbles, gravel, shell; contains modern landfill debris (Brick, Wood, Glass, Metal)
	Qfw Woody Fill; mixed sand, silt, clay; may contain cobbles, gravel, shell; contains wood pulp, wood debris, logs.
Qha	Archaeological deposits, differentiated as:
	Qas- Shell midden; consists of medium to thickly bedded layers of sand; shell and dark organic sandy midden matrix; dark gray to black.
	Qao- Dark gray to black organic sands; may include oxidized shell or burned sand strata.
	Qaom- Dark gray to black organic midden sands; consists of beach-derived sands and artifacts in the absence of shell; shell is assumed to have pedogenically leached from the deposit.
	Qaos- Dark gray to black sands with small fragments of shell; dark colors relate to organic staining; fragmented shell may reflect beach zone reworking or pedogenic leaching.
Qo	Organic Sediments
	Peat and decayed organic materials, sometimes fibrous with thin to medium-bedded silty sand; interbedded silt and clayey silt; Stringers and lenses of sand and gravel; Black to gray to very dark brown; the byproduct of pedogenesis between sediment depositional events; artifact free.
Qb	Beach Deposits
	Generally well-sorted sand and cobbles within the influence of the surf zone; may include silt, pebbles and cobbles; larger clasts in coarser deposits are generally well rounded and flattened by wave action

Qg Glacial Deposits

Undifferentiated upper Pleistocene glacial outwash and till deposits; typically gleyed.

Marine resources of the area include several species of salmon, steelhead, flounder, perch, rockfish, dogfish, lingcod, herring, smelt and sole. Freshwater fish in the vicinity of the site today include lamprey, trout, whitefish, peamouth, pikeminnow, dace, shiner, sucker, and a variety of introduced game fish. Mussel, clams, oysters, sea urchins, and other shellfish are available in a variety of intertidal environments. Marine mammals, including killer and gray whale, harbor seals, sea lions and porpoises occupy the area seasonally or year-round.

3.0 Cultural Overview

The native occupants of the project area were the Northern Lushootseed-speaking Salish peoples who shared ties with other Puget Sound cultures (Suttles and Lane 1990) who today include the Stillaguamish Tribe of Indians, the Swinomish Indian Tribal Community, the Upper Skagit Indian Tribe and the Tulalip Tribes (among whose members include the Snohomish).

Coastal Salish people relied on a diet of fish, roots, berries, and wild game. There is evidence to suggest a marginal difference in diet between coast-dwelling groups of Puget Sound and the more inland peoples who lived along rivers with the latter group focusing more on upland game animals instead of marine resources (Bryan 1963).

Ethnographic records indicate that the Samish occupied the shoreline areas of Guemes Channel. In 1792 explorers noted two large houses on Guemes Island near the present-day ferry landing. Known as *SWHAH-ee-melh*, this site became so popular many moved to *keh-LEH-tseelch* (ironwoods) located on the Fidalgo Island side of Guemes Channel. This latter village was settled in the early 1800s. At the present town of Fidalgo, another place named *kwuh-kwulh-AW'k-awl* (camas) was used as a camp site while the Samish harvested camas from the prairie at the head of the bay. By the mid-1800s, four large houses reportedly occupied this site (Dailey 2013).

Archaeological Overview

The first human occupation of Washington State may date back about 14,000 years to the Manis Mastodon site at Sequim, where a possible bone point and the spirally fractured bones of a mastodon suggest human hunting and butchering (Gustafson et al. 1979). The next phase of human occupation in Washington was between 13,000 and 13,500 years ago and referred to as the Clovis culture. There have been a few isolated locales in southern and central Puget Sound, but no campsite of this culture has yet been found in Washington. Following the Clovis period, there are the Early (approximately 12,000 to 7,000 years ago), then the Middle (7,000 to 3,500 years ago) and Late (3,500 to 150 years ago) periods. Sites deposited during the Early period, typically occur on high marine and river terraces, sometimes at a significant distance from modern water courses, and consist of concentrations of cobble cores, flakes, large ovate knives, and broad-stemmed and leaf-shaped projectile points (Wessen 1990).

Eustatic Sea Level rise continued through the Early period into the Middle period, eventually stabilizing between 7-5 thousand years ago. This period of time marks a significant shift in the overall environmental scheme which allowed for the establishment of a concentrated littoral adaptation. Archaeological evidence defining this period is seen in significant, widely spread changes in subsistence economy and residential patterns. Few, yet persistent lanceolate points, not uncommon in Olcott assemblages are present during this time and ground stone, bone and antler tools, and smaller, triangular projectile points are common.

During the Late Period (3,500 to 150 years ago) human lifeways changed radically, as people focused increasingly on aquatic resources; the number and diversity of sites markedly increased. People maintained permanent villages on the coast and along the lower reaches of inland rivers (Chatters 1989; 1990). They used these as home bases and storage warehouses for fish, shellfish, game, and plant foods systematically gathered during the warmer seasons. Shell-middens built up in coastal settings (Grabert 1988). Cemeteries are found adjacent to larger villages, midden sites, and fishing camps and petroglyph sites occasionally occur in higher upland environments. Small camps, left by hunters, fishers, plant gatherers, and traders are found from the lowlands well into the mountains, but usually remain close to larger, permanent sources of water. Typically, these sites are located along trade routes that linked communities living east and west of the Cascades (Burtchard 2003). Open, temporary camps, occurring as lithic scatters, are common in these settings. Blazed cedars, stripped of bark in order to make basketry or with planks removed from the base of their trunks, are still found in the lowlands (Gunther 1973).

Historical Overview

Permanent non-Indian settlement began on Fidalgo Island in the 1860s. An 1872 General Land Office map shows no structures or other cultural features in the project area (General Land Office 1872). The U.S. Geodetic Survey produced a map in 1886 that depicts the low land in the vicinity of the project areastretching between the Guemes Channel and Cap Sante Waterway as wetlands. The Seattle & Western Railroad planned to build a railroad between Sedro and Anacortes, which encouraged settlement and platting of the community occurred by 1889. The original plat map for Anacortes shows the project area in Bowman's Central Ship Harbor Addition, named for Amos Bowman, the city's great promoter, who established Skagit County's first large lumber mill in Anacortes (Bowman 1890 and Carter 2011).

Incorporated in 1891, Anacortes with its waterside location became an important port community that included considerable industrial development along the shoreline. The railway line, eventually owned by Great Northern Railway, generally paralleled Guemes Channel at the north end of Fidalgo Island. The areas adjacent to the line were the first to develop industries thanks to the benefit of water and rail transportation. Fishing, canning, logging and lumber were the leading industries. Many of the lumber mills specialized in making shooks or thin sheets of wood that formed crates for carrying anything from fruit to oil cans. These lumber and box mills thrived from the late 1800s until the 1940s when corrugated cardboard boxes took their place.

The early history of the project area relates to lumber mill operations. The city's first lumber mill began in the late 1880s when Bowman and Company built a mill at 3rd Street and T Avenue. Further north on T Avenue the Anacortes Sawmill developed in circa 1892. In 1901 the Storme and Ronnenberg Mill produced shingles between S and T avenues on 3rd Street. In this same area, the Great Northern Lumber Company operated a mill beginning in 1903. By 1905 the Anacortes Lumber and Box Company purchased the Great Northern mill along with 40 acres of land extending south to Cap Sante basin. The company incorporated in 1907 as the A.L.B. Company and operated at this location until 1941 when a fire burned the mill. This was the second fire the mill had experienced in four years. With the cost of rebuilding and the rise in cardboard boxes, the company sold the property to the Everett Company (Slotemaker 2007).

History of the Quiet Cove Property: The Nobar Hotel 1890-1909

The initial commercial use of the Quiet Cove property was as a hotel site. Figure 3 is of the Nobar Hotel, pictured c. 1890, likely on the 4th of July as a US flag atop the hotel and decorative streamers suggest (Figure 4). The hotel was built at 2nd St. and O Avenue, the location of the Quiet Cove project in February of 1890. The Nobar was built and operated by W.H. Hazzard and was marketed as an alternative to the copious drinking establishments (there were 47 local bars at the time). No bar was installed in the hotel; hence it was called the Nobar Hotel, "a dry island in a sea of saloons." That characterization was borne out by the 5-3-1890, coverage of the International Order of Good Templars meeting, (a temperance organization): "IOGT Basket Party: Members of the IOGT gave a basket party at the Nobar Hotel to which members and visitors attended filling

up the seating capacity of the dining room to its 'full' extent; it is thought to be truthful: cold water drinkers never get full (Anacortes museum records).

On 12-4-1890, the Nobar hotel advertised in the *Anacortes Progress*: "NOBAR HOTEL: \$2.00 to \$2.50 per day. Board \$7.00 a week; Rooms \$3.00 to \$6.00 per week. C. L. Haggard proprietor." One of Nobar's more distinguished guests was noted Northwest historian, U.W. Professor Edmond Meany, member of the executive committee for Washington's participation in the 1893 Worlds Columbian Exposition in Chicago. Meany stayed at the Nobar on 12-4-1890, during his inspection tour of Island and San Juan counties.

After a decade of service in its original location, both the Nobar and a small, unnamed building to its left were moved to Commercial Avenue. A number of newspaper accounts document the Hotel move. On 10-29-1891, the *Anacortes American* announced, "L. H. Jansen has purchased one-story building next to Nobar Hotel and moved it to P Avenue, next to Schmidt's drug store.". On 9-3-1891, the paper announced, "Nobar Hotel 30 rooms for sale or lease on account of sickness in family of proprietor: Apply to C. Haggard." It is unknown at this time what happened between that date and 1898 when it was purchased by Wallie Funk.

Valentine and Barbara Funk moved to Anacortes with their son Wallie in 1889 and opened the City Bakery. In 1890 Funk constructed a building to house the business at 517 P avenue (as listed in the 1891 city directory). The 8-25-1898 *Anacortes American* reported, "V. Funk has bought the NW corner of 6th and P and will move the old Nobar building to the recently acquired realty and occupy it with his stock of groceries"; 12-8-1898

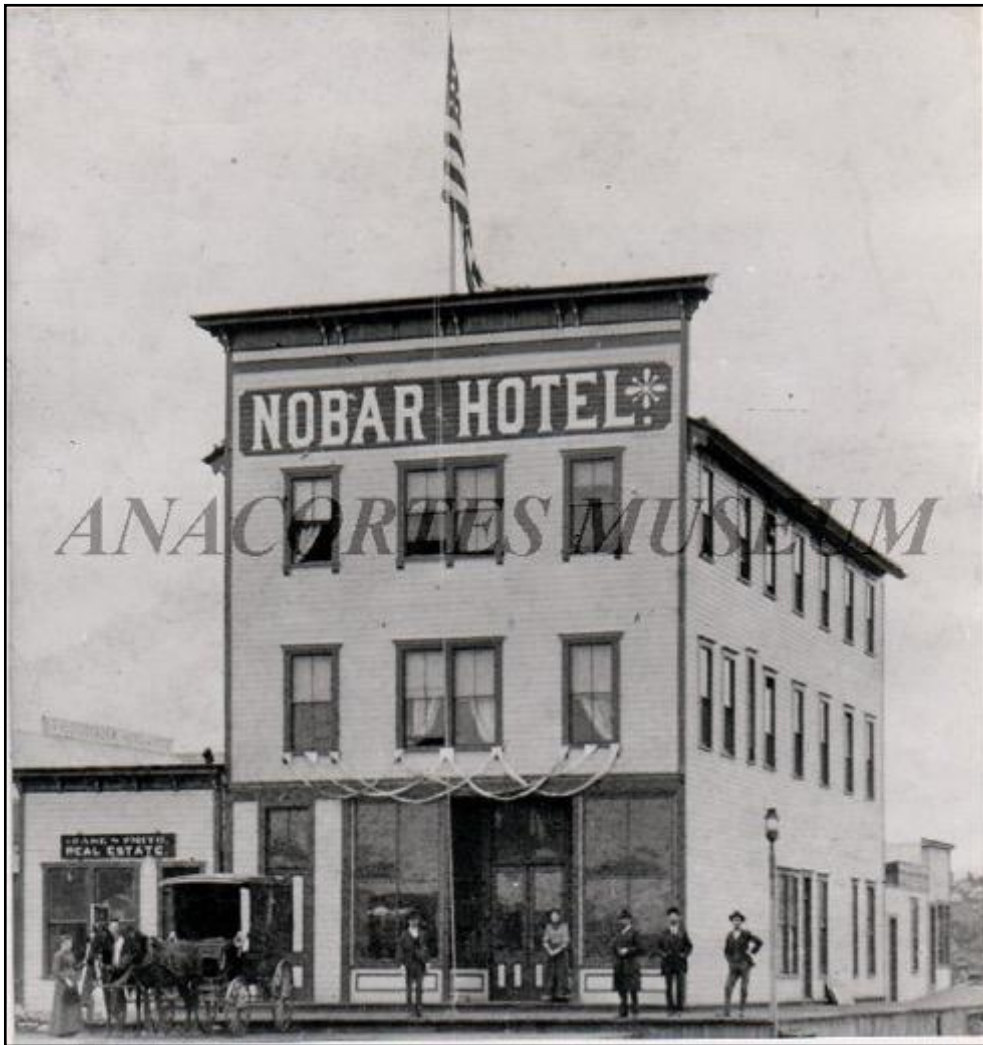


Figure 3. Photo of the Nobar Hotel originally built at the Quiet Cove site.



Figure 4. This photograph taken in 1890 shows a group of people celebrating the Fourth of July. The Nobar Hotel, located at the Quiet Cove property, is visible in the background. Celebrants are gathered at the foot of Commercial Avenue on Guemes Channel in front of the Oregon Improvement Company Land Office, the main town developer. This is one of many photos shot on July 4, 1890, as reported by the *Anacortes American* on 7-10-1890, "Photographic Views: On the fourth, Messers Booen and Ewing, the enterprising photographers of this city, were busy taking views of the most interesting points about town and along the wharves."

"Nobar building finally on the move, Mr. Funk having secured the services of 6 experienced housemovers from Seattle. To his lot at corner of 6th and P"; 12-15-1898 "The No Bar has met with no bar to impede its promenade up P Ave to its new premises"; on 12-22-1898, "The Nobar is now well placed upon its new foundation the work was so well done that the same parties have secured several other contracts in the city." Finally on 3-30-1899 " V. Funk's building at the corner of 6th and P is being remodeled inside and out and when completed will be attractive."

Eventually the Funks expanded their stock beyond baked goods to include groceries, and made a concomitant name change to Funk Groceries. In 1898, Funk purchased the Nobar Hotel and moved it to the Northwest corner of P Ave and 6th. The Funks moved their grocery business across the street to this building at that time, adding "furniture and crockery" to their stock by 1900, and eventually adding hardware. The bottom floor of the hotel served as retail space until 8-24-1905 when the business was sold to Davey Brothers Hardware. The top floor served as the Pioneer Hotel until c. 1930 when the top two floors of the building were removed.

History of the Standard Oil property

The history of the project site use by Standard Oil begins in 1909 after the Nobar motel moved to a new location (Figures 4, 5; Table 2). At that time, Standard Oil erected a dock and plant at the 2nd and O waterfront location. Their business did well, the 2-17-1910 *Anacortes American* reported the business was, "Selling 40,000 gallons of oil a month. Standard Oil doing a tremendous business from recently erected plant. Dock and plant erected



Figure 5. Undated view from the Quiet Cove location towards the Curtis Wharf



Figure 6. This photograph from 1909 shows the Standard Oil company. The Standard Oil complex is forefront in this image with oil tanks, a Red Crown gasoline facility (part of Standard Oil) and Standard Oil Company offices in the lower right. The smokestack in the center is located at Morrison Mill; the other smoke at center right is from other lumber processing plants.

three months ago, on waterfront between Curtis wharf and Robinson fisheries." Figure 5 shows cars, trucks and buses getting on/off the ferry at Curtis Wharf near 2nd and O street, the location of the Quiet Cove project. Guemes Island is visible in the background, the large building in the center of the photo is the Feed Mill and to the left of the ferry line on the waterfront can be seen the Sandand Gravel Wharf.

Standard Oil 1909-1977 and beyond

After the hotel was moved, the property was used for bulk fuel storage and distribution from approximately 1909 to at least 1977. The final date when fuel operations ceased is unknown. As reported in the February 17, 1910 *Anacortes American*, Standard Oil erected a dock (in the general vicinity of what is now Curtis Wharf) and bulk fuel plant on the Anacortes waterfront at 2nd Street and O Avenue in November 1909, selling 40,000 gallons of oil a month (Figure 7). Standard Oil operated the bulk fuel facility until the late 1970s at which time the facility was decommissioned, and the aboveground tanks were removed.

Since the late 1970s, the property has been used for the storage of marine vessels and recreational vehicles and contains several buildings that have been leased to various tenants for sales and marine services. The adjacent property to the west (also owned by the Port) is used for general storage. The southwestern adjacent property (owned by Texaco/Reisner) continues to operate as a bulk fuel storage and distribution facility generally consistent with the past operations. A beach with public access extends along the shoreline in the vicinity of these properties. Skagit County Assessor records indicate that the property was sold to Thomas and Patricia Stowe in 1977. In 2013, the property was purchased by the Port of Anacortes with plans to redevelop the property in conjunction with expansion and improvements to the Curtis Wharf.

Historical contamination is associated with the site being used as a bulk fuel terminal and storage facility, for which operations included oil tanks, an oil warehouse, a filling shed and piping. A Focused Environmental Site Investigation conducted in 2014 identified hydrocarbon and heavy metal contamination in the soil, as well as total petroleum hydrocarbons (TPHs) and arsenic in the groundwater.

The approximate location of the historical features at the Site are shown on Figure 9 based on historical drawings and photographs. A copy of the Standard Oil facility drawing dated May 31, 1921 shows the property layout while operating as a bulk fuel storage and distribution facility.

TABLE 2. Historic Use of the Quiet Cove Property

1890 to 1898

W.H. Hazzard built and operated the Nobar Hotel until it was moved in December of 1898.

1910 to late-1970s

Standard Oil operated a bulk fuel storage and distribution facility at the Quiet Cove property. During the 1960s, Standard Oil acquired Parcel No. P55358 and P55359.

Late-1970s

Bulk fuel storage and distribution operations ceased, and the above ground storage tanks were removed.

Late-1970s to 2013

Thomas and Patricia Stowe operated a storage yard for marine vessels and recreational vehicles, and leased office and warehouse space to various tenants for marine-related sales and services. Parcels P55358 and P55359 were redeveloped between 1977 and 1994 as shown on historical aerial photographs. During this time, northern and southern portions of the property were paved.

2013 to Present

Port of Anacortes purchased the Quiet Cove property. Currently, the Port plans to redevelop the property in conjunction with expansion and improvements to the Curtis Wharf International Shipping Terminal facility located north of the Site.



Figure 7. This undated aerial photograph shows early development of the Standard Oil company.

Potential for Archaeological Material

Given the history of land use at the remediation site, we considered it likely that artifacts and features related to historical activities could be present within the Area of Potential Effect. These deposits might consist of historic byproducts of filling the project area as well as building and use of the site from the turn of the century. Fuel operations at the site are well represented in documentary sources and historic records and engineering drawings present the location of product lines within the project area.

Similarly, and more importantly, we anticipated that ethnohistoric and prehistoric material could be present underlying the historic fill. Prehistoric archaeological resources were considered to potentially lie deeply buried beneath historic period fill at the project site. As presented above, large midden sites representing winter villages and smaller sites related to camping and shellfish processing are common in the area. Several archaeological sites are recorded near the Project area, but no recorded prehistoric sites were known to exist on or immediately adjacent to the property prior to the present monitoring project.

4.0 Monitoring Results

Monitoring was conducted by Brett Lenz and CGA archaeologists Douglas Beyer, Natalie Bankuti and Simon Schulties between September 25 and October 21, 2020. Two new sites were identified and recorded as a result of the monitoring. The first is the margin of a shell midden that was encountered in the northwest corner of the project. The second is the remains of a coal shed from the early 1900s (See site forms in appendix B).

The project APE had a high concentration of historic artifacts buried within the contaminated zone, immediately overlying the interface with native (pre-historic, late-glacial age) sediment. Historic artifacts included many hundreds of pieces of fragmentary metal, wood, glass, porcelain and ceramic. These materials represent the remains of many decades of accumulated use of the property, beginning with a hotel and commercial use through rail, fuel yard and industrial use. The only structural remnants identified were of the coal shed—however broken pieces of milled lumber were also common throughout.

Prehistoric Component

The only indication of prehistoric use of the project location is with the shell midden remnant identified in the northwest corner of the project. Work at the Quiet Cove site was stopped in response to the inadvertent discovery of the shell midden. The plan in Appendix A was prepared to provide a brief report and work plan to facilitate resumption of the remediation work. It was intended to outline steps to record and preserve the exposed cultural resources in place and then move forward with the remainder of hazardous cleanup work.

Discovery of the shell midden

In an effort to stabilize the excavation slope on the margin of the cleanup project, contaminated soils were stripped and removed until Historical beach levels (the historic land surface) were uncovered. At this horizon, the backhoe revealed a series of pipes reported by project engineers as oil product lines that would transport product from the former offload pier to the project area. An area of both clearly disturbed and intact shell midden in the stratum which included the metal pipes was exposed and immediately recognized by project archaeologist Natalie Bankuti. Excavation work was halted and excavation equipment was removed from the area. Site archaeologists Natalie Bankuti and Brett Lenz verified that the discovery was midden and that it appeared to be intact. The discovery area was cordoned off with flagging tape to keep people from entering and possibly disturbing the midden. Brett Lenz notified Geoengineers of the discovery and Geoengineers notified the Port of Anacortes. The Port then asked that contact be made immediately with the Department of Archaeology, the Samish, Swinomish and Lummi Tribal representatives to initiate consultation, which was already underway.

Work Plan

Project managers consulted with DAHP and the Tribes. As the project has a net benefit to people by cleaning up the hazardous waste, it was considered important to move forward as soon as possible. Several steps for resuming completion of the cleanup were implemented, including:

1. Recording the midden on a standard state of Washington archaeological site form.
2. Conserving the midden in place by simply keeping the surface exposure of the midden free of debris and covering it with a geotextile fabric.
3. Ensuring that the area of midden exposure was clearly delineated as a “no work zone” until the cleanup project was complete.
4. Resuming hazardous material removal under archaeological monitoring and recording of exposed, out of context historic fill and historic use foundations.
5. Backfilling the site, conserving and preserving the midden in place.

Description of the exposed midden

The exposed midden forms a crescent-shaped feature in the cutbank, measuring approximately one meter wide with a maximum thickness of 30cm. The buried surface of the midden is planar, indicating it was disturbed before burial. The original thickness of the deposit is unknowable. Regardless, the portion that remains is clearly intact and in place. Internal stratigraphy of the midden is typical of coastal middens, displaying alternating layers of highly organic sediment and pulverized shell. No shell identifiable to species was observed in the midden.



Figure 8. Shell midden at Quiet Cove

Discussion

The exposed midden appeared to be oriented underneath 2nd street and in a westwardly direction towards the beach. Sediment in the area was outside the scheduled project area and was not planned for removal. As the exposed portion of shell midden was intact with no further plans for removal, the only impacts to it were considered to be surface exposure. All aspects of the work plan were completed according to plan; the shell midden is now buried and conserved.

Historic Component

Based on analysis of historic air photos, we were able to identify the floor of a coal shed that was related to the old railroad line. Identification of the coal shed was relatively straight forward as there was clear agreement

between the air photos and engineer drawings of historic features of the project area (Figure 9). The site is defined, based on dateable (as well as potentially dateable) material recovered during and following excavation activities, as a roughly 100' by 20' area located within the footprint of the remediation area. Artifacts that could potentially yield a qualitative means of dating the site were collected during Archaeological Monitoring, cleaned and logged, then returned to the fill. The primary interpretation was made based on configuration of milled lumber, broadly in-situ and on trend with the historic photos and drawings.

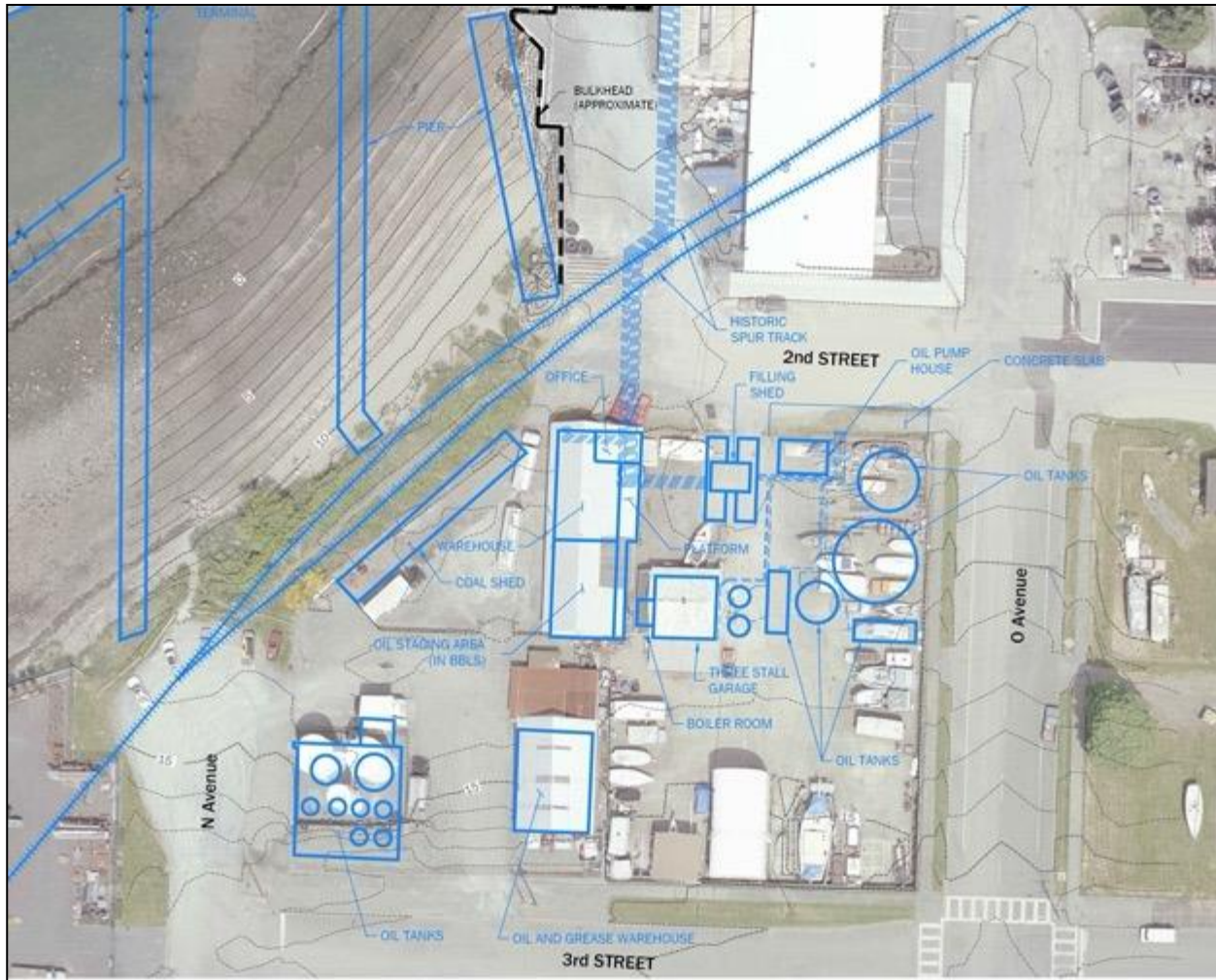


Figure 9. Location of project area; known historic features are overlaid.

Artifacts Recovered

Table 3 presents the artifacts recovered from the project subsurface. The artifacts with diagnostic characteristics are identified in the monitoring overview section below. In total there were more than 500 objects identified in each of the categories of fragmentary metal objects, glass fragments and bricks. All of these were non-diagnostic except to material type. As monitoring activities progressed, artifacts diagnostic to the period or otherwise identifiable to type were set aside (N=105 pcs.). These collected objects were cleaned and assessed to establish a possible range of relative dates for the historic deposit. The largest number of identifiable artifacts were butchered bones (N=41). Most non-bone objects offer an early to mid 1900's manufacture date range- of course these dates only offer a date range in artifact manufacture, not deposition and are therefore considered as limiting ages.



Figure 10. Coal Shed at Quiet Cove

Monitoring Project Overview

Project excavations were completed between August 25 to October 21, 2021. The first round excavated soils beneath the northwestern-running lane of East Marine View Dr, leaving the southeastern-running lane open to divert traffic. After Phase 1 excavations were completely backfilled and repaved, Phase 2 excavated the soils beneath the other half of the roadway. Spoils from all excavations were removed to an offsite staging area for processing, and ultimately trucked off to special dump sites depending on the levels of contamination present in the materials.

Table 3 Artifact Recovery:

Quantity	Artifact Class
>500	fragmentary metal objects
>500	glass fragments
>500	bricks (no dates)
>200	milled timbers (historic)
41	Bovid bones
12	Broken Transferware Concentrations
12	Transferware plates
9	Non-assigned Bottles
5	Whiteware Teacups
3	Medicine Bottles
3	Porcelain saucers
3	Beer Bottles
2	Milk Bottles
2	Liquor Bottles
2	Shot Glasses
2	Ceramic Canning Lids
2	beer cans with ring top openings
2	Shoe Soles
1	Glass Lantern Cover
1	Glass Road Reflector
1	Leather Boot
1	Shoe Heel
1	Metal Spoon

Monitoring Results with Artifact Descriptions**Date:** 8/26/2020**Monitor:** Doug Beyers, Brett Lenz**Weather:** sunny, clear, 50s**Mechanical Equipment:** CAT 320E Excavator **Size of Bucket:** 70 inches**Cultural Material Observed?:** yes

Excavations on 8/26 created a trench along the Northern edge of the project to 15ft below surface for most of its length, and to 20ft below surface in a 5ft x 5ft area at its western end. Excavations were halted at the NE corner of the project area as historic timber, concrete, and other debris were observed in these excavations. No observed materials appeared to be the remains of intact structures or culturally significant concentrations. All appeared to be scattered debris from historical leveling and releveling to rebuild on the site over time.

A pipe platform of 4 parallel “product lines” was observed on the surface (where the previous excavations had exposed them) extending 19ft East from the driveway at the Western edge of the project, along the Southern edge of the Northern trench. Their original provenance would have been appx 2ft below surface, all pipes measures 3.5” in diameter. Starting with the Northernmost pipe along the edge of the trench as 1st, and going south, the 2nd pipe is 4 inches south of the 1st, the 3rd pipe is 12” south of the 2nd, and the 4th pipe is 25” south of the 3rd.

Cultural Materials: Historical lumber, with occasional pipe pieces (metal, concrete, and plastic), metal pieces, wires, and concrete bits throughout upper fill layer and in spoils from previous excavations. No observed materials appeared to be the remains of intact structures or culturally significant concentrations. All appeared to be scattered remains from historical leveling and releveling to rebuild on the site over time.

Photos:



Figure 11. Site overview at start of day, facing WNW from eastern edge of site.



Figure 12. Example of timber in spoils.



Figure 13. Extent of excavations, facing East from driveway at Western edge of project. Pipe platform visible on right side of photo.



Figure 14. Product lines / pipe platform, facing ESE from driveway on Western edge of project.



Figure 15. Example of timber in spoils

Date: 8/31/2020

Monitor: Doug Beyers, Brett Lenz

Weather: overcast, drizzly, 50s/60s

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Cultural Material Observed? yes

The shallow trench running along the Eastern edge of the project was extended to a depth of 15 ft, starting at the NE corner, and running 80ft south. Timber was noted dispersed throughout the fill layer. Starting appx. 40ft South of the project's NE corner, excavations encountered an area with historic ceramics (many pieces), glass bottles (3), and brick bits (appx. 6) also intermingled with the fill layer. Historic items in this "ceramics area" make up less than 5% of the total volume of the fill. Most of the items were non-diagnostic, with the vast majority of ceramic and brick pieces being smaller than 6cm in any dimension. Potentially diagnostic items were photographed more closely (see photos) and left in situ. At the Northernmost edge of the ceramics area, a large mammal bone (probably elk or cow metatarsal) was observed in the Western wall of the trench. Using the excavator for further investigation, 2 pieces of ceramic, 1 brick piece, and 1 timber piece were agitated out of the trench wall in that same area (see photos). The bone and these other items are believed to be associated with the rest of the historic debris encountered in the ceramic area.

Cultural Materials: Historic lumber, metal pieces, and concrete bits throughout upper fill layer. Encountered an area of ceramic shards with occasional glass bottles (3 observed) and brick bits (appx 6 observed) mixed into the fill materials. Encountered what appears to be leg bone (metatarsal) from a cow or elk in area with other historical debris. No observed materials appeared to be the remains of intact structures or culturally significant concentrations. All appeared to be scattered remains from historical leveling and releveling to rebuild on the site over time.

Photos:



Figure 16. Start of day site overview, facing South from NE corner of project



Figure 17. Historic ceramic and brick artifacts out of same area as (cow or elk?) bone



Figure 18. Metatarsal view 1



Figure 19. Metatarsal view 2



Figure 20. Non-diagnostic ceramic



Figure 21. Example of ceramics amid mammal bones and broken glass bottle.



Figure 22. Historic debris throughout fill layer (Note “peat” layer at base of cut).



Figure X. Decorated ceramic fragment, likely from a broad bowl or shallow saucer. No makers marks.



Figure 23. Example of ceramic shard, most are small with no identifiable markings. None observed had visible maker's marks.



Figure 24. Glass bottle fragment



Figure 25. Unmarked bottle (left), unmarked liquor bottle (right).



Figure 26. Medicine bottle with cork and liquid inside (Dodson Braun MFG Co.; side view 1).



Figure 27. Medicine bottle with cork and liquid inside (Dodson Braun MFG Co.; side view 2).

Date: 9/01/2020

Monitor: Doug Beyers, Brett Lenz

Weather: Overcast, 50s/60s

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Cultural Material Observed? Yes

Excavations started by deepening the existing trench to 18ft b.s. along the Northern and Eastern edges, for the entire length of the northern trench to 60ft South of the NE corner, along the Eastern edge. No new soils or cultural materials were encountered. Crew then extended the width of the Eastern trench by 10ft Westward, starting from the NE corner, and extending 20ft Southward. In this area, excavations encountered a sizable concentration of boulders (measuring 1-4ft) in the fill layer, with some rounded chunks of concrete interspersed. A broken piece of red clay pipe was also observed in the fill from this area along with the typical historic lumber interspersed. The boulders extended down into the peat layer in places. Stratigraphy otherwise remained consistent with what was previously observed.

Crew then moved excavations to the Southeast corner of the project area, where they excavated down to 4ft below surface along the Southern edge, extending the previously excavated platform to connect that area. While this area was being excavated, a crew member noticed some bone sticking out of the wall, where a "ramp" had been cut into the Southernmost area of the East Wall trench for crew members to climb in and out of the trench, appx 60ft south from the NE corner of the project. The crew member alerted the archaeologist, who on closer investigation discovered a high concentration of cut and uncut bones, ceramics, stoneware, glass, metal, and leather objects in a dark lens above the native peat layer. Ceramics and other historic materials observed in fill around this area likely represent a redistribution of these materials during historic leveling projects from their original undisturbed provenance in this area. The area was taped off so it could be more closely inspected later, and crews continued with excavations in the SE corner, deepening the platform to 10ft to extend the East trench to the SE corner in a series of steps up (see map).

Cultural Materials: As on previous days, historic timber and other debris was observed dispersed throughout the upper fill layer of excavations. In the NE corner a concentrated boulder area was encountered, possibly a historic sea wall construction. In the SE corner excavations, various historic debris was observed, including many concrete chunks measuring between 1 and 2ft square, brick (x8), metal pipe (x1), and clay pipe (in situ, believed to be sewer) running E/W appx 3ft below surface.

Photos:



Figure 28. Start of day overview, facing SW from NE corner of project.



Figure 29. Boulder cluster in NE corner of excavations



Figure 30. Leather boot and sole (right foot) from near bone collection (unrelated to each other).



Figure 31. Sawn bones



Figure 32. LEA & PERRINS Worcestershire sauce bottle with marks J40D S on bottle bottom.



Figure 33. HUNT'S PICKLES jar.



Figure 34. Glass bottle fragments, no diagnostic marks



Figure 35. ALBERS BROS Milling company ceramics from near bone concentration.



Figure 36. Stoneware and spoon head

Date: 9/02/2020

Monitor: Doug Beyers, Brett Lenz

Weather: overcast, 60s/70s

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected?: yes **Observation Restriction?:** no

Cultural Material Observed? yes

Crew continued to excavate a working platform along the Southern edge of the project. Historical lumber, debris, and large concrete chunks continued to be encountered in the fill layer of this area. Fragmentary remains of a possible brick structure were encountered in the Southwestern corner of this impacted area. Bricks are mortared together, 1 brick wide, only intact to 3 or 4 bricks tall, with disturbed fill material overlying. The structure was likely pushed over and redistributed as fill across the site in various historical leveling projects. Bricks measure 9"x4"x2.5".

Excavations to previous established depths continued Westward, terminating 60ft W of the Eastern edge of the project area. The heavy boulder area continued to be encountered for a portion of these excavations in the Northernmost area.

Cultural Material: concrete chunks, bricks, continued boulders from possible sea wall in excavations from the NE area of excavations

Photos:



Figure 37. Start of day looking ESE from NW corner of project



Figure 38. Brick cluster, trowel oriented to the north

Project: Quiet Cove

Date: 9/3/2020

Monitor: Doug Beyers and Brett Lenz

Weather: 70s

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected? yes **Observation Restriction?** no

Cultural Material Observed? yes.

Excavations were extended a further 15ft from the edge of the previous day's excavations, to 75ft West of the Eastern edge of the project area - reaching previously established depths of 10ft below surface in the Southernmost third, 15ft below surface in the middle third, and 18ft below surface in the Northernmost third of the cut. Clay pipes were observed in situ. A handful of loose bricks were observed in fill from the area near where the brick concentration was encountered, but intact structural remains were not observed in the excavations.

Cultural Material: As on previous days, historic timber and other debris was observed dispersed throughout the upper fill layer of excavations. Concrete chunks and occasional bricks (x4) continued to be observed in the fill layer of the Southernmost portion.

Photos:

Figure 39. End of day overview, looking SSW from NE corner

Project: Quiet Cove

Date: 9/9/2020

Monitor: Natalie Bankuti, Brett Lenz

Weather: 70s

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected? yes **Observation Restriction?** no

Cultural Material Observed? yes.

Early in the day, wooden beams were uncovered in the peat stratum (under the modern fill) about 5 - 7 meters deep excavation stopped and the backhoe removed the next layer from the top of the unit. Mid-morning a white pvc pipe was uncovered and moved to the refuse pile around 1 meter below the modern surface. Overall, historic artifacts were scarce but matched the previous day's finds.

Finds:

All of these finds were uncovered in two or three buckets of the excavator near the middle of the excavation area at a depth of approximate 2.5-3 meters deep within the dark brown historical strata where wooden beams were found.



Figure 40. Ceramic (porcelain) fragment of a teacup handle. Incomplete, diagnostic to manufacture type. White inside and out with a thin gold decorative stripe on the handle. No makers marks, 2.4 cm long.



Figure 41. ceramic body sherd, non-diagnostic. Possibly whiteware as well, very large for a fragment, so perhaps was a large pot or vase? Undecorated so likely utilitarian in use. The inside glass was crazed with age, but the exterior seemed to have no crackling. Approximately 10 cm from end to end at the longest part of the sherd.



Figure 42. Multiple glass shards. Incomplete, non-diagnostic. Clear glass could be post 1880's. Glass bottle base with the numbers "176" manufactured into the center of the base. Incomplete, diagnostic clear glass. Approx. 6.5 cm in diameter. Half of a butter clam shell and some of the hinge. Not midden related. Incomplete, diagnostic rim sherd. Likely from a fine china decorative plate (bone porcelain) with an indigo blue painted design on the inside of the sherd (decorations rarely occur on the interior surfaces of vases etc.) the design shows a church building in ruins of some sort? Framed by swirling borders on both the top and bottom of the design. Presumably this was of European make, modeled after blue transferware which became popular in the 1810's onward. Rim length is approximately 4 cm and the estimated diameter of the vessel is 24.76 cm (using a ceramic sherd diameter chart).

Project: Quiet Cove

Date: 9/10/2020

Monitor: Natalie Bankuti, Brett Lenz

Weather: 70s

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected? yes **Observation Restriction?** no

Cultural Material Observed? yes.

Machine (s) used by crew: CAT 320 EL excavator

Comments:

Monitored soil removal in the area on the Western half of the jobsite. (opposite of the monitoring done Wednesday, September 9th, 2020) The soil was stripped and removed until Historical beach levels were encountered; no glacial/pleistocene soils were reached, as the lowest strata was beach sand. As soon as monitoring began, the backhoe revealed a series of pipes which engineering staff reported were oil pipes from when the area was used to fuel boats. North of the pipes, both disturbed and intact Shell Midden in the stratum which included the metal pipes were uncovered. Upon discovery of the midden, work was halted in the area and moved to a different section of the project. Monitors flagged the area with small survey flags and neon survey tape.



Figure 43. Shell Midden

Comments Continued:

Various dark black deposits were encountered in the same stratum as the historic fill. This was later identified by project engineers to be coal, likely due to the railroad which went through the site in the past. Multiple red bricks (all incomplete) were uncovered, one taupe colored brick was also found among the wooden beam foundations uncovered in this layer. The modern topsoil is gravel mixed in with fragments of cement, wood, iron rebar, modern refuse etc. See photos of notes for midden descriptions measurements.

Finds:



Figure X. 44: Glass shards, clear color. All non-diagnostic. Found in historic fill strata. One of the shards was slightly water worn, the edges look rounded slightly as if by water (beach glass).



Figure 45. Amber Glass, diagnostic base of a bottle and non-diagnostic shard. Both Incomplete. The bottle is 4 inches in diameter (10.16 cm) the makers mark is for the Owens-Illinois Glass Company (1929-1966), Toledo, OH, United State, makers of soda and beer bottles. The company was formed with the merger of the Owens and Illinois glass companies in 1929. The company became Owens-Illinois Incorporated in 1966. The letters OI suspended over a diamond was used as a mark on the bottom of the bottle from 1929-1954 when it was replaced with an I inside and O.



Figure 46. 11: Lusterware sherd, non-diagnostic. Light aqua blue, very thin wall with some embossing decoration on the exterior. 2 x 1 cm approx. no diameter could be measured.



Figure 47. Whiteware sherd maybe porcelain, diagnostic rim and base, incomplete with a fresh break. Likely a dish from the 20th century as it was found in the stratum associated with more recent refuse. Pink flower motif with green coloring in a watercolor style along the interior of the sherd. The exterior is glazed clear but is otherwise undecorated. 5.5 x 4.75 cm 20.5 in diameter.



Figure 48. 13: fragment of red brick with two patterns carved into one of the faces that repeat.



Figure 49. Shoe heel, leather perforated with nail holes where the heel would have attached to the rest of the shoe. Likely historic. 3.5 x 3 inches (8.8 x 7.6 cm).



Figure 50. Whiteware, diagnostic sherd. Glazed, undecorated, likely a cup or bowl. Measured diameter at 11.5 using a ceramic sherd diameter chart.

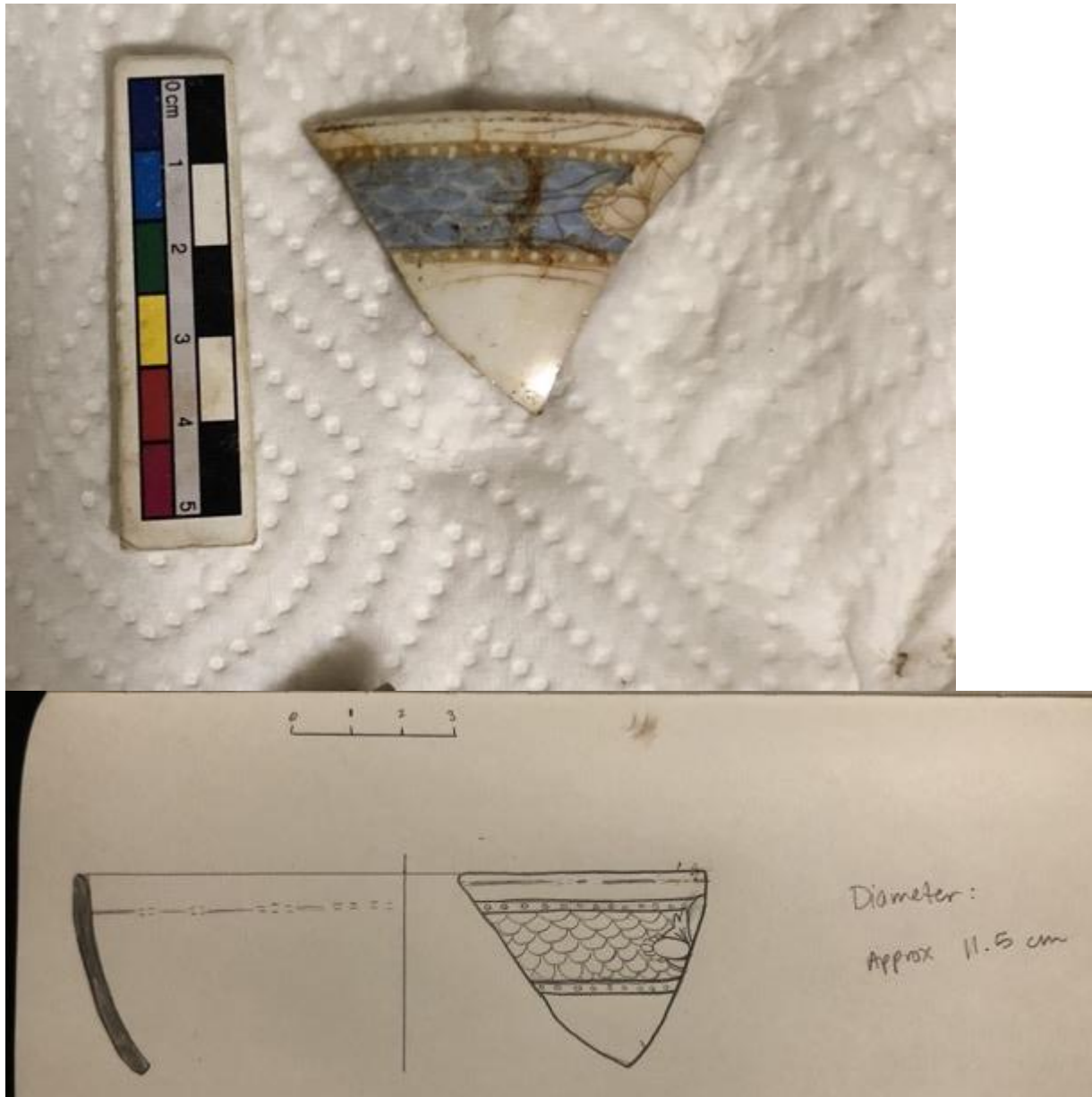


Figure 51. Whiteware, possibly porcelain. Diagnostic rim sherd, incomplete. White, blue and gold decoration the blue scalloped/scaly pattern with the gold and white bordering the blue pattern. Crazed interior glaze and has a light gold line under the rim that's almost completely faded away. Very thin and even wall (in section view) Also measured to 11.5 cm diameter using the rim chart, likely a teacup.



Figure 52. Animal bones, unknown but likely pig or cow. heavily saturated in oil/ hazardous waste and sawed/cut. (likely sawed with metal implements and found within the historic refuse fill strata. Presumably postcontact historic era)



Figure 53. Brick fragment, taupe/buff color. Incomplete. Carved inscription in english “TROY ... DE....” the lettering is cut off and the other half was not found. uncovered in historic refuse strata.

Project: Quiet Cove

Date: 9/16/2020

Monitor: Natalie Bankuti, Brett Lenz

Weather: Fog/smoke, 70s

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected? yes **Observation Restriction?** no

Cultural Material Observed? yes.

Comments:

Day started with cleanup in the bottom of the pit in the Eastern half of the site and leveling the bottom. No cultural deposits found as it was glacial till. A few whole bricks were found amongst the rubble, from the historic strata about 1.5-2 m deep. Additionally, more natural tree roots were uncovered at about 1 meter deep. Many large cobbles and boulders were removed from the glacial till layer, which was gray-blue and very clay rich; heavily compacted. The remnants of the terracotta red sewer pipe from the historic era were uncovered as well again on this side of the site.



Figure 54. The site (eastern side) at the beginning of the day taken facing South East (left). The stratigraphy of the pit being dug with the refuse pile on top to be hauled away. Facing South (right)



Figure 55. The site about midway through the day (facing SE) showing the excavator machine and the progress of the dig.

Finds:



Figure 56. Multiple ceramic sherds: whiteware, non-diagnostic, undecorated with clear glaze that is cracked and soiled from the surrounding pollution. Found on the surface on the western half of the site.



Figure 57. Whiteware sherd with decoration, non-diagnostic, damaged. Found on the surface on the western portion of the site.



Figure 58. Shells: fragmented/incomplete unsure of species but they are clam shells. Not culturally modified, so likely natural.



Figure 59. Saucer, white ware or porcelain diagnostic, undecorated. Half of a saucer presumably paired with a teacup. Surface find on the western half of the site in the modern refuse strata. Approx 19 cm diameter. (measured using a ceramic rim chart)



Figure 60. Glass bottle base, clear glass, 9 cm diameter. Heavily worn and broken edges (perhaps beach tumbled?) the makers mark on the bottom is a simple capital C.



Figure 61. Cluster of porcelain transferware dating to late 1800's to early 1940's.



Figure 62. Porcelain sherds, decorated, incomplete, mix of diagnostic and undiagnostic. Measuring both sherds with the diagnostic rim, the diameter of the plate was 24 cm and the base was approx 16 cm)

Project: Quiet Cove

Date: 9/17/2020

Monitor: Natalie Bankuti, Brett Lenz

Weather: Extreme wildfire smoke, 70s

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected? yes **Observation Restriction?** no

Cultural Material Observed? yes.

Machine (s) used by crew: CAT 320 EL excavator

Comments:

Began monitoring at 7:30 am in the Eastern side of the site; no cultural deposits or artifacts found, as it was mostly soil that has already been disturbed. A few wooden beams (incomplete/broken and splintered) were also uncovered during this phase, about 2.5-3 m deep. Maybe historical although seemed more jumbled; less in-situ than that of the coal storage shed flooring on the Western side of the site. No small finds on this side of the site. Work waned on this side of the site as the day continued, the pile eventually was moved to the larger pile to be hauled away on the West side of the site. Work excavating there is pretty much complete.

Switched to cleanup, moving trashcans/modern refuse such as chain link fence, and additional excavation of the Northwestern most corner of the extent of the site. Monitored removal of rounded pebbles/gravel and ran into geotextile fabric about 10 cm deep, covering the modern fill layer. This fill was sandy, brown-gray and had about 30-40% cobbles and pebbles, no vegetation or roots and no cultural deposits. The level in which the hazardous waste was uncovered was about 1.5-2.5 m deep. Found some more wooden beams, only one in-situ which was larger than all the others found (about 20 cm thick, 35 cm wide, 300+ cm long) maybe a foundation or part of the railroad track? Not seeming to be in connection to the coal warehouse but was found within the same strata. The Terra cotta sewage pipe was also encountered again and destroyed by

excavation. Many boulders encountered at the lowest level near the sand (historic beach) and just above that layer about 3 meters deep, significant coal deposits were found. The rest of the afternoon was spent monitoring the removal of soil from the northwest corner of the site to the temporary piles to be hauled away. Eventually, geotextile fabric was put over the shells midden and covered in clean fill. This is also when the metal oil pipes near the shell midden, which was uncovered last week, were cut with a chain saw and removed. Josephine Jefferson, Cultural Resource Representative from the Swinomish Tribe, stated she wished to be present to monitor the removal of the pipes as well as any additional movement of soil within the area of potential effect surrounding the Midden. It was monitored for cultural deposits and none were found.



Figure 63. Covering shell midden with geotextile fabric.



Figure 64. Backfilling conserved shell midden.

Finds:

Figure 65. Ceramic sherd; Porcelain Transferware, diagnostic plate base fragment with blue decoration. Approx 12.5 cm diameter.



Figure 66. Glass shards: two non-diagnostic pieces one is green and one is clear. Both are heavily worn on the edges and fairly thick in profile.



Figure 67. Stone slab?? Unidentified ceramic or stone tile, fragmented into 8+ pieces 2cm thick



Figure 68. Ceramic sherd; whiteware, diagnostic base with thick profile, buff paste, clear cracked glaze interior and exterior. Incomplete 14,5 cm diameter.

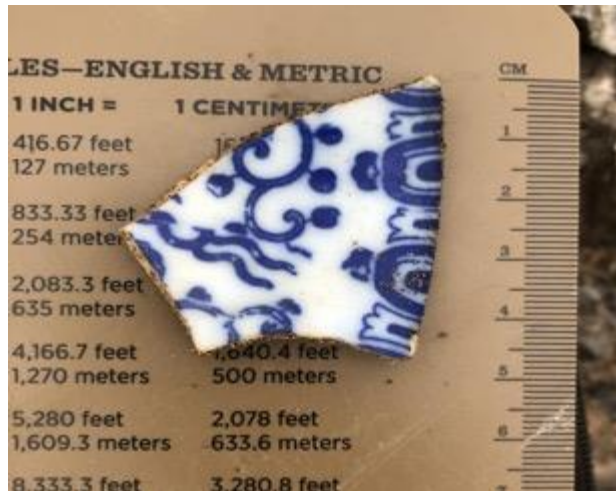


Figure 69. Ceramic sherd; porcelain transferware with indigo blue flower pattern, diagnostic rim sherd, thin profile. 7.5 cm diameter approx.



Figure 70. Ceramic sherd, whiteware buff paste diagnostic base sherd. Unsure of diameter, too small to use on the ceramic diameter chart.

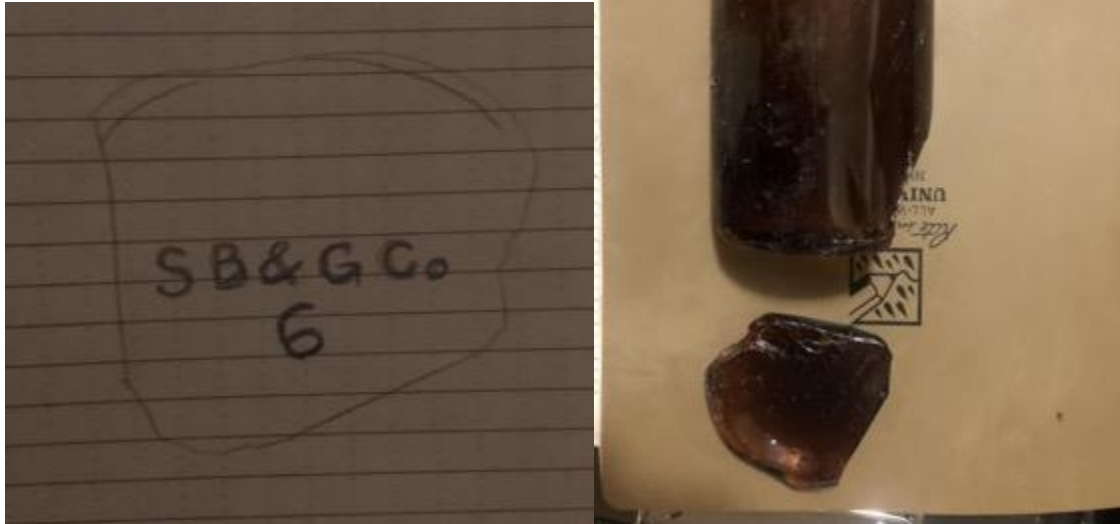


Figure 71. Glass bottle shards; amber colored glass incomplete but in many pieces Including base with makers mark on it for the East coast bottle manufacturer Streator Bottle & Glass Company in Illinois. Diameter: 8.5 cm. Streator Bottle & Glass Company, Streator, Illinois (1881-1905). The Streator plant eventually became part of the American Bottle Company, then later Owens Bottle Company, and finally part of the Owens Illinois Glass Company (Plant #9). “S.B.& G.CO.” is one of the most commonly seen marks on handblown beer bottles from the late 1800s and early 1900s. Many, many private brewers and bottlers from the Midwest and eastern United States had bottles specially made for them by Streator. The mark is also seen on other bottles of the period, including pickle bottles, soda bottles and other containers.

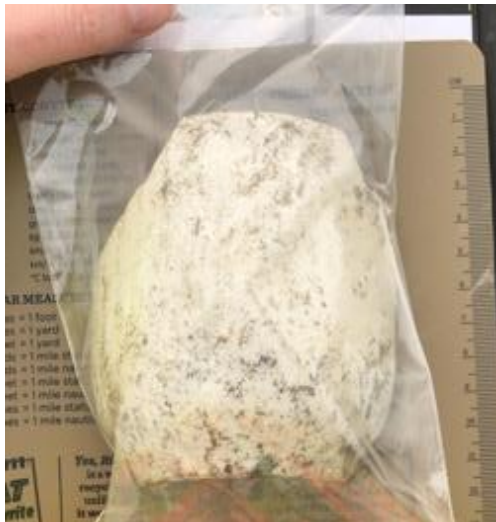


Figure 72. Ceramic; Whiteware, maybe porcelain maybe milk bottle? Glaze clear on inside & outside including the base. This artifact has a thick section & profile, 5.5 cm diameter.



Figure 73. Glass; semi-opaque white disk with a diameter of 6.5 cm, three concentric rings are embossed into the middle of the disk. This is a historic “vintage” road reflector/marker which would be used along roads to slow drivers as well as give them visual markers by which to drive in the dark. It still had some sort of sludge/epoxy on the back side. Post 1910’s glass gave way to polyurethane and other plastics/resins since their popularization in the middle of the 20th century. The glass pavement markers originated in China within their road systems.

Project: Quiet Cove

Date: 9/18/2020

Monitor: Natalie Bankuti, Brett Lenz

Weather: Overcast, 60s

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected? yes **Observation Restriction?** no

Cultural Material Observed? yes.

Monitored the eastern side of the site where the crew ran into more contaminated soil and had to follow it south. This meant taking a short break while they sawed through the cement so they could break it up with the excavator. Digging resumed and many artifacts were found, almost all of which were in the historic layer about 1.5-2 m down, though some were from the modern fill. There was a stratum previously undiscovered/not noted that was a dark brown organic layer with white speckling, which at first was thought to be shell midden, but turned out to be a variation in the soil structure, likely some light clay mixed in with the surrounding soil.



Figure 74. Clay minerals in soil



Figure 75. Modern cement pipe facing south.



Figure 76. Photo taken facing Southwest of the excavator on the temporary road; showing in situ modern metal piping likely from plumbing in the building which used to stand there.



Figure 77. Intact terra cotta ceramic sewage pipe in situ on the southern wall of the excavation (in the eastern side of the site) photo taken facing south towards scale.



Figure 78. A photo of the approximate center of the site. This shows the eastern wall of the temporary road going down the site which the trucks use to park and have soil loaded. (photo taken facing West)

Finds:



Figure 79. Ceramic sherd, incomplete. Whiteware, non-diagnostic. Buff paste glazed white exterior and interior with ridges in a parallel form along one side. Perhaps a tile fragment? Found in the historic stratum.



Figure 80. Ceramic sherd, incomplete. Whiteware diagnostic rim and base. Cream paste glazed white exterior and interior heavily cracked with contaminates seeming into those cracks. Diameter of rim: approx. 14.5 cm. diameter of base: approx. 9.5 cm. Found in the historic strata.



Figure 81. Ceramic sherd, incomplete. whiteware non diagnostic. Buff paste glazed white exterior and interior. Maybe another tile, due to the exact 90-degree right angle of one of the edges of the sherd. Found in the historic stratum.



Figure 82. Ceramic sherd, incomplete. whiteware non diagnostic. Buff paste glazed white exterior and interior with ridges in a parallel form along one side. Perhaps a tile fragment? Found in the historic stratum.



Figure 83. Metal (aluminum?) scrap metal with bright indigo blue paint. Found in the modern fill stratum.



Figure 84. Heavily rusted metal, 2 pieces found in modern fill strata.



Figure 85. Ceramic sherd, incomplete. Porcelain diagnostic rim with gold decoration on the outside in the form of a single band of gold foil along the base of the rim. White Porcelain paste with glazed white exterior and interior. Found in the historic strata. Diameter approximately 17 cm.



Figure 86. Metal pot lid, complete. Diagnostic rim and handle all intact. Painted with peeling pale yellow paint except the handle which is a sage green color. Diameter is 33 cm.



Figure 87. Metal bottle lid warped but complete. Pale gold colored aluminum metal lid that once capped a soda bottle. Found in the historic strata very near to the bottle. Diameter 3 cm.



Figure 88. Glass bottle, whole. Clear/light green complete vessel with no makers mark, only concentric rings on the base (scar where it was taken off the glass blowing tool) likely late 1800's before the industrial revolution changed the bottle manufacturing process. Found in historic stratum.



Figure 89. Ceramic sherd, incomplete. Whiteware diagnostic rim sherd. Buff paste glazed white exterior and interior. Non decorated, historic stratum.



Figure 90. Ceramic sherd, incomplete. whiteware diagnostic rim sherd. Buff paste glazed white exterior and interior. Non decorated, but has concentric rings radiating out from the center in a raised pattern that parallel each other on the exterior (base) side. Diameter approx 21.5 cm likely a plate. Found in the historic stratum.



Figure 91. Ceramic interior view, incomplete. Decorated handle of a teapot or other ceramic vessel with a buff paste and white glazed exterior. Blue paint or glaze on bottom half, white glaze on top. Sections have three large dots; red paint on top white section, black paint along the blue section. Exterior diameter: approx 1.6 cm, interior wall diameter approx 1 cm diameter, wall thickness .4 cm. In the historic stratum.



Figure 92. Ceramic handle, exterior view

Project: Quiet Cove

Date: 9/21/2020

Monitor: Natalie Bankuti, Brett Lenz

Weather: Cloudy during the morning but cleared up and was sunny in the afternoon 60-70 degrees

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected? yes **Observation Restriction?** no

Cultural Material Observed? yes.

Monitored the removal of the soil in the western half of the site as they dug deeper (to their desired depth greater than 5 meters) past the Historic Beachfront layer which was about 2 meters deeper than where they left it last week. A few more of the 2 x 5meter long boards of milled treated wood were uncovered, among lots of splintered wood (not splintered from the excavator, previously damaged) 2 very large fragments of cement were also uncovered and removed. The excavation carried on into the floor of the coal shed, removing all of the material. The beams measured at about 22 cm wide, 10 cm thick, and 5 meters long. Groundwater began collecting along the southern and westernmost edges of the pit in this side of the site. Encountered more of the terra cotta sewer pipe from historic time, it was blown through and removed. Continued seeing some fragments of the red historic brick about 2.5 m deep. Along the entire southern edge, the coal layer is thicker about .5 m thick. Much of the wood being uncovered and removed is soiled completely with petroleum and darkly stained. Some geotextile material was uncovered along the western extent of the floor of the coal shed.

Finds:

All finds for the day were uncovered about .70- 1 meter below the surface of the excavation, within the historic stratum of refuse fill underneath and intermixed with quite a few wooden planks.



Figure 93. Ceramic sherds, three pieces one diagnostic rim, 2 non diagnostic. Whiteware, thin section, undecorated. Glazed in clear glaze on interior and exterior. Diameter of the rim sherd is approximately 13.5cm.



Figure 94. Ceramic sherds, 3 rim diagnostic sherds, one nondiagnostic. Whiteware, thin section, undecorated. Glazed in clear glaze on interior and exterior. Diameter of the rim sherd is approximately 24.5 cm and the base is approx. 17.5 cm.



Figure 95. National Remedy Company New York glass medicine bottle. Glass, clear/ light blue complete. Embossed “NATIONAL REMEDY COMPANY NEW YORK” on one side. Rectangular shape, cork top, diagonal molding seams. Dimensions: 14 cm tall, 2.5 cm wide on the body 2 cm wide neck, lip diameter 2.2 cm. (on exterior rim)



Figure 96. Whitall Tatum & Co apothecary bottle. “W. T. CO. USA. 4” embossed on the bottom, no other markings or labels. Soil stuck on the interior. Possibly used for essential oils or perfume. Cork seal design, slight signs of seal in a diagonal along the body. Dimensions: 5 cm tall, 1.5 cm wide on the body 1 cm wide at neck, lip diameter 1.5 cm (on exterior rim)



Figure 97. Glass apothecary/medicine bottle, amber. With mold seams along the sides and a makers mark “E44” on the bottom; “30 PHENOLAX WAFERS UPJOHN” this is a bottle which once contained Phenolax (a laxative) medicine in the form of easily dissolved wafers. 6.5 cm tall, 3 cm wide body 2 cm neck diameter, 2.5 cm exterior diameter of lip/rim. These finds indicate that a doctor or physician dumped their medical refuse in this strata along with the other historical trash sometime between the 1880’s and the 1930’s.

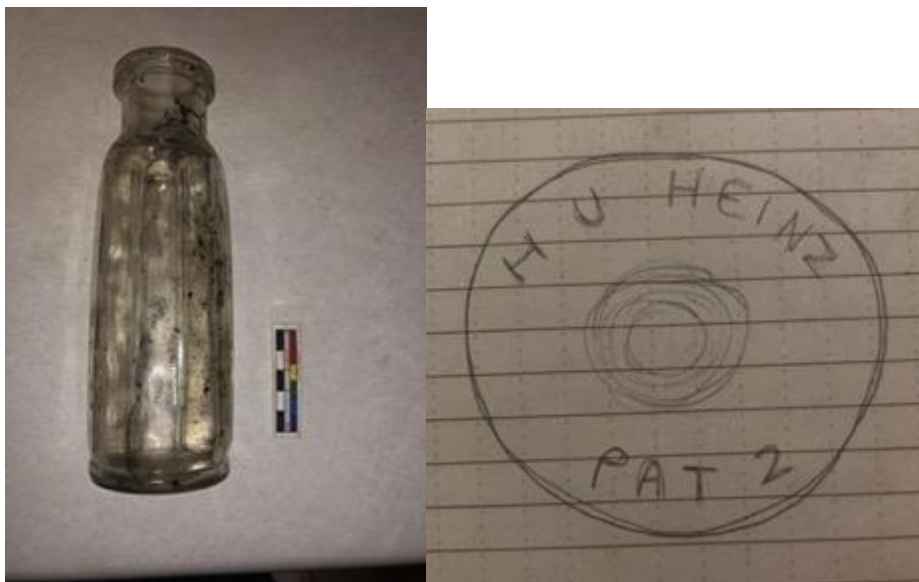


Figure 98. Glass bottle, clear; complete. Beveled edges on exterior, maker’s mark shows “H U HEINZ PAT 2”. This is a Heinz condiment bottle. The designs have obviously changed over time, but the beveling on the exterior is consistent with historic glass condiment bottles. Dimensions: 18 cm tall, 7 cm wide at the widest part of the body, 4 cm neck diameter, 5 cm wide exterior diameter of lip/rim.



Figure 99. Glass: semi-opaque white canning lid with a diameter of 6.5 cm, three concentric rings are embossed into the middle of the disk. Another glass lid like the one from last week, but it was not a historic road marker or a lantern lens, it was just another milk cap for canned goods on mason jars.

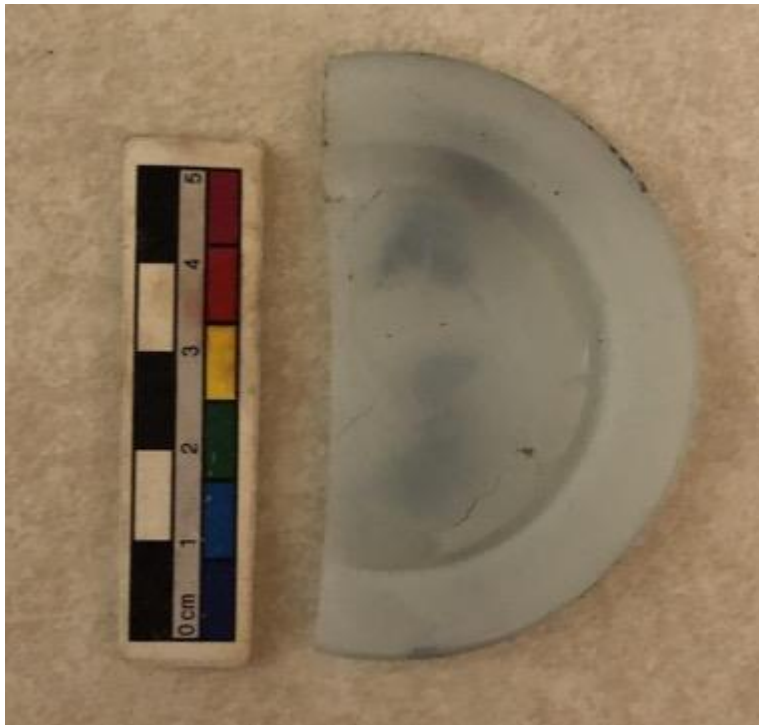


Figure 100. Glass; semi-opaque white disk (canning lid) with a diameter of 6.5 cm, shallow indent in the middle. Perhaps a glass lid to a container? “BOYD’S GENUINE PORCEL-” written on one side along the rim. These lids were common for milk containers and canning during the 19th and 20th centuries although it is difficult to assign a certain age.



Figure 101. Glass bottle, amber glass, incomplete (though the body is mostly whole) 6 cm diameter base, 2.5 cm at the (broken) neck of the bottle.



Figure 102. Glass vessel base, opaque white, incomplete, perhaps the base of a milk bottle? No makers mark on the bottom. Diameter of base: 7.5 cm



Figure 103. Glass base fragment, incomplete, light blue handblown glass (from mark on the bottom) also has a hand formed “2” along the base. Diameter in 9.5 cm.



Figure 104. Glass bottle neck and lip fragment, clear. Very thick wall so likely older and /or handmade. Not not beer, likely milk or other food goods. 5.5 cm diameter at lip, overall length at longest section of the fragment is 9.4 cm.



Figure 105. Glass fragment, diagnostic lip and neck of a glass bottle. Heavily chipped and damaged. Clear translucent color. 10 cm diameter approx.



Figure 106. Glass bottle neck and lip fragment; clear, incomplete vessel, diagnostic piece. One side of it is seemingly sliced off. 2.7 cm diameter for the lip and neck, overall length of the fragment 8.4 cm.



Figure 107. Glass bottle neck and lip, partial base, and partial body fragments, incomplete, diagnostic pieces; clear glass. “10 OZ” embossed along one side, “-DE MAR-” embossed along one fragment, “-URAU-” embossed along one fragment, 2.3 cm diameter lip, 11.7 cm long.



Figure 108. Glass bottle, fragmented/incomplete, amber color, very thin walls. Likely a remedy bottle or medicinal bottle. Lip diameter: 2.1 cm, neck diameter 1.2 cm, 4.8 cm body diameter and base diameter. Maker’s mark is really just a capital “F” in the middle of multiple concentric rings, so it’s likely hand blown into a mold. There is a seam along the body.



Figure 109. Metal shot glasses. Unknown metal maybe aluminum, perhaps for measuring medicine as well. Heavily soiled, rusted. Dimensions: diameter 4.6 cm, length 3.7 cm tall. Some traces of red paint peeling off of one of them. Relatively thin walls.



Figure 110. Ceramic sherds, whiteware, incomplete plate fragments, clear cracked glaze on exterior and interior. Left fragment Measurements: 11 cm diameter rim, 8 cm base. Right fragment measurements: 12 cm rim

Project: Quiet Cove

Date: 9/23/2020

Monitor: Natalie Bankuti, Brett Lenz

Weather: High winds, cloudy, 70 degrees

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected? yes **Observation Restriction?** no

Cultural Material Observed? yes.

This short excavation day was dedicated to hauling soil away on the trucks. Began at 7 am in the western portion of the site and went until 11:45 am. Not many cultural materials were uncovered. As with the rest of this week, the wooden planks that made up the floorboards of the coal shed were removed. The brick fragments are starting to subside, only saw a few over the whole morning. The crew installed a sump drain for the water at 11 feet deep (3.3 meters), took the rest of the pit to 10 feet (3 meters) and began pumping the water that accumulated in the bottom of the site.



Figure 111. Left: facing south shot of the excavation observed today. Right: the CAT excavator sitting on what was the coal shed.

Finds:

Figure 112. Ceramic sherds, porcelain transferware, incomplete, decorated with dark indigo blue pattern on interior of the vessel (likely a plate) approximate diameter, 20cm.



Figure 113. Ceramic sherd, whiteware, diagnostic base sherd, incomplete saucer fragment, glazed interior and exterior with a green maker's mark stamp. Approx diameter of base: 10cm.



Figure 114. Glass Mason Jar lid rim and neck, clear glass diagnostic rim, incomplete vessel. 7 cm diameter.



Figure 115. Glass shard, diagnostic rim sherd, lusterware. Semi translucent white/purple iridescent color.

Project: Quiet Cove

Date: 9/25/2020

Monitor: Natalie Bankuti, Brett Lenz

Weather: Windy, 60 degrees

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected? yes **Observation Restriction?** no

Cultural Material Observed? yes.

Began monitoring the western side of the site as the crew excavated the rest of the soil from the layer that had the coal shed floor. The water was continuing to collect along with lots of petroleum in the bottom of the site, so pumping was still happening all day. Some finds from the historic fill stratum but not many. Multiple breaks were taken over the course of the day to break up more of the cement on the southern extent of the site. Additionally, the amount of space left for the excavator slowly shrunk and Gabe the operator eventually had to get out of the pit once as much of the soil was removed as possible.



Figure 116. South facing photo of the western progress



Figure 117. Northeast facing shot of the eastern side of the site

Finds:



Figure 118. Clear glass vessel base, diagnostic fragment with maker's mark. Large vessel, diameter: 14.4 cm. The base was very thick, almost a centimeter at the edges of the base where it started to curve up into the body.



Figure 119. Ceramic sherd, diagnostic decorated blue and white transferware incomplete. Part of a plate or saucer, rim but not big enough of a sherd to tell the diameter. Found on surface

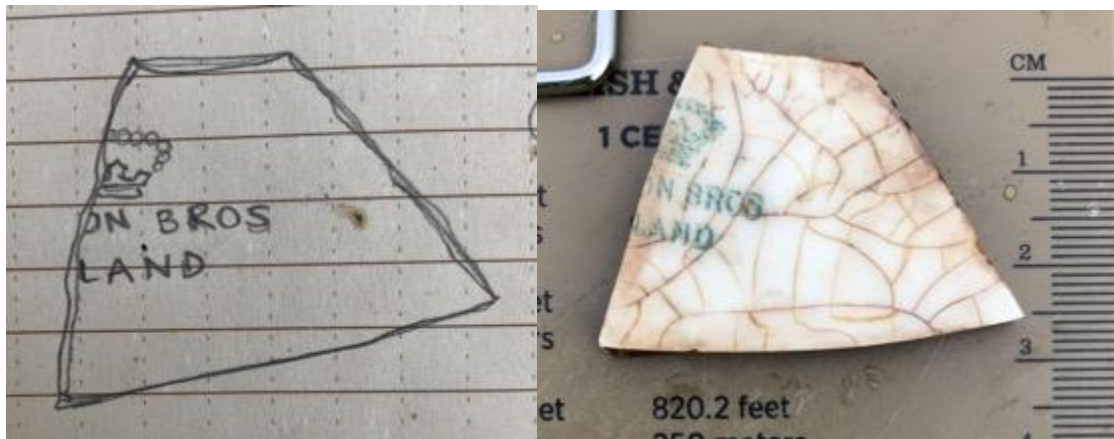


Figure 120. Ceramic sherd, non-diagnostic, decorated makers mark stamp on the bottom, partial design of a crown and the words “-ON BROS-LAND-” Found in historic fill stratum. Johnson Bros was a successful fine china company established in 1883, sold to Wedgewood group in 1968.



Figure 121. Glass bottle lip/neck fragment, partial shoulder. Clear glass, diagnostic fragment, undecorated but has a worn and peeling dark black label on the neck. Found in historic stratum.

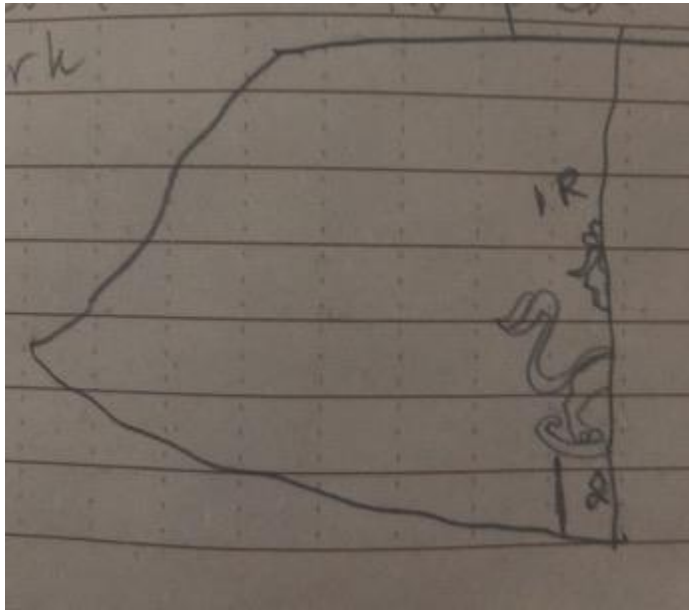


Figure 122. Ceramic sherd, body fragment non diagnostic, decorated with a stamp on the bottom in green the design shows the hind quarters of a lion? “IR-” letters are present. Likely Ironstone China company.

Project: Quiet Cove

Date: 9/25/2020

Monitor: Natalie Bankuti, Brett Lenz

Weather: Heavy rain, wind, 57 degrees

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected? yes **Observation Restriction?** no

Cultural Material Observed? yes.

Primary work was transferring soil from piles onsite into the transport trucks. Some modern metal pipes were uncovered about .75 m down from the surface, there were some fragments of red brick, possibly historic. Towards the end of the day in the afternoon, an oil tank was punctured and spilled into the site. Two whole butter clam shells were uncovered at around the same layer (.5 - .75 m deep) along with some heavily splintered wood about 1 m deep that was not intact, probably scooped up from where the Coal Shed floor was. 2 cement blocks (rectangular) were also uncovered very near to the surface. Overall, not many signs of cultural resources or artifacts.



Figure 123. Photo taken facing West, showing the excavation progress at southern edge of the site.

Finds:

Figure 124. Glass bottle, whole, still sealed. Green glass. No makers mark. Mold seal along sides. 19 cm tall, 6 cm diameter base, 3 cm diameter at the mouth of the bottle.

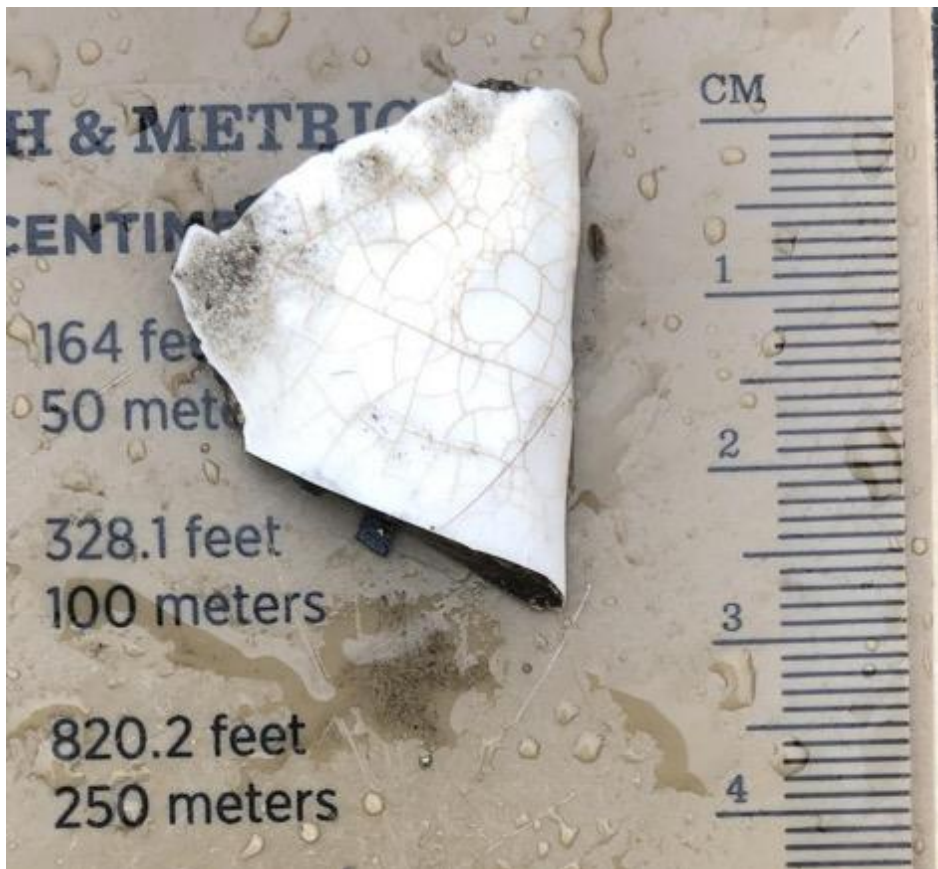


Figure 125. Ceramic sherd, whiteware with clear glaze on interior and exterior. 2.7 cm diameter using rim sherd diameter chart.

Project: Quiet Cove

Date: 9/30/2020

Monitor: Simon Schultheis, Brett Lenz

Weather: 70s

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected? yes **Observation Restriction?** no

Cultural Material Observed? yes.

Excavation began at roughly 7am with removing the lower glacial sediments left in the southeastern part of the site by the furthest point of the artificial pathway on which the excavator is working from. The crewman operating the excavator explained that the plan would be to work towards the north/ northwest removing the pathway until they reach the edge of the site. The area being excavated is a part of an old sewage drain-field. Multiple 30cm terra-cotta sewer pipes are scattered inside of the soils.

Two sawed pieces of a bovid tibia were present together with some small glass shards, bricks and metal refuse - all found at around 1-2m depth which is consistent with the finds from the previous weeks. Additionally, the remnants of a shoe in the same general area as the sawed bones. On the opposing wall, an auto bottle machine glass bottle was found in the wall next to a sherd of glazed and cracked white ware without a maker's mark present. The excavation continued to work itself towards the northern end of the site incrementally. By the end of the day the sewage drain field was almost completely excavated. As excavation moved north, historic artifacts became much scarcer with wooden planks and large logs being the most prevalent. Overall, 4-5m of the remaining pathway that leads from the north end of the site towards the south had been removed.

Finds:



Figure 126. Terra-cotta sewage pipes. 30cm long. Varying 10-13cm in diameter (not perfect cylinders). 2 photographed, 5 total observed.



Figure 127. Unknown metal object. Pos. vehicle or machinery part. 'AMER' writing on face of the object, assumed to spell out AMERICA. Rusted and corroded, 10cm x 6cm.



Figure 128. Remnants of shoe. Leather.



Figure 129. 2 sawed bovidae bones. Proximal end of a tibia and a long bone.

Project: Quiet Cove

Date: 10/1/2020

Monitor: Simon Schultheis, Brett Lenz

Weather: 70s

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected? yes **Observation Restriction?** no

Cultural Material Observed? yes.

No excavation of soils with probability of containing cultural and historic material today. Both excavators worked on creating a grade in the already excavated western portion of the site using the glacial sediments present in order to create a clean floor (scraping away a small layer to expose clean, uncontaminated soils). Due to water, this process took longer than expected resulting in a setback on the start on continuing to excavate the remaining portion of the pathway that was being worked on the day prior (9/30/2020).

Photos:



Figure 130. Overview of project progress.

Project: Quiet Cove

Date: 10/2/2020

Monitor: Simon Schultheis, Brett Lenz

Weather: Overcast, 55 degrees

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected? yes **Observation Restriction?** no

Cultural Material Observed? yes.

Excavation was initiated with the historic layer by the project exit. During the course of the day, the eastern portion of the site is slowly getting imported clean soils dumped and graded. The western portion of the site has had the glacial sediments on the floor scraped and graded. No cultural or historic materials were observed on the ground or in the strata. Continuing with the same work plan of cutting back the remnants of the pathway in the mid-section of the site, spanning north to south, the crew manning the excavator will rip away the asphalt/concrete, scrape away the top layers of fill and modern refuse until they are roughly on top of the historic layer to create a bench (2-2.5m above the preferred floor depth) for the excavator in order to get a good angle to cut back the lower layers until it is level with the glacial till/outwash strata. Once the bench is nearly gone, rinse and repeat. In the beginning of the day, soils observed are less greasy than they were on Wednesday (9/30) and historic materials have become far and few between.

Mainly just a few isolated bricks and wooden planks identified. As the pathway receded multiple fabric encapsulate 'tubes' of white foam were spotted. These were modern and found between wood planks and the asphalt in the modern refuse/construction fill strata. The dark greasy and oil drenched layer gets thinner as it gets closer to the northern border of the site. No diagnostic glass or ceramics were uncovered during excavation today. Roughly 2m of soil was removed from the south end of the pathway (not counting the slope) and roughly 1m of asphalt was removed to continue expanding the bench to the north.

Photos:



Figure 131. Project overview on exit path.

Project: Quiet Cove

Date: 10/5/2020

Monitor: Simon Schultheis, Brett Lenz

Weather: Clear skies, 60s

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected? yes **Observation Restriction?** no

Cultural Material Observed? yes.

Similar to activity on 10/2, the excavators continued to cut back the exit pathway. Excavation of the pathway paused every 20-30 min to allow the operator to alternate between spreading out the clean soils that were being imported and the excavation of the pathway. During excavation, 1 sawed bovid long bone and 3 fragmented/sawed bovid vertebrae (all assumed to be cow due to butcher marks, morphology and proximity to each other). Other historic materials observed were glass shards, white ware glazed ceramic sherds, bricks and wooden planks. An opaque glass bottle fragment was recovered from the bench at about 1.75m depth. No maker's mark was present on the fragment. Two sherds of white ware were found about .75m to the north of the bottle fragment in the historic refuse strata. Neither sherd was diagnostic or had maker's marks present. Overall, the asphalt on the pathway only spanned roughly 6m, and the bench in which the excavator sat on is only another roughly 6- 7m total. Many large pipes were ripped out of the ground and cut up by the crew. Black sludge/oil was dripping out of them as they were being pulled out.

Photos:



Figure 132. Project overview

Findings:

All artifacts were found either directly in the historic refuse layer about 1.5-2m deep, or adjacent to it as a result of the walls caving/falling as the excavator scraped them.



Figure 133. Sawn bone



Figure 134. Glass bottle fragment, opaque, 7.5cm in diameter, no distinguishable makers mark.



Figure 135. Ceramic sherds, white ware, glazed, non-diagnostic, no distinguishable makers marks. Both roughly 2.5cm x 4cm

Project: Quiet Cove

Date: 10/6/2020

Monitor: Simon Schultheis, Brett Lenz

Weather: Breezy, 50 degrees

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected? yes **Observation Restriction?** no

Cultural Material Observed? yes.

Comments:

The day began with roughly 6m left of the full exit pathway to remove. The trucks used for exporting the hazardous soils have started to park parallel with the northern edge of the site since the pathway is now too small for them. Logistics surrounding the number of trucks available for exporting the hazardous waste has caused excavation to slow down quite a bit. As excavation went on throughout the day, a wood foundation that looks to be a part of the old warehouse that is referenced on the site map. There have been little to no artifacts found in the strata directly above the foundation. However, in the historic strata to the south of the foundation, a glass bottle fragment and a butchered/sawed bovid rib were found (see photos). Not much else was recovered during this portion of the excavation, observed but not recorded cultural materials include bricks, metal pipes, thin metal sheets, and large wooden planks. By the end of the day, the asphalt now only spans roughly 4m from the northern border of the site, while the bench spans another 5m out from it. The bench is slightly over 2m below the asphalt, stopping right above/within the historic refuse/fill layer.

Photos:



Figure 136. Overview of remaining soil to remove.

Findings:



Figure 137. Rib 5cm x 2.25cm



Figure 138. Opaque/green glass bottle fragment. 6.5x 11.75cm

Project: Quiet Cove

Date: 10/7/2020

Monitor: Simon Shultheis, Brett Lenz

Weather: 70s

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected? yes **Observation Restriction?** no

Cultural Material Observed? yes.

Excavation and loading were both occurring on this day. Early in the day, wooden planks were recovered. Not many artifacts came from excavating this, the only artifact of significance was a corroded metal object, resembling a small hatch/door. Artifacts included a historic Budweiser beer can, large mammal bone (pos. atlas from cow), an opaque glass shard, a pipe coupler and a shoe sole. All the asphalt has been scraped away from the spit and the bench has been moved back by over 5 meters. Excavation moved at a slower pace than expected.

Photos:



Figure 139. Overview of progress near end of project.

Findings:



Figure 140. Metal object, 31x41cm. Heavily corroded/rusted.



Figure 141. Budweiser beer can, ring tab



Figure 142. Non-human, unidentifiable mammal bone (pos. cow atlas), robust, found in same layer as butchered/sawed cow bones from previous days.



Figure 143. Opaque glass shard. 4x5.5cm



Figure 144. Shoe sole, 16cm long.



Figure 145. Pipe coupler, 6cm diameter.

Project: Quiet Cove

Date: 10/8/2020

Monitor: Natalie Bankuti, Brett Lenz

Weather: Overcast, 50 degrees

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected? yes **Observation Restriction?** no

Cultural Material Observed? yes.

Excavation narrowed down the width of the remaining platform extending out of the northern edge of the site. Bricks and small metal refuse are dominant as cultural materials. Very few artifacts were found today, much of the excavation was conducted above the historic layer or around the edges of the platform where till had been scraped from the floor and moved leaving a mix of cultural material and sterile soils, mainly the latter. A ceramic sherd was found at the northern site boundary east of where the excavation was taking place. It was found in soils that had fallen out of the historic strata.

By the end of the day, the remaining amount of material needed to be excavated was located in a small 5x8m wide half circle (not including the slope) barely big enough for the 320 EL to stand on. Historic bricks and wooden planks were observed in the excavated soil, but not photographed or recorded due to the common occurrence throughout the past few weeks.

Findings:

All artifacts were found either directly in the historic refuse layer about 1.5-2m down, or adjacent to it as a result of the walls caving/falling as the excavator scraped them.



Figure 146. Historic ceramic sherd, 3.4 x 3.6cm, rounded edge, no curvature, small arc-shaped ridge on face, reddish brown, cracked glazed surface. Most likely a ceramic lid.

Project: Quiet Cove

Date: 10/9/2020

Monitor: Natalie Bankuti, Brett Lenz

Weather: 70s

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected? yes **Observation Restriction?** no

Cultural Material Observed? yes.

The overall goal of the day was to cut back the edge at the top of the remaining portion of unexcavated material creating a slope, then contouring. Few artifacts were recovered. The only recorded cultural/historic materials included two ceramic sherd fragments of a cup. Other cultural/ historic materials observed but not recorded were bricks, wooden planks, and small, fragmentary metal refuse. The wood foundation of the old warehouse is still present and spans back to the northern edge of the site. The base surrounding the remaining portion of what is left to be excavated is within glacial strata, but still has a probability of containing archaeology. Some portions of the site are already down to sterile strata.

Photos:



Figure 147. Small portion of fill to be removed.

Findings:



Figure 148. Ceramic sherds, white ware, glazed. Fragments of a cup, no maker's mark.

Project: Quiet Cove

Date: 10/12/2020

Monitor: Natalie Bankuti, Brett Lenz

Weather: 70s

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected? yes **Observation Restriction?** no

Cultural Material Observed? yes.

A majority of the project was covered with fresh sediment as a part of the backfilling process. The final bit of excavation focused on removing the remainder of contaminated sediment. Several historic objects were observed and documented. A can, bottle and a few other glass shards/fragments were spotted falling out of the bucket. A second bottle fragment was found at the base of the excavation. It likely fell out of the historic stratum during excavation. Similar to last week, there is an abundance of bricks and metal refuse scattered throughout the historic layer and the construction fill layer. No identifiable cultural objects were observed in layers below the historic strata (storm surge deposits and glacial layers).

Findings:

All artifacts were found either directly in the historic refuse layer about 1.5-2m down, or adjacent to it as a result of the walls caving/falling as the excavator scraped them.



Figure 149. Coca-Cola ring-tab can, approx. 1971, aluminum, 10cm



Figure 150. Amber glass bottle, 29.5 cm, crown top finish (likely beer bottle), no maker's marks present



Figure 151. Opaque glass bottle fragment, cork still present in the top, pouring finish, two rings on neck, 7.5 cm, no maker's marks present



Figure 152. Cylinder with tapered middle shaped glass fragment, wavy edge up top, possibly an oil lantern. Opaque, thin and frail, 6.5cm long.

Project: Quiet Cove

Date: 10/13/2020

Monitor: Simon Shultheis, Brett Lenz

Weather: 70s

Mechanical Equipment: CAT 320E Excavator **Size of Bucket:** 70 inches

Spoils Inspected? yes **Observation Restriction?** no

Cultural Material Observed? yes.

The excavation came to an end this day. The base of the project was mucky and wet, with some areas of till becoming extremely slick. Visibility was terrible for the first truckload. As the day went on, the rain let up and the sky brightened, it became easier to differentiate between strata and the strata became easier to interpret. With the small portion of soil in need of excavation, not many cultural materials observed apart from the usual: bricks, wooden planks, metal refuse etc. No diagnostic artifacts were recovered during the final portions of excavation. Typical soil profiles were found in the final exposed portion of the southern site boundary, and the entirety of the remaining portion of the site was fully excavated and exported.

Photo:



Figure 153. Excavation completion note contoured excavation margins.

5.0 Conclusions

The project site is a known commerce area occupied by the Nobar Hotel during the late 1800s until 1941 and later used by the Standard Oil company for storage and distribution. Development of the property through time included surface clearing for building and parking lot development and use as a storage area for associated businesses. Such disturbances limited the possibility of identifying intact archaeological deposits; archaeological monitoring during identified the remains of a historic structure and a prehistoric shell midden, discovery of the latter requiring work stoppage and consultation with DAHP and the local Tribes.

Archaeological monitoring identified a range of artifacts that support the recorded history of the property use. Discovery of a number of complete liquor and beer bottles alongside hundreds of broken glass pieces that likely represent many others, suggest that while the Nobar Hotel may have not had a legal drinking establishment associated with the Hotel, guests and visitors enjoyed a drink nonetheless.

7.0 References

Barsh, Russell,

- 2003 State of Washington Archaeological Site Inventory Form 45SK294 Kiwanis Water Front Park. On file at the Washington State Department of Archaeology and Historic Preservation, Olympia.

Bowman, Amos

- 1890 “1890 Plat of Anacortes,” Anacortes.pastperfect-online.com, accessed February 8, 2013.

Bryan, Alan

- 1953 University of Washington Archaeological Survey of Washington 45SK13. On file at the Washington State Department of Archaeology and Historic Preservation, Olympia.

- 1954a University of Washington Archaeological Survey of Washington 45SK43. On file at the Washington State Department of Archaeology and Historic Preservation, Olympia.

- 1954b University of Washington Archaeological Survey of Washington 45SK44. On file at the Washington State Department of Archaeology and Historic Preservation, Olympia.

Carter, Phil

- 2011 “Amos Bowman Builds Anacortes’ First Lumber Mill February 1890,” historylink.org, accessed February 8, 2013.

Conca, D.

- 1985 Washington Archaeological Site Inventory Form 45SK44. On file at the Washington State Department of Archaeology and Historic Preservation, Olympia.

Dailey, Tom

- 2013 Coast Salish Villages of Puget Sound, <http://coastsalishmap.org>, accessed February 8, 2013.

Gilbert, J.J.,

1886 U.S. Geodetic Survey – Rosario Strait, Ship Harbor and Padilla Bay, accessed February 8, 2013, <http://riverhistory.ess.washington.edu/tsheets/framedex.htm>.

Gilpin, Jennifer, Gail Thompson, Rene Small, Derek Shaw, and Jenny Dellert,

2009 Archaeological Monitoring Report for the Port of Anacortes Pier 1 Redevelopment Project, City of Anacortes, Skagit County, Washington, Historical Research Associates, Inc. Seattle, Washington.

Gustafson, C. E., Dilbow, and R. Daugherty

1979 The Manis mastadon site: Early man on the Olympic Peninsula. Canadian Journal of Archaeology 3:157- 164.

Kohler, Julie

2003 Robinson's Marina, Washington State Historic Property Inventory form, on file at the Washington Department of Archaeology and Historic Preservation, Washington.

Museum of Anacortes

2013 Past Perfect Website , <http://anacortes.pastperfect-online.com>, selected files relating to Robinson Marina. Accessed February 8, 2013.

2013a Raymond Robinson Biographical File, on file at museum, Anacortes, Washington.

Moura, Guy

2003 State of Washington Archaeological Site Inventory Form 45SK43 Kiwanis Water Front Park. On file at the Washington State Department of Archaeology and Historic Preservation, Olympia

Port of Anacortes

2012 Wyman's Property Habitat Mitigation (Pier 1 Redevelopment Mitigation), on file at Port of Anacortes, Anacortes, Washington.

Port of Anacortes

2013 Selected photos and historical files provided electronically from Port of Anacortes, on file at Port of Anacortes, Washington.

Schalk, Randall

2004 State of Washington Archaeological Site Inventory Form Update 45SK43.
On file at the Washington State Department of Archaeology and Historic
Preservation, Olympia

Slotemaker, Terry

2007 *From Logs to Lumber: On Fidalo, Guemes, Cypress Burrows, and Sinclair Islands,*
Anacortes Museum, Anacortes, Washington.

Trost, Teresa

2005 State of Washington Archaeological Site Inventory Form 45SK43. On file at
the Washington State Department of Archaeology and Historic Preservation,
Olympia.

Appendix A: Inadvertent Discovery Work Plan

**Notice of Inadvertent Discovery of Archaeological Resources and a Proposed Plan for
Resuming the Cleanup Effort at Quiet Cove, Port of Anacortes**

Brett R. Lenz, PhD, PEG, RPA

And

Natalie Bankuti, MA

9/11/2020

Introduction

Work at the Quiet Cove site has been stopped in response to the inadvertent discovery of an intact shell midden. This brief discovery report and work plan is intended to outline steps to record and preserve the exposed cultural resources in place and then move forward with the remainder of hazardous cleanup work and the Port of Anacortes property.

Discovery of the shell midden

During the course of planned fill removal and archaeological monitoring along the western margin of the Quiet Cove property, apparent shell midden was exposed in the active cutbank by project archaeologist Natalie Bankuti. Excavation work was halted immediately, and excavation equipment was removed from the area. Site archaeologist Natalie Bankuti and Brett Lenz verified that the discovery was midden and that it appeared to be intact. The discovery area was cordoned off with flagging tape to keep people from entering and possibly disturbing the midden.

Prior to its discovery, in an effort to stabilize the excavation slope on the margin of the cleanup project, contaminated soils were stripped and removed until Historical beach levels (the historic land surface) were uncovered. At this horizon, the backhoe revealed a series of pipes reported by project engineers as oil product lines that would transport material from the former offload pier to the project area. An area of both clearly disturbed and intact shell midden in the strata which included the metal pipes was exposed. Upon discovery of the midden, work was halted in the area and it was flagged the area with small survey flags and neon survey tape to delineate a “no work zone”.

Brett Lenz notified Geoengineers of the discovery and Geoengineers notified the Port of Anacortes. The Port then asked that contact be made immediately with the Department of Archaeology, the Samish, Swinomish and Lummi Tribal representatives to initiate consultation, which was already underway.

Description of the exposed midden

The exposed midden forms a crescent-shaped feature in the cutbank, measuring approximately one meter wide with a maximum thickness of 30cm. The buried surface of the midden is planar, indicating it was disturbed before burial. The original thickness of the deposit is unknowable, regardless, the portion that remains is clearly intact and in place. Internal stratigraphy of the midden is typical of coastal middens, displaying alternating layers of highly organic sediment and pulverized shell.

Site-wide stratigraphy and Geoarchaeological Units

Quiet Cove sediments are differentiated based on their constituent parts, and in particular, whether they are natural or engineered and part of the built environment. Further geoarchaeological differentiation is based on the original parent material, ratios of sediment to shell, shell fragmentation, and admixture by historic and recent sediments. Table 1 displays Geoarchaeological units that were applied to interpretations of the stratigraphic sections at the Quiet Cove site.

Five broad master stratigraphic units are exposed in the cleanup site excavations, listed in Table 1. From deepest to most shallow, they include glacial till and recessional moraine sediments, beach sands and gravels, midden, and mixed fill. Variations, including midden with varying amounts of whole and fragmentary shell and wood ash, historically disturbed natural deposits and fill materials were observed within these stratigraphic units. Figure 1 displays a profile of the exposed midden.

TABLE 1 QUIET COVE GEOARCHAEOLOGICAL UNITS

Qf	Differentiated historic fill
	Riprap, soil, sediment, rock, and solid waste material that has been added and reworked to modify topography; includes engineered and non-engineered fill. Within project boundary differentiated as:
	Qfcr Clean Recent Fill; mixed sand, silt, clay; may contain cobbles, gravel, shell; characterized by lack of or disruption of bedding planes; defined by bounding contacts with other units.
	Qfr Recent Fill; mixed sand, silt, clay; may contain cobbles, gravel, shell; contains modern landfill debris (Glass, Plastic, Metal, Wood)
	Qfs Structural fill; mixed sand, silt, clay; may contain cobbles, gravel, shell; contains modern landfill debris (Brick, Wood, Glass, Metal)
	Qfw Woody Fill; mixed sand, silt, clay; may contain cobbles, gravel, shell; contains wood pulp, wood debris, logs.
Qha	Archaeological deposits, differentiated as:
	Qas- Shell midden; consists of medium to thickly bedded layers of sand; shell and dark organic sandy midden matrix; dark gray to black.
	Qao- Dark gray to black organic sands; may include oxidized shell or burned sand strata.
	Qaom- Dark gray to black organic midden sands; consists of beach-derived sands and artifacts in the absence of shell; shell is assumed to have pedogenically leached from the deposit.

Qaos- Dark gray to black sands with small fragments of shell; dark colors relate to organic staining; fragmented shell may reflect beach zone reworking or pedogenic leaching.

Qo Organic Sediments

Peat and decayed organic materials, sometimes fibrous with thin to medium-bedded silty sand; interbedded silt and clayey silt; Stringers and lenses of sand and gravel; Black to gray to very dark brown; the byproduct of pedogenesis between sediment depositional events; artifact free.

Qb Beach Deposits

Generally well-sorted sand and cobbles within the influence of the surf zone; may include silt, pebbles and cobbles; larger clasts in coarser deposits are generally well rounded and flattened by wave action

Qg Glacial Deposits

Undifferentiated upper Pleistocene glacial outwash and till deposits; typically gleyed.

Work Plan

Work on the project site is presently halted due to the archaeological discovery. As the project has a net benefit to people by cleaning up the hazardous waste, it is important to move forward as soon as possible. Several steps for resuming completion of the cleanup project are proposed.

6. Record the midden on a standard state of Washington archaeological site form and submit to DAHP via WISAARD.
7. Conserve the midden in place. This can be completed by simply keeping the surface exposure of the midden free of debris and covering it with a geotextile fabric.
8. Ensure that the area of midden exposure is clearly delineated as a “no work zone” for the remainder of the cleanup project unless coordinated with DAHP and Tribal consulting parties.
9. Restart hazardous material removal and continue archaeological monitoring and recording of exposed, out of context historic fill and historic use foundations.
10. Backfill the site, conserving and preserving the midden in place.
11. Complete a final report of the archaeological monitoring results including details on the shell midden and features identified during monitoring related to historic use of the site.

Discussion

The exposed midden appears to be oriented underneath 2nd street and west towards the beach. Sediment in this area is outside the scheduled project area and is not planned for removal. As the exposed portion of shell midden is intact with no further plans for removal, the only impacts to it are surface exposure. Conserving the midden surface by covering it with geotextile fabric will serve to both protect it in place as well as delineate the feature when potential future exposures occur.

Appendix B –Washington State Archaeological Site Forms



STATE OF WASHINGTON ARCHAEOLOGICAL SITE INVENTORY FORM

DRAFT

Smithsonian Number: 45

County:

Date: 3/28/2021

Human Remains? ☐ DAHP Case No.:

Compiled By: Brett Lenz

Columbia Geotechnical Associates

Archaeological Sites are exempt from public disclosure per RCW 42.56.300

SITE DESIGNATION

Site Name:

Field/Temporary ID: Quiet Cove Coal Shed

Site Type: Historic Commercial Properties

Historic Industrial

Historic Railroad Properties

Historic Structures Not Specified

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this request for determination of eligibility meet the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the site

☐ meets ☒ does not meet the National Register Criteria.

I recommend that this property be considered significant at the following level(s) of significance:

Criteria

Statement of Significance

Integrity

Site lacks fundamental integrity. The original structure is completely demolished, the only remnants are fragmentary floor boards.

SHPO Determination

Eligibility Survey/Inventory Determined On

Determined By

SHPO Comments

SITE LOCATION

USGS Quad Map Name(s): ANACORTES NORTH

T: 35

R: 01

E/W: E

Section: 13

UTM: Zone: 10

Easting: 528411

Northing: 5374214

Latitude: 48.5204

Longitude: -122.6153

Elevation (ft/m):

Drainage, Major:

Drainage, Minor:

River Mile

Aspect

Slope

ARCHAEOLOGICAL SITE INVENTORY FORM

Page 2 of 8

Location Description (General to Specific):

The site is located on the northern coastline of Fidalgo Island, on the Guemes Channel. The site-is-located in the City of Anacortes, Washington, within the Port of Anacortes, and is situated directly where the north end of North Avenue park and 2nd st. intersect. This location is 50 feet from the Guemes Channel.

Directions (For Relocation Purposes):**SITE DESCRIPTION****Narrative Description** (Overall Site Observations):

This site was the location of a former coal storage shed presumably used to support railroad operations in Anacortes due to its proximity to the historical rail line. It discovered during remediation of contaminated sediments in the old Quiet Cove fuel yard. Site was represented by broadly in-situ floor boards lying on trend with historic air photos and engineers drawings that show the location of the former coal shed.

Site Dimensions (Overall Site Dimensions):

Length: 100ft. **Direction:** 210/SW **Width:** 20ft. **Direction:** 300/NW

Method of Horizontal Measurement: Tape

Depth: <1ft. **Method of Vertical Measurement:** Measuring meter

Vegetation (On Site):

Local: Tree layer includes Douglas fir (Pseudotsuga menziesii) and red alder (Alnus rubra). The shrub layer includes snowberry (Symphoricarpos albus) and Nootka rose (Rosa nutkana). The herbaceous layer includes bull thistle (Cirsium vulgare)

Regional:

Landforms (On Site):

Local: Beach **Regional:** Glaciated terrane

Water Resources (Type):

Distance: 80ft.

Permanence:

CULTURAL MATERIALS AND FEATURES**Narrative Description** (Specific Inventory Details):

All manner of historic building materials, bricks, metal, milled lumber. Domestic items, food containers. Medicine containers.

Method of Collection:

Material was not collected

Location of Artifacts (Temporary/Permanent):**SITE AGE**

Component Type	Historic
Dates	1890-1970
Dating Method	Historic records/relative artifacts

ARCHAEOLOGICAL SITE INVENTORY FORM

Smithsonian Number: **DRAFT** 45

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Phase

Basis for Phase Designation

SITE RECORDERS

Observed By

Brett Lenz

Address

1608 Sanders Road, Ellensburg, WA 98926

Date Recorded:

3/28/2021

Recorded by (Professional Archaeologist):

Brett Lenz

Organization:

Columbia Geotechnical Associates

Phone Number:

509-933-3081

Address:

1608 Sanders Road, Ellensburg, WA 98926

Email:

brettlenz@gmail.com

SITE HISTORY

Previous Archaeological Work:

The initial commercial use of the Quiet Cove property was as a hotel site. The hotel was built at 2nd St. and O Avenue, the location of the Quiet Cove project in February of 1890. The Nobar was built and operated by W.H. Hazzard and was marketed as an alternative to the copious drinking establishments (there were 47 local bars at the time). No bar was installed in the hotel; hence it was called the Nobar Hotel, "a dry island in a sea of saloons." That characterization was borne out by the 5-3-1890, coverage of the International Order of Good Templars meeting, (a temperance organization): "IOGT Basket Party: Members of the IOGT gave a basket party at the Nobar Hotel to which members and visitors attended filling up the seating capacity of the dining room to its 'full' extent; it is thought to be truthful: cold water drinkers never get full (Anacortes museum records).

The history of the project site use by Standard Oil begins in 1909 after the Nobar motel was moved to its new location. At that time, Standard Oil erected a dock and plant at the 2nd and O waterfront location. Their business did well, the 2-17-1910 Anacortes American reported the business was, "Selling 40,000 gallons of oil a month. Standard Oil doing a tremendous business from recently erected plant.

After the hotel was moved, the property was used for bulk fuel storage and distribution from approximately 1909 to at least 1977. The final date when fuel operations ceased is unknown. As reported in the February 17, 1910 Anacortes American, Standard Oil erected a dock (in the general vicinity of what is now Curtis Wharf) and bulk fuel plant on the Anacortes waterfront at 2nd Street and O Avenue in November 1909, selling 40,000 gallons of oil a month. Standard Oil operated the bulk fuel facility until the late 1970s at which time the facility was decommissioned, and the above ground tanks were removed.

Since the late 1970s, the property has been used for the storage of marine vessels and recreational vehicles, and contains several buildings that have been leased to various tenants for sales and marine services. The adjacent property to the west (also owned by the Port) is used for general storage. The southwestern adjacent property (owned by Texaco/Reisner) continues to operate as a bulk fuel storage and distribution facility generally consistent with the past operations. A beach with public access extends along the shoreline in the vicinity of these properties. Skagit County Assessor records indicate that the property was sold to Thomas and Patricia Stowe in 1977. In 2013, the property was purchased by the Port of Anacortes with plans to redevelop the property in conjunction with expansion and improvements to the Curtis Wharf.

Historical contamination is associated with the site being used as a bulk fuel terminal and storage facility, for which operations included oil tanks, an oil warehouse, a filling shed and piping.

ARCHAEOLOGICAL SITE INVENTORY FORM

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LAND OWNERSHIP		
Owner	Address	Parcel
Port of Anacortes	100 Commercial Ave, Anacortes, WA 98221, Anacortes, Wa	P55354

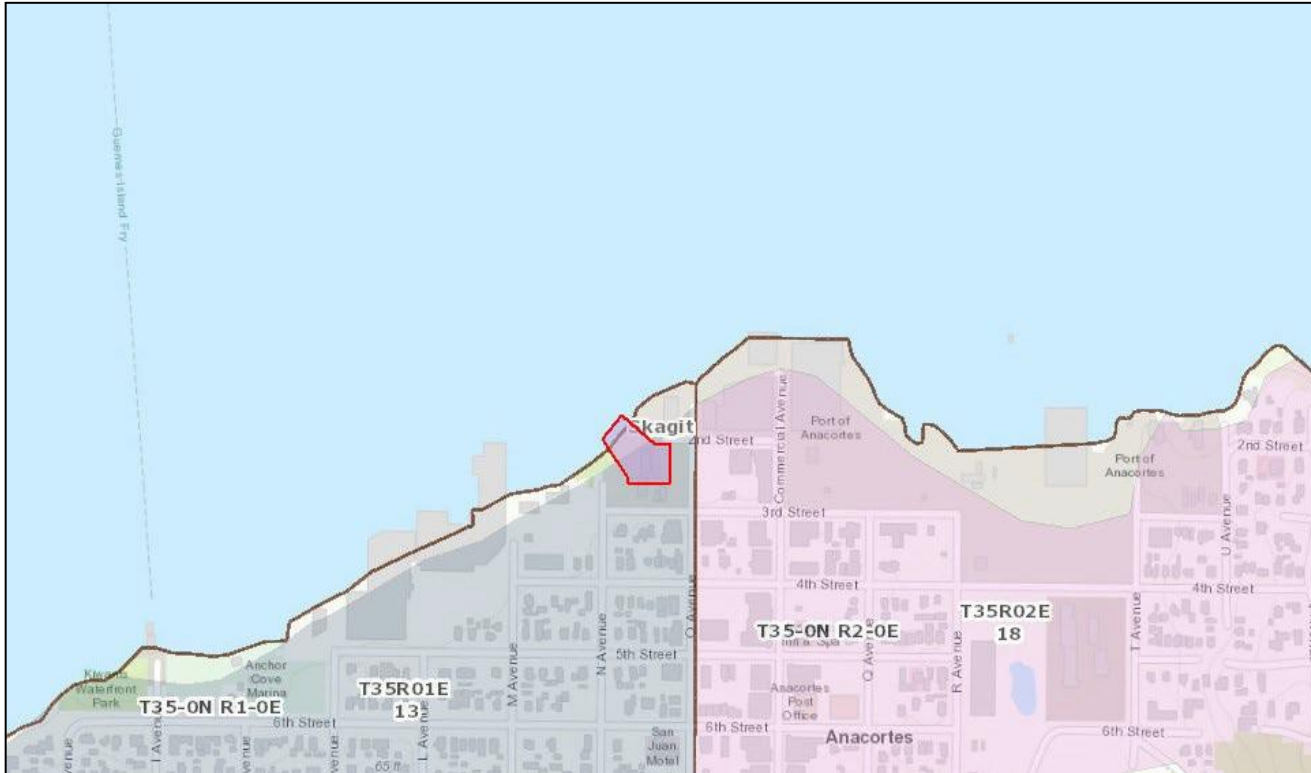
RESEARCH REFERENCES
Items/Documents Used in Research: "Anacortes Shipways Inc. Gets Army Contract" 1943 Anacortes American, March 11, 1943. "Anacortes Back Building Boats" 1967 Anacortes American, December 7, 1967. General Land Office 1872 Survey map for T Gilbert, J.J., 1886 U.S. Geodetic Survey - Rosario Strait, Ship Harbor and Padilla Bay, accessed February 8, 2013, http://riverhistory.ess.washington.edu/tsheets/framedex.htm. Gilpin, Jennifer, Gail Thompson, Rene Small, Derek Shaw, and Jenny Dellert, 2009 Archaeological Monitoring Report for the Port of Anacortes Pier 1 Redevelopment Project, City of Anacortes, Skagit County, Washington, Historical Research Associates, Inc. Seattle, Washington. Kohler, Julie 2003 Robinson's Marina, Washington State Historic Property Inventory form, on file at the Washington Department of Archaeology and Historic Preservation, Washington. Museum of Anacortes 2013 Past Perfect Website , http://anacortes.pastperfect-online.com, selected files relating to Robinson Marina. Accessed February 8, 2013. Slotemaker, Terry 2007 From Logs to Lumber: On Fidalco, Guemes, Cypress Burrows, and Sinclair Islands, Anacortes Museum, Anacortes, Washington.

ARCHAEOLOGICAL SITE INVENTORY FORM

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USGS MAP



ARCHAEOLOGICAL SITE INVENTORY FORM

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SKETCH MAPS

Photographs, Tables and Additional Information

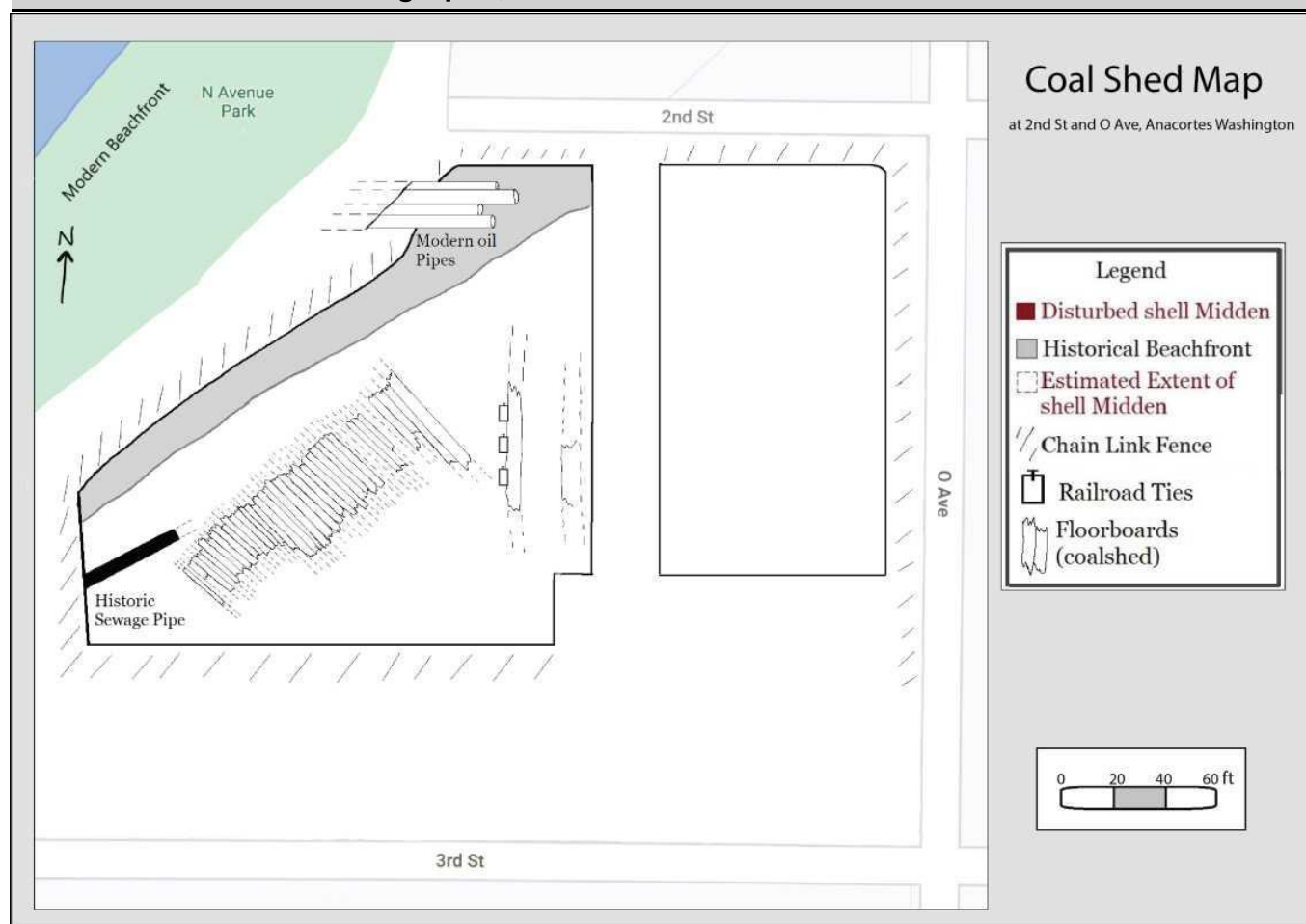


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Year Taken

Is Circa? ☐

Notes

Type image/png

Photo View

Source

Copyright ☐

ARCHAEOLOGICAL SITE INVENTORY FORM

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DRAFT
Smithsonian Number: 45



ARCHAEOLOGICAL SITE INVENTORY FORM

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Title IMG_1061.JPG

Year Taken

Is Circa? ☐

Notes

Type image/jpeg

Photo View

Source

Copyright ☐



STATE OF WASHINGTON ARCHAEOLOGICAL SITE INVENTORY FORM

DRAFT

Smithsonian Number: 45

County:

Date: 3/8/2021

Human Remains? ☐ DAHP Case No.:

Compiled By: Brett Lenz

Columbia Geotechnical Associates

Archaeological Sites are exempt from public disclosure per RCW 42.56.300

SITE DESIGNATION

Site Name:

Field/Temporary ID: Quiet Cove Midden

Site Type: Pre Contact Feature

Pre Contact Shell Midden

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this request for determination of eligibility meet the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the site

☒ meets ☐ does not meet the National Register Criteria.

I recommend that this property be considered significant at the following level(s) of significance:

Criteria D

Statement of Significance

The Quiet Cove midden appears to be at least partly intact and buried in its primary context. It is likely to yield information that is important to prehistory.

Integrity

The exposed portion of the midden appears to be intact, although it is clear that the former surface of the midden has been planed off at some point in the past.

SHPO Determination

Eligibility Survey/Inventory Determined On

Determined By

SHPO Comments

SITE LOCATION

USGS Quad Map Name(s): ANACORTES NORTH

T: 35

R: 01

E/W: E

Section: 13

UTM: Zone: 10

Easting: 528415

Northing: 5374235

Latitude: 48.5206

Longitude: -122.6152

Elevation (ft/m):

Drainage, Major: Puget Sound

Drainage, Minor:

River Mile

Aspect 350

Slope <2%

Location Description (General to Specific):

The site is located on the northern coastline of Fidalgo Island, on the Guemes Channel. The site-is-located in the City of Anacortes, Washington, within the Port of Anacortes, and is situated directly where the north end of North Avenue park and 2nd st. intersect. This location is 50 feet from the Guemes Channel.

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ARCHAEOLOGICAL SITE INVENTORY FORM

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ARCHAEOLOGICAL SITE INVENTORY FORM

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Directions (For Relocation Purposes):

Within Anacortes, WA, head north on O Avenue towards the Guemes Channel. At the intersection of O Avenue and 2nd Street, begin at the northeast corner of this intersection. Proceed west (~290°) for 300 ft. The resource is buried at this location.

SITE DESCRIPTION

ARCHAEOLOGICAL SITE INVENTORY FORM

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ARCHAEOLOGICAL SITE INVENTORY FORM

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Narrative Description (Overall Site Observations):

The site was observed during archaeological monitoring of backhoe removal of contaminated sediments. The excavation removed most of the entire city block, the midden was exposed along the northwest margin of the excavation. The exposed midden forms a crescent-shaped feature in the cutbank, measuring approximately one meter wide with a maximum thickness of 30cm. The buried surface of the midden is planar, indicating it was disturbed before burial. The original thickness of the deposit is unknowable, regardless, the portion that remains is clearly intact and in place. Internal stratigraphy of the midden is typical of coastal middens, displaying alternating layers of highly organic sediment and pulverized shell.

Site-wide stratigraphy and Geoarchaeological Units

Quiet Cove sediments are differentiated based on their constituent parts, and in particular, whether they are natural or engineered and part of the built environment. Further geoarchaeological differentiation is based on the original parent material, ratios of sediment to shell, shell fragmentation, and admixture by historic and recent sediments. The following are Geoarchaeological units that were applied to interpretations of the stratigraphic sections at the Quiet Cove site.

Five broad master stratigraphic units are exposed in the cleanup site excavations. From deepest to most shallow, they include glacial till and recessional moraine sediments, beach sands and gravels, organic sediment, midden (based on this discovery), and mixed fill. Variations, including midden with varying amounts of whole and fragmentary shell and wood ash, historically disturbed natural deposits and fill materials were observed within these stratigraphic units.

Geoarchaeological Units.**Qf Differentiated historic fill**

Soil, sediment, rock, and solid waste material that has been added and reworked to modify topography; includes engineered and non-engineered fill. Within project boundary differentiated as:

Qfcr Clean Recent Fill; mixed sand, silt, clay; may contain cobbles, gravel, shell; characterized by lack of or disruption of bedding planes; defined by bounding contacts with other units.

Qfr Recent Fill; mixed sand, silt, clay; may contain cobbles, gravel, shell; contains modern landfill debris (Glass, Plastic, Metal, Wood)

Qfs Structural fill; mixed sand, silt, clay; may contain cobbles, gravel, shell; contains modern landfill debris (Brick, Wood, Glass, Metal)

Qfw Woody Fill; mixed sand, silt, clay; may contain cobbles, gravel, shell; contains wood pulp, wood debris, logs.

Qha Archaeological deposits, differentiated as:

Qas- Shell midden; consists of medium to thickly bedded layers of sand; shell and dark organic sandy midden matrix; dark gray to black.

Qao- Dark gray to black organic sands; may include oxidized shell or burned sand strata.

Qaos- Dark gray to black sands with small fragments of shell; dark colors relate to organic staining; fragmented shell may reflect beach zone reworking or pedogenic leaching.

Qo Organic Sediments

Peat and decayed organic materials, sometimes fibrous with thin to medium-bedded silty sand; interbedded silt and clayey silt; Stringers and lenses of sand and gravel; Black to gray to very dark brown; the byproduct of pedogenesis between sediment depositional events; artifact free.

Qb Beach Deposits

Generally well-sorted sand and cobbles within the influence of the surf zone; may include silt, pebbles and cobbles; larger clasts in coarser deposits are generally well rounded and flattened by wave action

Qg Glacial Deposits

Undifferentiated upper Pleistocene glacial outwash and till deposits; typically, gleyed.

ARCHAEOLOGICAL SITE INVENTORY FORM

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Site Dimensions (Overall Site Dimensions):

Length: 105cm **Direction:** west-east **Width:** exposed **Direction:** N/A
in
vertical
cut

Method of Horizontal Measurement: tape

Depth: 55-78cmbs
(23cm
midden
thickness
) **Method of Vertical Measurement:** tape

Vegetation (On Site):

Local: Urban landscape **Regional:** Western Helmock

Landforms (On Site):

Local: Shoreline **Regional:** Glacial outwash

Water Resources (Type): Puget Sound **Distance:** 50ft. **Permanence:**

CULTURAL MATERIALS AND FEATURES**Narrative Description** (Specific Inventory Details):

The exposed midden forms a crescent-shaped feature in the cutbank, measuring just more than one meter wide with a maximum thickness of 30cm. The buried surface of the midden is planar, indicating it was disturbed before burial. The original thickness of the deposit is unknowable, the portion that remains is clearly intact and in place. Internal stratigraphy of the midden is typical of coastal middens, displaying alternating layers of highly organic sediment and pulverized shell.

Method of Collection:**Location of Artifacts** (Temporary/Permanent):**SITE AGE**

Component Type Precontact

Dates Holocene

Dating Method Relative

Phase

Basis for Phase Designation

ARCHAEOLOGICAL SITE INVENTORY FORM

DRAFT
Smithsonian Number: 45

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SITE RECORDERS		
Observed By	Address	
Brett Lenz	1608 Sanders Road, Ellensburg, WA 98926	
Date Recorded:	3/8/2021	
Recorded by (Professional Archaeologist):	Brett Lenz	
Organization:	Columbia Geotechnical Associates	Phone Number: 509-933-3081
Address:	1608 Sanders Road, Ellensburg, WA 98926	Email: brettlenz@gmail.com
SITE HISTORY		
Previous Archaeological Work: During the course of planned fill removal and archaeological monitoring along the western margin of the Quiet Cove property, shell midden was exposed in the active cutbank. Excavation work was halted immediately, and excavation equipment was removed from the area. Site archaeologists verified that the discovery was midden and that it was intact. The discovery area was cordoned off with flagging tape to keep people and equipment from entering and possibly disturbing the midden. Prior to its discovery, remedial excavation was performed in the area to remove soil contaminated with petroleum hydrocarbon. At approximately 2.5 to 3 feet below ground surface, historical beach levels (the historic land surface) were uncovered. At this horizon, the backhoe revealed a series of pipes reported by project engineers as former oil product lines that would transport product from the former pier to the project area. An area of both clearly disturbed and intact shell midden in the strata which included the metal pipes was exposed. Upon discovery of the midden, work was halted in the area and it was flagged with survey flags and neon survey tape to delineate a "no work zone". The construction crew was informed of the development. Brett Lenz notified Geoengineers of the discovery and Geoengineers notified the Port of Anacortes. The Port then asked that contact be made immediately with the Department of Archaeology, the Samish, Swinomish and Lummi Tribal representatives to initiate consultation, which was already underway.		
LAND OWNERSHIP		
Owner	Address	Parcel
Port of Anacortes	100 Commercial Ave, Anacortes, WA 98221	p55354
RESEARCH REFERENCES		
Items/Documents Used in Research:		

ARCHAEOLOGICAL SITE INVENTORY FORM

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USGS MAP



DRAFT

Smithsonian Number: 45

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SKETCH MAPS

ARCHAEOLOGICAL SITE INVENTORY FORM

Smithsonian Number: 45

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Photographs, Tables and Additional Information



Photo ID 513862
Title Quiet Cove Midden.png
Year Taken
Is Circa? ☐
Notes
Type image/png
Photo View
Source
Copyright ☐

ARCHAEOLOGICAL SITE INVENTORY FORM

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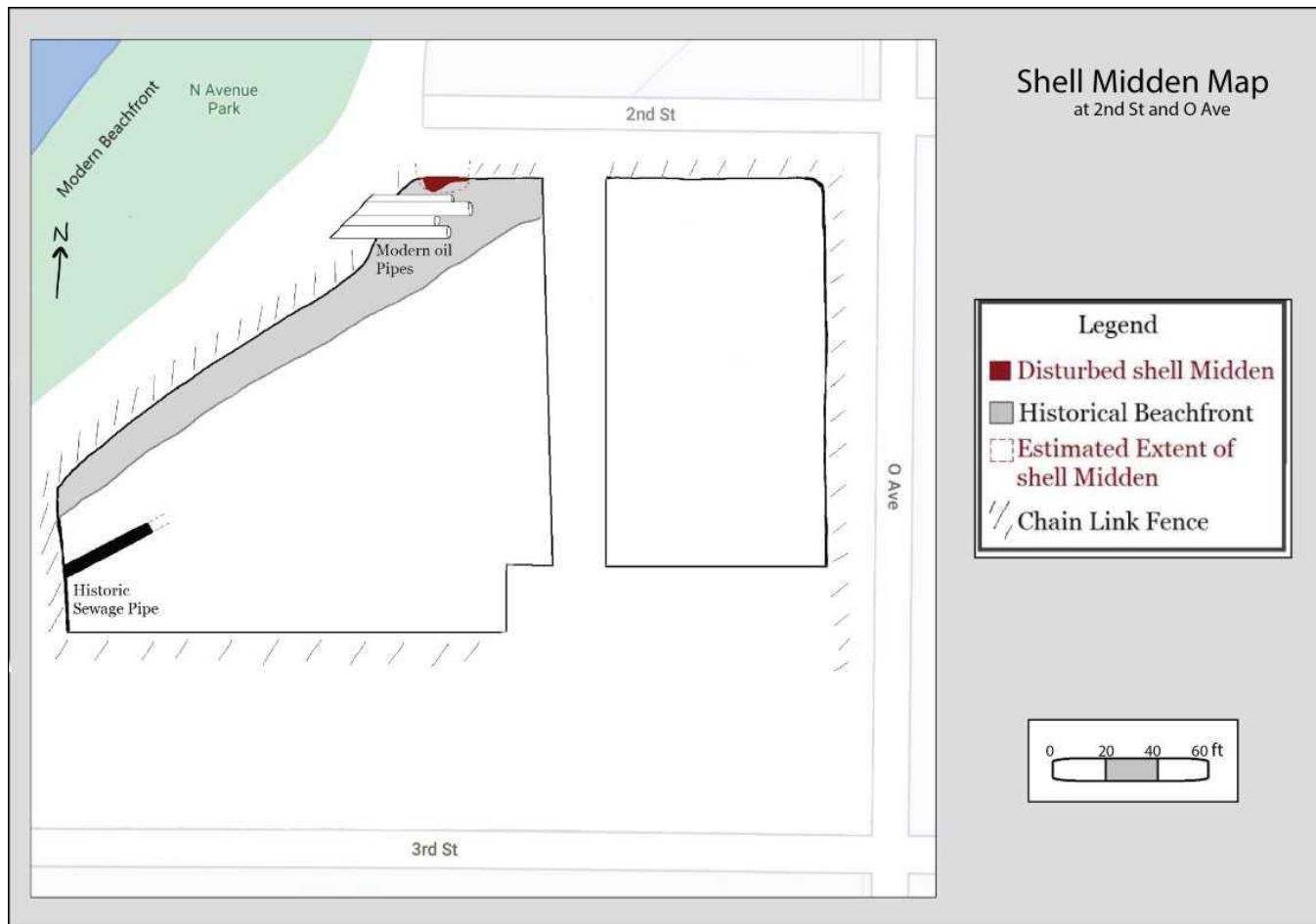


Photo ID 518140
 Title Shell Midden map-1.png
 Year Taken
 Is Circa? ☐
 Notes
 Type image/png
 Photo View
 Source
 Copyright ☐

DRAINAGE REPORT

Curtis Wharf Entrance and Redevelopment
Anacortes, WA 98221

April 2023

Prepared For:
Port of Anacortes
100 Commercial Avenue
Anacortes, WA 98221

For Submittal to:
City of Anacortes



Seattle | Mount Vernon | Whidbey Island | Federal Way | Spokane
2210 Riverside Drive, Suite 110
Mount Vernon, WA 98273
Tel 360.899.1110

CERTIFICATE OF ENGINEER
Drainage Report for
Curtis Wharf Entrance and Redevelopment

The technical material and data contained within this report has been prepared by or under the direction of the following registered professional engineer(s), licensed in accordance with the laws of the State of Washington to practice in the State of Washington.



QUICK REFERENCE PROJECT INFORMATION

General Project Information

Project Name	Curis Wharf Entrance Redevelopment
Project Description	The project involves the repaving of the intersection of 2 nd Street and O Avenue, construction of the paved entrance to Curtis Wharf and associated sidewalk, in Anacortes, Washington.
Owner	City of Anacortes Washington
Location	SE ¼, SEC 13, T35N, R1E, Skagit County, Washington and, SW ¼, SEC 18, T35N, R2E, Skagit County, Washington
Site Access	Travel north on Commercial Avenue, turn west on 2 nd Street, at intersection of O avenue and 2 nd Street
Parcel Number	P31510, P55355 and P55361
Project Size	0.584 Total Acres
Land Use	Manufacturing and Shipping
Project Client Representative	Port of Anacortes Attn: Brad Tesch 100 Commercial Avenue Anacortes, WA 98221 Ph: 360.299.1830
Surveyor	Pacific Surveying & Engineering, INC. 909 Squallicum Way, Suite111 Bellingham, WA 98225 Ph: 360.671.7387
Drainage Engineer	DCG/Watershed Attn: Selina Gilbertson, P.E. 2210 Riverside Drive, Suite 110 Mount Vernon, WA 98273 Ph: 360.899.1110 x2084

Drainage

Existing Conditions	The site consists of an existing roadway and associated sidewalk. The site is generally flat. Stormwater runoff drains to nearby existing catch basins and into existing stormwater lines generally flowing North and discharges into Guemes Channel. See the Existing Conditions & Demo Plan in the Civil Plan Set in APPENDIX A. A survey was done for the entire project site showing existing conditions which can be found in APPENDIX C.
Developed Conditions	The proposed development includes the repaved intersection, wharf entrance, proposed gates, proposed fencing, and concrete sidewalk. See Civil Plan Set in APPENDIX A.
Major Site Soils	Clallam-Urban land complex (31), 0-8% slopes, HSG "C" See the NRCS Soils Report in APPENDIX B for site soil details.
Recommended Drainage Best Management Practices (BMPs)	Stormwater runoff from the pollution generating roadway will be collected and conveyed through catch basins and treated by V-10 - Manufactured Treatment Modular Wetland before being tightlined to the City of Anacortes storm drain facility. Additionally, T5.13 - Post-Construction Soil Quality and Depth Stormwater management shall be applied to pervious landscaped areas throughout the site.

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1.0 PROJECT OVERVIEW

The project is located in Anacortes, Washington at the intersection of 2nd Street and O Avenue as shown below in FIGURE 1. The project's total area is 0.584 acres (25,459 SF) according to City of Anacortes Interactive Map. Proposed development includes the repaving of the intersection of 2nd Street and O Avenue, construction of the paved entrance to the wharf, proposed gates, and associated sidewalk. Approximately 0.584 acres (25,459 SF) of replaced impervious area is proposed.

See FIGURE 1 (not to scale) below for a vicinity map of the parcel. Site can be accessed by 2nd Street in Anacortes, Washington by heading north onto Commercial Avenue and turning left on 2nd Street. Additional information regarding existing and proposed infrastructure is included in the Civil Plan Set provided in APPENDIX A.

The proposed stormwater improvements have been designed in compliance with the 2019 Stormwater Management Manual for Western Washington (2019 SWMMWW), City of Anacortes Stormwater Management Plan (updated March 2022), and Anacortes Municipal Code (AMC).



FIGURE 1 Vicinity (Not to scale)

See FIGURE 2 for a view of the 2nd Street and O Avenue intersection looking east. The existing gravel roadway edge of 2nd Street can be seen meeting O Avenue. See FIGURE 3 for a view of 2nd Street meeting the Curtis Wharf entrance. The existing gravel edge of O Avenue can be seen meeting the Curtis Wharf entrance.



FIGURE 2 O Avenue & 2nd Street Intersection

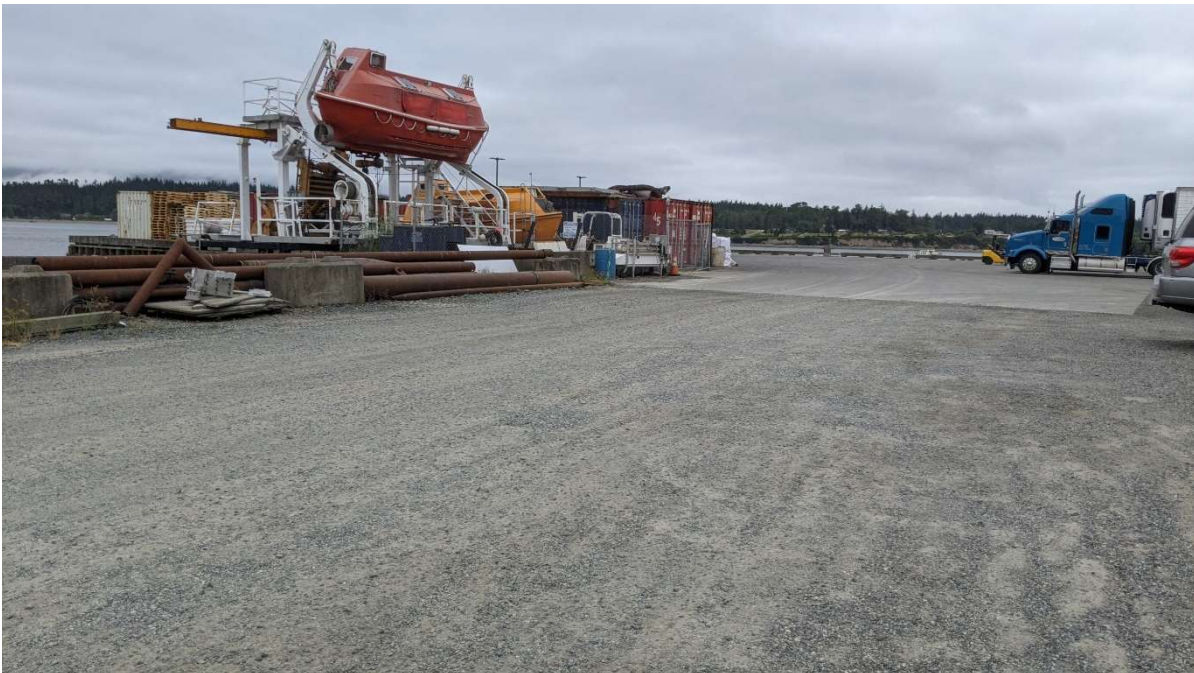


FIGURE 3 Entrance of Curtis Wharf

GENERAL DESCRIPTION OF PROJECT

The project proposes repaving the intersection of 2nd Street and O Avenue, paving the current gravel entrance on O Avenue and construction of new concrete walkways. The proposed paved entrance will cover a total surface area of approximately 18,450 SF (0.424 acres), the repaved intersection will cover a total area of approximately 4,550 SF (0.104 acres) and concrete walk totals approximately 2,459 SF (0.056 acres). The total replaced

impervious coverage will cover approximately 25,459 SF (0.584 acres). See TABLE 1 for a summary of impervious coverage. A detail of the proposed improvements is included in the Civil Plan Set in APPENDIX A of this report.

SITE AREA AND SIZE OF IMPROVEMENTS

The entire site is approximately a total of 0.584 acres located at 2nd Street and O Avenue. The project proposes 25,459 SF (0.584 acres) of replaced impervious surface.

The areas in TABLE 1 were determined by measurements in AutoCAD from the Civil Plan Set included in APPENDIX A.

Table 1 Developed Site Conditions

AREA DESCRIPTION	PROJECT AREA TOTALS	
	SQ. FT.	ACRES
Non-Pollution Generating Impervious Surfaces (Non-PGIS)		
Concrete Sidewalk	2,459	0.056
Pollution Generating Impervious Surfaces (PGIS)		
Asphalt Pavement	23,000	0.528
Total	25,459	0.584

DEVELOPED SITE AND RUNOFF CONDITIONS

The developed site conditions are based on the Civil Plan Set, located in APPENDIX A.

Stormwater runoff from the proposed asphalt entrance and concrete walk within the project area will be conveyed by catch basins and sheet flow to a Contech Modular Wetland biofiltration system before entering the existing City of Anacortes storm drainage system. Stormwater will then make its way through the existing City of Anacortes's storm drain system north under O Avenue, through an existing DOE GULD Vortechs 9000 pretreatment vault and eventually discharge into Guemes Channel. Details regarding the Modular Wetland can be found in the Civil Plan set in APPENDIX A. Operation and maintenance instructions for proposed stormwater facilities can be found in APPENDIX E of this report.

2.0 EXISTING CONDITIONS SUMMARY

SITE TOPOGRAPHY

The topography of the project site is generally flat with a few feet of elevation differential across the entire property.

EXISTING DRAINAGE PATTERNS

The entirety of the site is covered in impervious surfacing consisting of gravel, asphalt pavement, or concrete walk. The general stormwater flow does not follow any distinct pattern causing storm water to sheet flow to the nearest catch basin.

SITE SOILS AND GROUND COVER

The Natural Resources Conservation Service (NRCS) soil survey classifies site soils of the project area as primarily Clallam-Urban land complex, belonging to hydraulic soil group "C". See the NRCS Soil Report in APPENDIX B for more soil details.

CRITICAL AREAS

Per City of Anacortes Municipal Code 19.70 the critical areas regulated by the jurisdiction include:

- Wetlands
- Critical Aquifer Recharge Areas
- Geologically Hazardous Areas
- Fish and Wildlife Habitat Conservation Areas
- Frequently Flooded areas

The project site does not lie within or contain any wetlands, aquifer recharge areas, geologically hazardous areas, or any fish and wildlife habitat conservation areas. A review of the Anacortes Critical Areas map did not indicate wetlands within the project site, nor did it indicate that the project site will impact or be impacted by existing aquifer recharge areas. The site lies in a Tsunami Hazard Zone though it is not within a frequently flooded area.

ADJACENT AREAS AND EXISTING DEVELOPMENT

Bounding the site to the north is Curtis Wharf. To the west and south of the site is property classified as Manufacturing and Shipping per the city of Anacortes Interactive Map, see FIGURE 1 for an aerial image surrounding the site. Bounding the site to the east is the continuation of 2nd Street.

3.0 APPLICABLE MINIMUM REQUIREMENTS

The City of Anacortes uses the Stormwater Management Manual for Western Washington (SWMMWW) for stormwater guidelines. Volume 1 of the SWMMWW outlines the Minimum Technical Requirements applicable to new development, redevelopment, and road-related projects. Figure 1-3.2 of the SWMMWW is a diagram to aid in the determination of the minimum technical requirements applicable to redevelopment projects. Figure 1-3.2 from the SWMMWW is included below in FIGURE 4.

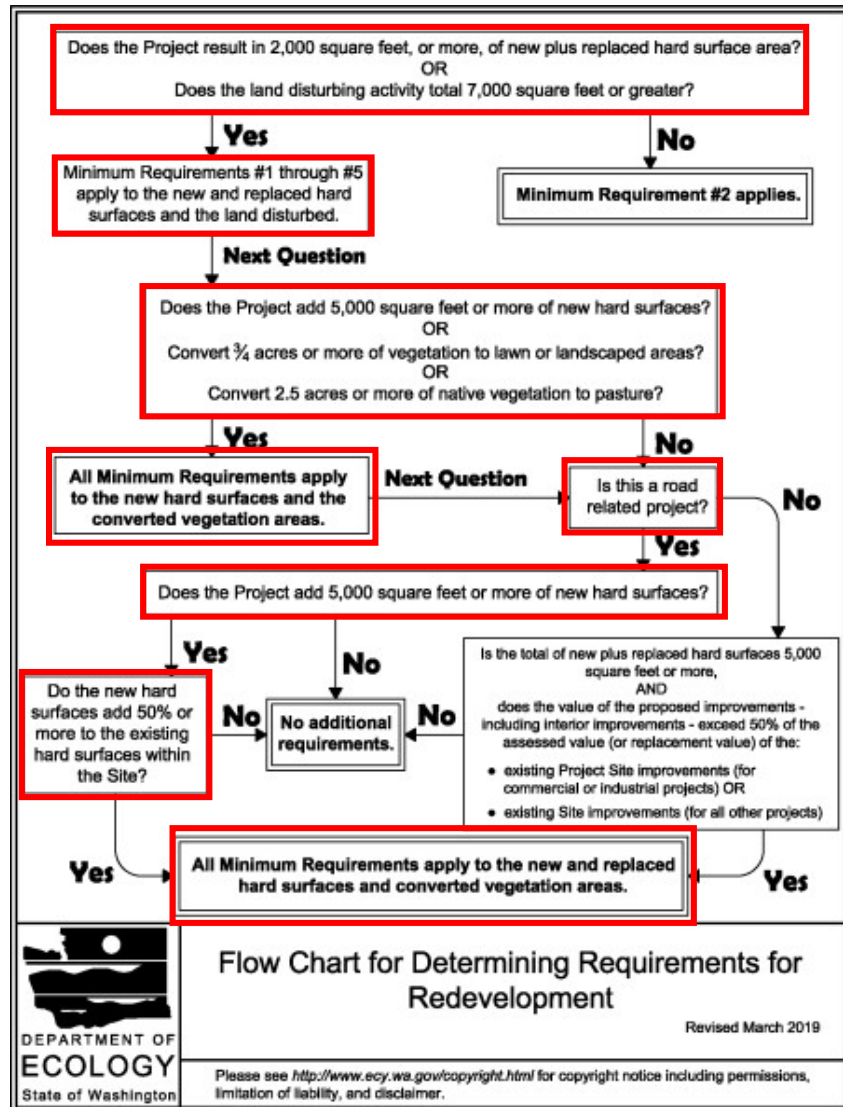


FIGURE 4 Stormwater Management Manual for Western Washington – Volume I – Figure 1-3.2

As shown in FIGURE 4, because the proposed project will install more than 5,000 SF of new plus replaced hard surface area and is road related, all minimum requirements apply to the project.

MINIMUM REQUIREMENT #1: PREPARATION OF STORMWATER SITE PLANS

The Stormwater Site Plan was prepared in accordance with Volume 1, Chapter 3 of the SWMMWW and includes the minimum requirements applicable to the subject site based on the thresholds of new and replaced site impervious coverage. This document shall serve as the Stormwater Site Plan for this project. The Project Plans submitted separately supplement this document and are referred to herein. The civil site plan is attached to this report in APPENDIX A.

MINIMUM REQUIREMENT #2: STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

The Construction Stormwater Pollution Prevention Plan, which complies with the required elements outlined in Volume I, Section 3.4.2 of SWMMWW is provided in the Project Plans submitted separately and serves as a guide for the contractor to implement a final Temporary Erosion and Sediment Control (TESC) Plan.

See Section 5 of this report for additional SWPPP details.

MINIMUM REQUIREMENT #3: SOURCE CONTROL OF POLLUTION

In general, the purpose of source control BMPs is to protect potential downstream receiving waters from stormwater runoff discharges that have been or could be composed of contaminants outside of the stormwater itself. The activities and BMPs are outlined in Volume IV of the SWMMWW.

Section IV-2 Source Control BMPs Applicable to All Sites discusses general source control BMPs that shall be followed when a site includes any kind of development that could pollute downstream stormwater. Under this section in the SWMMWW all BMPs apply; however, an emphasis on the following BMPs seem pertinent to the developed site:

- BMPs for Good Housekeeping
 - The following is a partial list of applicable BMPs. Please refer to this BMP in Volume IV of the SWMMWW manual for the complete list:
 - Promptly contain and clean up solid and liquid pollutant leaks and spills including oils, solvents, fuels, and dust from manufacturing operations on any exposed soil, vegetation, or paved area.
 - If a contaminated surface must be pressure washed, collect the resulting washwater for proper disposal (usually involves plugging storm drains, or otherwise preventing discharge and pumping or vactoring up washwater, for discharge to sanitary sewer or for vactor truck transport to a wastewater treatment plant for disposal).
 - Sweep all appropriate surfaces with vacuum sweepers quarterly, or more frequently as needed, for the collection and disposal of dust and debris that could contaminate stormwater.
 - Do not hose down pollutants from any area to the ground, storm drains, conveyance ditches, or receiving water unless necessary for dust control purposes to meet air quality regulations. Convey pollutants before discharge, to treat system approved by the local jurisdiction.
 - Clean oils, debris, sludge, etc. from all stormwater facilities regularly, including catch basins, settling/detention basins, oil/water separators, boomed areas, and conveyance systems to prevent the contamination of stormwater.
 - Promptly repair or replace all substantially cracked or otherwise damaged paved secondary containment, high-intensity parking, and any other drainage areas, subjected to pollutant material leaks or spills. Promptly repair or replace all leaking connections, pipes, hoses, valves, etc., which can contaminate stormwater.
 - Do not connect floor drains in potential pollutant source areas to storm drains, surface water, or to the ground.
 - At industrial and commercial facilities, drain oil and fuel filters before disposal. Discard empty oil and fuel filters, oily rags, and other oily solid waste into appropriately closed

and properly labeled containers, and in compliance with the Uniform Fire Code or International Building Code.

- BMPs for Streets and Highways
 - The following is a partial list of applicable BMPs. Please refer to this BMP in Volume IV of the SWMMWW manual for the complete list:
 - Deicing and Anti-Icing Operations:
 - Adhere to manufacturer's guidelines and industry standards of use and application.
 - Sweep/clean up accumulated de and anti-icing materials and grit from roads as soon as possible after the road surface clears.
 - Minimize use in areas where runoff or spray from the roadway immediately enters sensitive areas such as fish-bearing streams.
 - Maintenance Operations:
 - Collect and contain all solids, slurry, and rinse water. Do not allow these to enter gutters, storm drains, or drainage ditches or onto the paved surface of a roadway or driveway.
 - Designate an area onsite for washing hand tools and collect that water for disposal.
 -
- BMP S417 – Maintenance of Stormwater Drainage and Treatment Systems
 - Pollutant Control Approach: Provide maintenance and cleaning of debris, sediments, and oil from stormwater collection, conveyance, and treatment systems to obtain proper operation.
 - Applicable Operational BMPs: Maintain stormwater treatment facilities per the operations and maintenance (O&M) procedures presented in Section 4.6 of Volume V.

MINIMUM REQUIREMENT #4: PRESERVATION OF NATURAL DRAINAGE SYSTEMS AND OUTFALLS

The proposed improvements attempt to emulate the pre-developed conditions of the site to the project's fullest extent. Stormwater runoff from the proposed impervious surfaces on site shall drain to catch basins located throughout the site. Catch basins shall then discharge to the existing City of Anacortes storm drain system as they do in the projects existing state.

MINIMUM REQUIREMENT #5: ON-SITE STORMWATER MANAGEMENT

According to Volume I Section 3.4.5 of the SWMMWW, On-Site Stormwater Management requirements for projects triggering minimum requirements #1 through #9 must meet the requirements of Table I-3.2. Requirements can be found in FIGURE 5. This project will be designed to meet the requirements of List #3.

Table I-3.2: The List Approach for MR5 Compliance

List #1 (For MR #1 - #5 Projects That Are Not Flow Control Exempt)	List #2 (For MR #1 - #9 Projects That Are Not Flow Control Exempt)	List #3 (For Flow Control Exempt Pro- jects)
Surface Type: Lawn and Landscaped Areas		
BMP T5.13: Post-Construction Soil Quality and Depth	BMP T5.13: Post-Construction Soil Quality and Depth	BMP T5.13: Post-Construction Soil Quality and Depth
Surface Type: Roofs		
1. BMP T5.30: Full Dis- persion or BMP T5.10A: Downspout Full Infiltration	1. BMP T5.30: Full Dis- persion or BMP T5.10A: Downspout Full Infiltration	1. BMP T5.10A: Downspout Full Infiltration
2. BMP T5.14: Rain Gardens or BMP T7.30: Bioretention	2. BMP T7.30: Bioretention	2. BMP T5.10B: Downspout Dispersion Systems
3. BMP T5.10B: Downspout Dispersion Systems	3. BMP T5.10B: Downspout Dispersion Systems	3. BMP T5.10C: Perforated Stub-out Connections
4. BMP T5.10C: Perforated Stub-out Connections	4. BMP T5.10C: Perforated Stub-out Connections	
Surface Type: Other Hard Surfaces		
1. BMP T5.30: Full Dis- persion	1. BMP T5.30: Full Dis- persion	
2. BMP T5.15: Permeable Pavements or BMP T5.14: Rain Gardens or BMP T7.30: Bioretention	2. BMP T5.15: Permeable Pavements	BMP T5.12: Sheet Flow Dis- persion or BMP T5.11: Concentrated Flow Dispersion
3. BMP T5.12: Sheet Flow Dispersion or BMP T5.11: Concentrated Flow Dispersion	3. BMP T7.30: Bioretention 4. BMP T5.12: Sheet Flow Dispersion or BMP T5.11: Concentrated Flow Dispersion	

FIGURE 5 Stormwater Management Manual for Western Washington – Volume I – Table I-3.2

The proposed project does qualify as flow control exempt in accordance with Section 3.4.7 in Volume I of the SWMMWW (See Minimum Requirement #7) as stormwater will discharge eventually to the Guemes Channel. The proposed project will follow List #3 of the SWMMWW according to Table I-3.2 On-site Stormwater Management Requirements for Projects Triggering Minimum Requirements #1-#9 as seen in FIGURE 5.

Lawn and Landscaped Areas:

The only BMP listed for lawn and landscaped areas included in List #3 is T5.13, Post-Construction Soil Quality and Depth. This BMP will be applied as necessary.

Roofs:

The proposed project does not include the construction of any roof areas. BMPs for roofs will not be applicable to the site.

Other Hard Surfaces:

Other hard surfaces on the project include a paved roadway and walkways.

BMP T5.12 – Sheet Flow Dispersion or BMP T5.11 – Concentrated Flow Dispersion are the choices under list #3. The proposed concrete walkway shall be graded so stormwater runoff will flow onto the proposed asphalt road.

The proposed asphalt road shall be graded so that stormwater will flow to catch basins that connect and discharge to a Contech Modular Wetland structure at the northeast end of the road and into the City of Anacortes stormwater network.

MINIMUM REQUIREMENT #6: RUNOFF TREATMENT

Section 3.6.1 Volume I of the SWMMWW outlines the thresholds that require the construction of stormwater facilities. Since the proposed project will install more than 2,000 SF of pollution-generating hard surfaces (PGHS), and discharges to the Guemes Channel, the project requires the construction of an enhanced stormwater treatment facility.

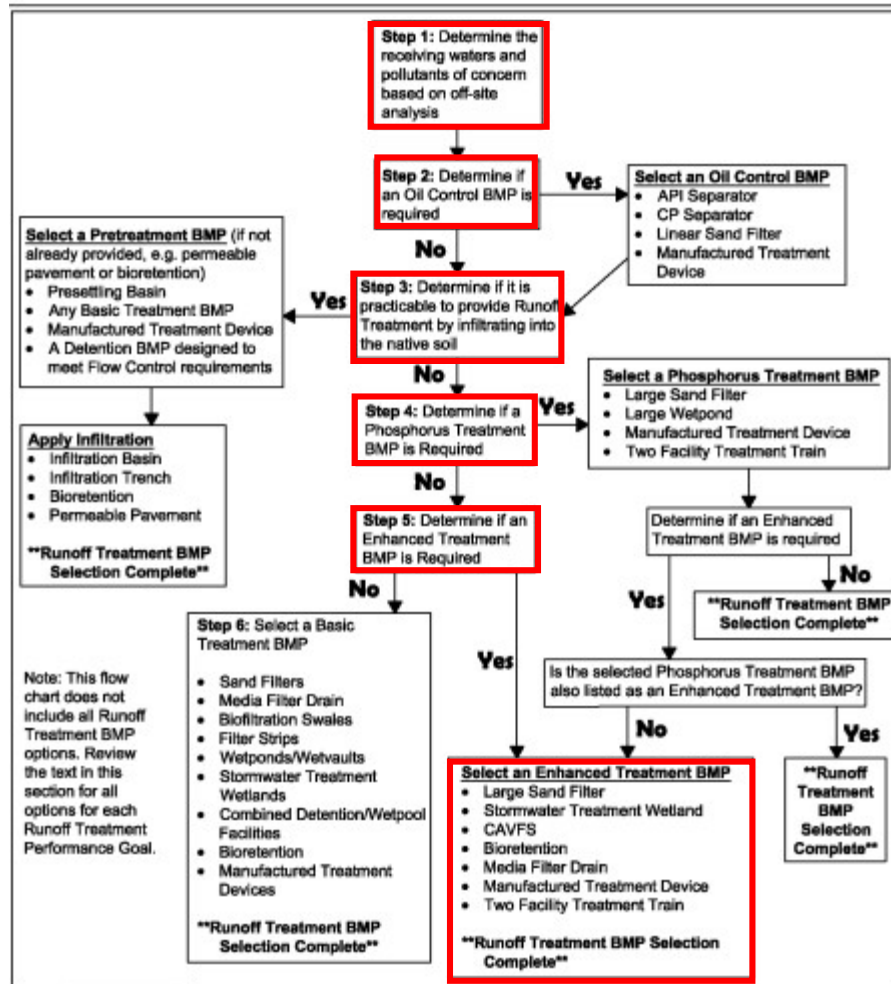


FIGURE 6 Stormwater Management Manual for Western Washington – Volume I – Figure III-1.1

FIGURE 6 above was used to help determine the best treatment facility for all PGHS. The steps were followed in the figure to potential basic treatment facilities that could be used to treat the drive aisle storm water.

Step 2 is to determine if an oil control facility is required for the proposed project. Oil controlled facilities are required on projects that have “high-use sites.” According to the SWMMWW a “high-use site” is classified as:

- An area of a commercial or industrial site subject to an expected average daily traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area;
- An area of commercial or industrial site subject to petroleum storage and transfer in excess of 1,500 gallons per year, not including routinely delivered heating oil;

- An area of commercial or industrial site subject to parking, storage or maintenance of 25 or more vehicles that are over 10 tons gross weight (trucks, buses, trains, heavy equipment, etc.);
- A road intersection with a measured ADT count of 25,000 vehicles or more on the main roadway and 15,00 vehicles or more on any intersecting roadway, excluding projects proposing primarily pedestrian or bicycle use improvements.

The first criteria states there would need an oil facility if the ADT count is equal or greater than 100 vehicles per 1,000 square feet of gross building area. The redeveloped road does not access any buildings; therefore, the ADT will be under the 25,000 threshold; therefore an oil facility is not required.

Step 3 in determining a treatment facility looks at infiltration for pollutant removal. Characteristics of the native soil are not known to meet the site suitability criteria for treatment.

Step 4 asks about control of phosphorous. The location of the proposed project is not known to be subject to a site where phosphorous control is required.

Step 5 talks about enhanced treatment options and if they are required for the project. In accordance with SWMMWW, enhanced treatment is required for projects that 1) discharge directly to fresh waters or conveyance systems tributary to fresh waters designated for aquatic life use or that have an existing aquatic life use; or 2) use infiltration strictly for flow control – not treatment – and the discharge is within ¼ mile of fresh water designated for aquatic life use or that has an existing aquatic life use. The proposed project directly discharges into the existing storm drain system which directly ties to the Guemes Channel therefore enhanced treatment is required.

A V-10 Manufactured Treatment Device is being utilized as the treatment facility for this project. The Contech Modular Wetland biofiltration system is proposed to treat stormwater runoff from the pollution generating impervious surface (PGIS) asphalt roadway and concrete sidewalk (graded towards PGIS roadway) runoff totaling 14,397 SF (0.329 ac) of impervious surface runoff entering the Modular Wetland. Runoff from the northern drive lane of 2nd Street, concrete sidewalk north of 2nd Street, new asphalt Curtis Wharf Entrance, and proposed concrete walk will be collected and conveyed to the proposed Contech Modular Wetland structure and then discharged into the existing storm drain system. Runoff from the concrete walkway is proposed to be treated through the facility as it will mix with the other pollution generating impervious surfaces prior to discharge. The southern half of the 2nd Street pavement will bypass the Modular Wetland as site grading limited the southern half of 2nd Street to sheet flow north. The southern half of 2nd street runoff shall make its way into existing catch basins as it does in its current drainage pattern and make its way to the City of Anacortes stormwater network.

A pollution generating drainage basin of 14,397 SF (0.329 ac) was modeled in the Western Washington Hydrology Model (WWHM). A 100-year flow rate of 0.3048 cfs and 15-minute water quality adjusted flow rate of 0.0435 cfs to gallons per min (gpm) was used to size the facility.

$$19.5 \text{ gpm} = \frac{0.0435 \text{ ft}^2}{\text{sec}} \times \frac{7.49 \text{ gal}}{\text{ft}^3} \times \frac{60 \text{ sec}}{\text{min}}$$

A Contech Representative also assisted in the sizing of the Modular Wetland. A modular wetland can treat 1 gpm per square foot of wetland cell surface.

An existing pretreatment DOE GULD approved Vortech 9000 facility exists downstream of the project. Stormwater runoff from this project and surrounding basins makes its way to the Vortech 9000 facility prior to discharging into Guemes Channel. This facility was sized previously to pretreat runoff from this project as well as surrounding areas. The previous report discussing the Vortech 9000 can be found in APPENDIX F of this report.

The results of the WWHM model used to size the Modular Wetland have been included in APPENDIX D along with a basin delineation map.

MINIMUM REQUIREMENT #7: FLOW CONTROL

Flow control requirements are outlined in Section I-3.4.7 Volume I of the 2019 SWMMWW.

The proposed stormwater runoff will be tightlined into the existing City of Anacortes stormwater infrastructure which ultimately discharges to Guemes Channel. Guemes Channel is classified in Appendix I-A of the 2019 SWMMWW as flow control exempt surface water.

MINIMUM REQUIREMENT #8: WETLANDS PROTECTION

The project does not discharge stormwater directly or indirectly to a wetland. Minimum Requirement #8 is not applicable per Volume 1, Section 3.4.8 of the SWMMWW.

MINIMUM REQUIREMENT #9: OPERATION AND MAINTENANCE

Operation and maintenance measures for the proposed stormwater improvements should meet the standard requirements of the 2019 Stormwater Management Manual for Western Washington. APPENDIX E includes the Operation and Maintenance procedures for the proposed stormwater facilities and BMPs as well as the maintenance procedures for the proposed Contech Modular Wetland structure.

4.0 OFF-SITE ANALYSIS

Stormwater runoff will enter the City of Anacortes's drainage system. The current system has total flow and treatment capacity to accept the runoff from the site. Details regarding the City's existing pretreatment drainage system capacity can be found in APPENDIX F.

5.0 STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

The project is anticipated to add or replace greater than 2,000 square feet of impervious surface and therefore requires the development and implementation of a SWPPP in compliance with the elements listed in Section 3.4.2 of Volume I of the Washington State Department of Ecology's SWMMWW. Temporary erosion and sediment control measures are shown in the Project Plans, submitted separately. Each of the 13 required elements of the SWPPP are addresses below:

ELEMENT NO. 1 –MARK CLEARING LIMITS

To protect adjacent properties and to reduce the area of soil exposed to construction, the limits of construction will be clearly marked before land-disturbing activities begin. The BMPs relevant to marking the clearing limits that will be applied for this project may include:

- Buffer Zones (BMP C102)
- High Visibility Plastic or Metal Fence (BMP C103)

ELEMENT NO. 2 – ESTABLISH CONSTRUCTION ACCESS

Construction activities occurring on unpaved areas shall be minimized and construction vehicle access will be limited to one entry, constructed according to SWMMWW standards, as depicted in the plan set attached to this report. The proposed construction access is located off 2nd Street and O Avenue and is shown on the TESC plan in. Street sweeping and street cleaning shall be employed to prevent sediment from entering the roadway or the roadway drainage system. The specific BMPs related to establishing construction access that will be used on this project include:

- Stabilized Construction Entrance (BMP C105)

ELEMENT NO. 3 – CONTROL FLOW RATES

If necessary, in addition to silt fencing, wattles or sediment traps may be used to control flows downstream of construction. The specific BMPs related to controlling flow rates may include:

- Wattles (BMP C235)
- Sediment Trap (BMP C240)

ELEMENT NO. 4 – INSTALL SEDIMENT CONTROLS

All stormwater runoff from disturbed areas shall pass through an appropriate sediment removal BMP before leaving the construction site. Sediment barriers and other BMPs intended to trap sediment on-site shall be constructed as one of the first steps in grading. The specific BMPs used for controlling sediment on this project include:

- Silt Fence (BMP C233)
- Sediment Trap (BMP C240)

In addition, sediment will be removed from paved areas in and adjacent to construction work areas manually or using mechanical sweepers, as needed, to minimize tracking of sediments on vehicle tires away from the site and to minimize wash off of sediments from adjacent streets in runoff.

Any accumulated sediment shall be removed after construction is complete.

ELEMENT NO. 5 – STABILIZE SOILS

Exposed and unworked soils shall be stabilized by application of effective BMPs to prevent erosion throughout the duration of the project. The specific BMPs for soil stabilization that shall be used on this project may include:

- Buffer Zones (BMP C102)
- Temporary and Permanent Seeding (BMP C120)
- Dust Control (BMP C140)

In general, cut and fill slopes will be stabilized as soon as possible, and soil stockpiles will be temporarily covered with plastic sheeting. All stockpiled soils shall be stabilized from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets and drainage channels.

ELEMENT NO. 6 – PROTECT SLOPES

The existing slopes shall be protected in a manner that minimizes erosion. The following specific BMPs may be used to protect slopes for this project:

- Nets and Blankets (BMP C122)

ELEMENT NO. 7 – PROTECT DRAIN INLETS

All storm drain inlets made operable during or potentially influenced by construction shall be protected to prevent unfiltered water from entering the drainage conveyance system. However, the first priority is to keep all access roads clean of sediment and prevent street wash water from entering storm drains until treatment can be provided. The following inlet protection measures will be applied on this project:

- Storm Drain Inlet Protection (BMP C220)

ELEMENT NO. 8 – STABILIZE CHANNELS AND OUTLETS

The use of a temporary sediment pond, straw wattles, silt fence and other pollutant removal devices should be strictly adhered to by the contractor to ensure no sediment laden stormwater enters the roadway and city stormwater system. Any temporary outlets or swale should be adequately stabilized through the use of rock or other energy dissipation devices.

ELEMENT NO. 9 – CONTROL POLLUTANTS

All pollutants, including waste materials and construction debris, that occur on-site shall be handled and disposed of in a manner that does not cause contamination of stormwater. Good housekeeping and preventative measures will be taken to ensure that the site will be kept clean, well-organized, and free of debris. The following pollutant control measures will be applied on this project:

- All vehicles, equipment, and petroleum product storage/dispensing areas will be inspected regularly to detect any leaks or spills, and to identify maintenance needs to prevent leaks or spills.

ELEMENT NO. 10 – CONTROL DE-WATERING

If necessary, the contractor shall submit a dewatering plan for the project. It is not anticipated that a dewatering plan will be necessary as below grade excavation is limited during construction.

ELEMENT NO. 11 – MAINTAIN BMPS

All temporary and permanent erosion and sediment control BMPs shall be maintained and repaired as needed to assure continued performance of their intended function. Maintenance and repair shall be conducted in accordance with each particular BMP's specifications.

All temporary erosion and sediment control BMPs shall be removed within 30 days after the final site stabilization is achieved or after the temporary BMPs are no longer needed. Trapped sediment shall be removed or stabilized on-site. Disturbed soil resulting from removal of BMPs or vegetation shall be permanently stabilized.

ELEMENT NO. 12 – MANAGE THE PROJECT

Erosion and sediment control BMPs for this project have been designed based on the following principles:

- Design the project to fit the existing topography, soils, and drainage patterns.
- Retain sediment on-site.
- Thoroughly monitor site and maintain all ESC measures.
- Emphasize protection of the critical areas and adjacent slough.

The project will be managed according to the following key project components:

Phasing of Construction

- The construction project is being phased to the extent practicable in order to prevent soil erosion, and, to the maximum extent possible, the transport of sediment from the site during construction.

Coordination with Utilities and Other Jurisdictions

- All BMPs shall be inspected, maintained, and repaired as needed to assure continued performance of their intended function. Site inspections shall be conducted by a person who is knowledgeable in the principles and practices of erosion and sediment control. This person has the necessary skills to:
 - Assess the site conditions and construction activities that could impact the quality of stormwater, and

- Assess the effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges.
- A Certified Erosion and Sediment Control Lead shall be on-site or on-call at all times.

Maintaining an Updated Construction SWPPP

- This SWPPP shall be retained on-site or within reasonable access to the site.
- The SWPPP shall be modified whenever there is a change in the design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the state.
- The SWPPP shall be modified if, during inspections or investigations conducted by the owner/operator, or the applicable local or state regulatory authority, it is determined that the SWPPP is ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site. The SWPPP shall be modified as necessary to include additional or modified BMPs designed to correct problems identified. Revisions to the SWPPP shall be completed within seven (7) days following inspection.

ELEMENT NO. 13 – PROTECT LOW IMPACT DEVELOPMENT BMPs

All low impact development BMPs shall be maintained and repaired as needed to assure continued performance of their intended function. Maintenance and repair shall be conducted in accordance with each particular BMP's specifications. The maintenance procedures are outlined in APPENDIX E. The following specific BMPs may be used to protect slopes for this project:

- Storm Drain Inlet Protection (BMP C102)
- Silt Fence (BMP C233)

Proposed ESC Measures
(All ESC Measures Shall Comply with the 2019 SWMMWW)

	ESC Measure	Comment
1	Identify Project Limits	Mark by fencing or other means to contain the grubbing and grading activities.
2	Catch Basin Inlet Protection	Install catch basin inlet protection in any drainage structures that may collect any stormwater flowing from the construction site.
3	Phase Grubbing and Grading	Phase clearing so that only those areas that are actively being worked are uncovered. From October 1 through April 30, no soils shall remain exposed for more than 2 days. From May 1 through September 30, no soils shall remain exposed for more than 7 days.
4	Install Straw Wattles	Install straw wattles around disturbed areas where sediment could be transported off-site. Adjust straw wattles as required by site conditions and construction sequencing.
5	Sod/Seed Exposed Areas	Cleared areas will be sod/seeded as soon as possible after grading completed (few weeks).
6	Soil Removal	Remove excess soil from the site as soon as possible after backfilling.
7	Protect Adjacent Properties	Adjacent properties shall be protected from sediment deposition by appropriate use of vegetative buffer strips, sediment barriers or filters, dikes or mulching, or by a combination of these measures and other appropriate BMPs.
8	Street Cleaning	Provide for periodic street cleaning to remove any sediment that may have been tracked out. Sediment should be removed by shoveling or sweeping and carefully removed to a suitable disposal area where it will not be re-eroded.
9	Inspect ESC BMPs	Inspect all erosion and sediment control BMPs installed regularly, especially after any large storm. Maintenance, including removal and proper disposal of sediment should be done as necessary.

6.0 SPECIAL REPORTS AND STUDIES

No special report or studies were prepared for this project.

7.0 OTHER PERMITS

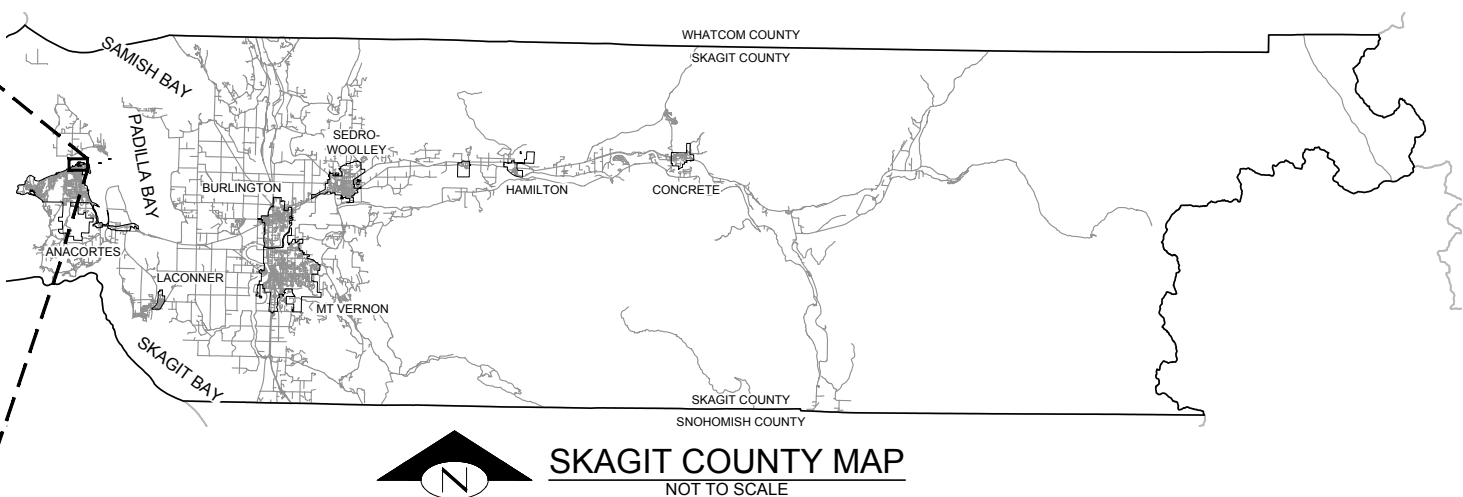
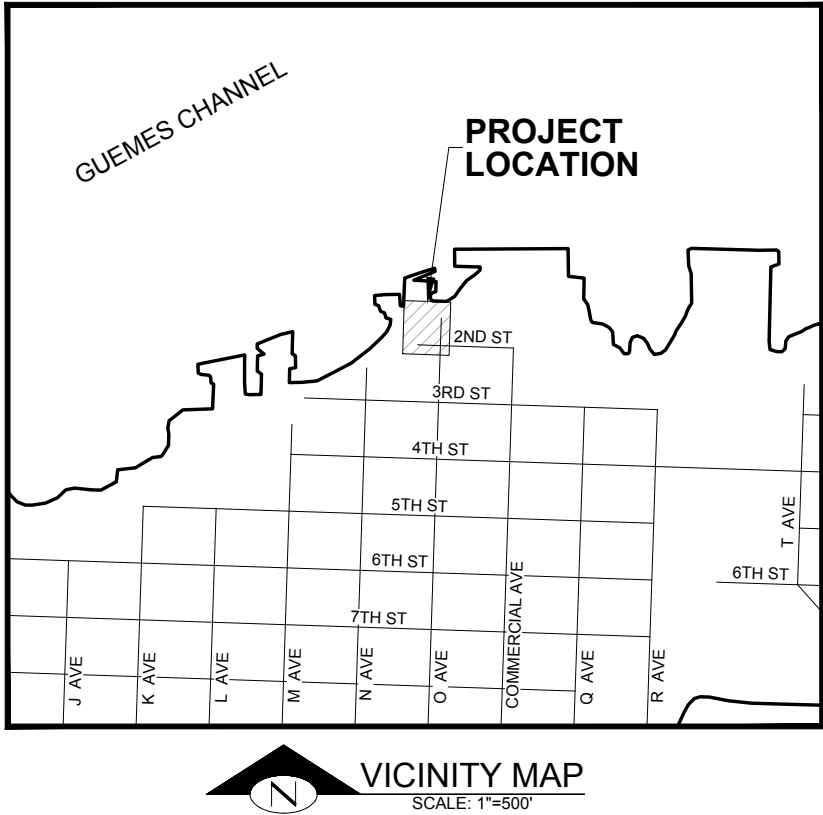
No other permits are known to exist with this project.

8.0 OPERATION AND MAINTENANCE MANUAL

See APPENDIX E for information on the operation and maintenance of on site catch basins and Contech Modular Wetland structure.

APPENDIX A Civil Plan Set

CURTIS WHARF ENTRANCE REDEVELOPMENT 2ND ST ANACORTES, WA 98221



SHEET INDEX	
SHEET #	SHEET TITLE
C01	COVER SHEET
C02	GENERAL NOTES
C03	EX CONDITIONS, DEMO, & TESC PLAN
C04	SITE PLAN
C05	GRADING & DRAINAGE PLAN
C06	ROAD & DRAINAGE PROFILES
C07	DETAILS
C08	DETAILS
C09	DETAILS
C10	DETAILS
C11	DETAILS
C12	DETAILS
C13	DETAILS

PROJECT INFORMATION:

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DAN WORRA, PORT EXECUTIVE DIRECTOR
BRENDA TREADWELL, DIRECTOR OF PLANNING, PROP. & ENV.
KEVIN ANDERSON, ENVIRONMENTAL SPECIALIST

PORT COMMISSIONERS:

BONNIE BOWERS
SHAWN OTTENBREIT
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ABBREVIATIONS:

CB	= CATCH BASIN
CL	= CENTERLINE
CY	= CUBIC YARD
CONC	= CONCRETE
DEMO	= DEMOLITION
EG	= EXISTING GRADE
EOP	= EDGE OF PAVEMENT
TESC	= TEMPORARY EROSION & SEDIMENTATION CONTROL
EX	= EXISTING
FG	= FINISH GRADE
FL	= FLOW LINE
FOC	= FACE OF CURB
HMA	= HOT MIX ASPHALT
HSS	= HOLLOW STRUCTURAL SECTION
IE	= INVERT ELEVATION
LF	= LINEAL FEET
PC	= POINT OF CURVATURE
PT	= POINT OF TANGENT
RET	= RETURN
SD	= STORM DRAIN
SDMH	= STORM DRAIN MANHOLE
SF	= SQUARE FEET
SS	= SANITARY SEWER
STA	= STATION
TOP	= TOP OF PAVEMENT
TYP	= TYPICAL
UGP	= UNDERGROUND POWER
W	= WATER



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NO.	DATE	BY	REVISION



PORT OF ANACORTES
CURTIS WHARF
PROJECT #MRT-64

COVER SHEET

DRAWN:	GR	PROJECT NO.:	XXX
DESIGN:	DO, SS	SCALE:	AS NOTED
CHECKED:	DO	DATE:	4/28/23
SHEET NO.		C01	

100% CONSTRUCTION SET

CAD FILE NUMBER: P:\CLIENTS\CIVIL\Public\ANACORTES - PORT OF CURTIS WHARF ENTRANCE REDEVELOPMENT DESIGN & BID SUPPORT\DWG\DRAWING\CURTIS WHARF REDEVELOPMENT.DWG
DATE: 4/28/2023 4:08 PM - SHEET SET: XXX - ORIGINAL SHEET SIZE: ANSI FULL BLEED (34.00 X 22.00 INCHES)
AUTOCAD VERSION: CIVIL 3D 2013

P:\CLIENTS\CIVIL\Public\ANACORTES - PORT OF CURTIS WHARF ENTRANCE REDEVELOPMENT DESIGN & BID SUPPORT\DWG\DRAWING\CURTIS WHARF REDEVELOPMENT.DWG TAB: C02 NOTES MODIFIED BY NDAVIS ON APR 28, 2023 - 16:08

GENERAL NOTES:

- 1. THE CONTRACTOR SHALL NOTIFY THE UNDERGROUND UTILITY LOCATE CENTER AT 1-800-424-5555 AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.
- 2. THE CONTRACTOR SHALL PROTECT IN PLACE, ALL UTILITIES, STRUCTURES AND FEATURES, WHETHER OR NOT SHOWN ON THESE PLANS. ANY DAMAGE TO EXISTING UTILITIES OR FEATURES SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.
- 3. LOCATIONS OF EXISTING FEATURES AND UTILITIES AS SHOWN ON THESE PLANS ARE APPROXIMATE AND BASED ON THE BEST AVAILABLE INFORMATION. ACTUAL LOCATIONS SHALL BE DETERMINED BY THE CONTRACTOR.
- 4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE MEANS, METHODS AND SEQUENCE OF CONSTRUCTION.
- 5. THE CONTRACTOR SHALL BE REQUIRED TO KEEP ACCURATE AS-BUILT DRAWINGS AND DELIVER THIS INFORMATION TO THE OWNER FOR PREPARATION OF AS-BUILT DRAWINGS.
- 6. ACCESS TO PRIVATE PROPERTY SHALL BE RESTORED DAILY.
- 7. STREETS SHALL BE SWEEPED DAILY OR AS NEEDED.

EROSION AND SEDIMENTATION CONTROL (ESC) NOTES:

- 1. THE CONTRACTOR SHALL MEET CITY OF ANACORTES STANDARDS AND REQUIREMENTS BY USING APPROPRIATE BEST MANAGEMENT PRACTICES (BMPs) FOR EROSION AND SEDIMENTATION CONTROL AS APPROVED BY THE COUNTY.
- 2. EROSION ON- AND OFF-SITE. DURING AND AFTER CONSTRUCTION, THE CONTRACTOR SHALL MINIMIZE EROSION AND SEDIMENTATION ON-SITE AND SHALL PROTECT PROPERTIES AND WATER COURSES DOWNSTREAM FROM THE SITE FROM EROSION DUE TO INCREASES IN THE VELOCITY AND PEAK FLOW RATE OF STORM WATER RUNOFF FROM THE SITE.
- 3. TRANSPORT OF SEDIMENT. THE CONTRACTOR SHALL PREVENT THE TRANSPORT OF SEDIMENT FROM THE SITE THROUGH MEASURES SUCH AS MULCHING, MATTING, COVERING, SILT FENCES, SEDIMENT TRAPS, SETTLING PONDS AND PROTECTIVE BERMS USING THE FOLLOWING BMPs: FILTER FENCE, STRAW BALE BARRIER, BRUSH BARRIER, GRAVEL FILTER BERM, SEDIMENT TRAP, TEMPORARY SEDIMENT POND, PRESERVING NATURAL VEGETATION, AND/OR BUFFER ZONES. TRANSPORT OF SEDIMENT ONTO PAVED SURFACES SHALL BE MINIMIZED, AND IF SEDIMENT IS TRANSPORTED ONTO A PAVED SURFACE, THE PAVED SURFACE SHALL BE CLEANED AT THE END OF EACH DAY IN ACCORDANCE WITH BMPs IN THE DRAINAGE MANUAL, OR APPROVED BY THE COUNTY. IN ADDITION, ACCESS ROADS MUST BE SPRAYED DOWN WITH WATER PERIODICALLY FOR DUST CONTROL PURPOSES.
- 4. STABILIZING EXPOSED SOIL. THE CONTRACTOR SHALL PREVENT ON-SITE EROSION BY STABILIZING ALL SOILS THAT ARE TEMPORARILY EXPOSED AND NOT BEING ACTIVELY WORKED, THROUGH SUCH METHODS AS THE INSTALLATION OF SEEDING, MULCHING, MATTING AND COVERING. CONTRACTOR SHALL APPLY ONE OR MORE OF THE FOLLOWING TEMPORARY ESC BMPs: TEMP SEEDING, MULCHING AND MATTING, CLEAR PLASTIC COVERING, AND/OR DUST CONTROL.
- 5. DENUDED AREAS SHALL BE STABILIZED AND SOIL STOCKPILES AS ESTABLISHED IN THE DRAINAGE MANUAL.
- 6. STORM DRAIN INLETS SHALL BE PROTECTED USING BMP STORM DRAIN INLET PROTECTION. THE COMMENDED INLET PROTECTION ALTERNATIVES ARE TRIANGULAR SILT DIKES; BIOLOGS; EXERTS (FOSS ENVIRONMENTAL); DANDY BAGS; AND, STRAW WATTLES.
- 7. NO MORE THAN THREE HUNDRED (300) FEET OF TRENCH MAY REMAIN OPEN AT ONE TIME. EXCAVATED MATERIAL SHALL BE PLACED ON THE UPHILL SIDE OF TRENCHES, UNLESS INCONSISTENT WITH SAFETY OR SITE CONSTRAINTS.
- 8. MAINTENANCE AND REPAIR OF EROSION AND SEDIMENTATION CONTROL MEASURES. THE CONTRACTOR SHALL MAINTAIN AND REPAIR AS NECESSARY ALL TEMPORARY AND PERMANENT EROSION AND SEDIMENTATION CONTROL BMPs TO ASSURE THEIR CONTINUED PERFORMANCE.
- 9. TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE MAINTAINED UNTIL FINAL SITE STABILIZATION.

STORM DRAINAGE:

- 1. TEMPORARY EROSION/WATER POLLUTION CONTROL MEASURES SHALL BE IN INSTALLED AS NECESSARY.
- 2. STORM DRAIN PIPE SHALL MEET THE FOLLOWING REQUIREMENTS:
 - SOLID WALL CORRUGATED HIGH DENSITY POLYETHYLENE PIPE WITH SMOOTH INTERIOR, CONFORMING TO AASHTO DESIGNATION M-252 TYPE S
 - PVC PIPE CONFORMING TO ASTM D 3034 SDR 35. PVC PIPE JOINTS SHALL CONFORM TO ASTM D 3212 WITH RESTRAINED GASKETS CONFORMING TO ASTM F 477
 - ALL PIPE JOINTS SHALL BE RUBBER GASKETED.
- 3. ALL STORM DRAIN PIPE SHALL BE BEDDED. BEDDING MATERIAL SHALL CONFORM TO "BEDDING MATERIAL FOR RIGID PIPE" AS SPECIFIED IN SECTION 9-03.15 OF THE STANDARD SPECIFICATIONS. BEDDING SHALL BE PLACED TO A MINIMUM DEPTH OF 6 INCHES UNDER THE BARREL OF THE PIPE AND 4 INCHES OVER THE CROWN.

- 4. TRENCH BACKFILL SHALL BE EXCAVATED NATIVE MATERIAL OR BANK RUN GRAVEL FOR TRENCH BACKFILL CONFORMING TO SECTION 9-03.19 OF THE STANDARD SPECIFICATIONS, DEPENDING ON THE SUITABILITY OF THE NATIVE MATERIAL TO COMPACTION. SUITABLE NATIVE MATERIAL SHALL BE FREE FROM MUD, MUCK, ORGANIC MATTER, BROKEN PAVEMENT, ROCKS GREATER THAN 6 INCH DIMENSION, AND OTHER DELETERIOUS MATERIAL, AND MUST BE CAPABLE OF COMPACTION TO MEET THE REQUIRED DENSITY AT THE TIME OF PLACEMENT. IF THE NATIVE MATERIAL CANNOT BE READILY COMPACTED TO THE SPECIFIED DENSITY, ONLY BANK RUN GRAVEL SHALL BE UTILIZED AND ANY INSUFFICIENTLY COMPACTED NATIVE MATERIAL SHALL BE REMOVED AND REPLACED WITH BANK RUN GRAVEL. THE NATIVE MATERIAL SHALL ONLY BE USED AND REMAIN IN PLACE IF INSITU COMPACTION TESTING PROVIDES SUFFICIENT EVIDENCE THAT THE SPECIFIED COMPACTION IS UNIFORMLY ATTAINED.

- ALONG AND OVER THE PIPE TO A DEPTH OF ONE FOOT ABOVE THE CROWN OF THE PIPE - 90 PERCENT OF MAXIMUM DENSITY.
- ABOVE ONE FOOT ABOVE THE CROWN OF THE PIPE IN UNIMPROVED AREAS - 90 PERCENT OF MAXIMUM DENSITY.
- ABOVE ONE FOOT ABOVE THE CROWN OF THE PIPE IN AREAS TO BE PAVED (ROADWAY AND/OR SIDEWALK)
- 95 PERCENT OF MAXIMUM DENSITY.

- 5. IN NO CASE SHALL THE FOOTING DRAINAGE SYSTEM AND THE ROOF DOWNSPOUT SYSTEM BE INTERCONNECTED.
- 6. PIPE ZONE BEDDING (MINIMUM 1' COVER) FOR STORM DRAIN PIPE PER ASTM D2321 (CLASS 1B) OR PER MANUFACTURER'S RECOMMENDATION.
- 1. WORK HOURS
THE CITY OF ANACORTES ORDINANCE ALLOWS WORK FROM 7:00 A.M. TO 10:00 P.M. SEVEN DAYS A WEEK (COA ORD. #2316). SOMEONE IN CHARGE TO BE ON SITE AT ALL TIMES WHEN WORK IS IN PROGRESS. IF WORK IS DONE ON WEEKENDS, PLEASE INFORM THE PROJECT MANAGER SO THE CITY OF ANACORTES CAN HAVE AN INSPECTOR ON SITE. CONTRACTOR WILL BE BILLED FOR CITY OF ANACORTES OVERTIME.
- 2. CALL 48-HOURS BEFORE THE FOLLOWING:
FOR INSPECTION CONTACT 360.299.1951.
 - A. PRIOR TO WORK START-UP
 - B. PRIOR TO ANY UTILITY CONSTRUCTION IN THE RIGHT OF WAY.
 - C. PRIOR TO POURING CAST-IN-PLACE CONCRETE STRUCTURES.
 - D. PRIOR TO PLACING ANY CRUSHED ROCK ON ROADWAY SUB GRADE.
 - E. PRIOR TO PLACING CURB, GUTTERS AND SIDEWALKS.
 - F. PRIOR TO ASPHALT PAVING.
- 3. MATERIALS AND WORKMANSHIP:
 - A. ALL MATERIALS USED, MUST MEET WSDOT, APWA AND CITY OF ANACORTES SPECIFICATIONS.
 - B. ALL WORK AND MATERIALS THAT DO NOT MEET THE ABOVE SPECIFICATIONS MUST BE REMOVED AS DIRECTED BY THE PROJECT INSPECTOR.
 - C. SUBGRADE COMPACTION TESTS: WILL BE DONE BEFORE ANY C.S.B.C IS PUT IN PLACE, ALL TRENCHES WILL BE TESTED FOR COMPACTION. THE MATERIAL TESTING LAB NEEDS 24-HOUR NOTICE. USE THE TESTING PROTOCOL PROVIDED BY THE CITY. ITEMS TO BE COMPACTION TESTED WILL INCLUDE THE PIPE BEDDING (SECTION 7-08.3(1)C), BACKFILL (SECTION 7-08.3(5) AND SUB GRADE FOR SURFACING (SECTION 2-06.3(2)) AND ASPHALT (SECTION 5-04.3(10)B).
 - D. INSPECTION: ALL ASPECTS OF THIS PROJECT WILL BE INSPECTED INCLUDING PIPING, BACKFILL, SUB GRADE, CONCRETE AND ASPHALT, AS WELL AS FORMS, CURB, GUTTER AND SIDEWALK. IF A PORTION GETS BACKFILLED BEFORE INSPECTION, THE CONTRACTOR WILL DIG UP THAT PORTION FOR INSPECTION. 24-HOUR NOTICE REQUIRED. KNOW THE SCHEDULE AND LET THE CITY KNOW.
 - E. TESTING PROTOCOL: PRIOR TO CONSTRUCTION, A PROCTOR AND SIEVE ANALYSIS SHALL BE SUBMITTED, REVIEWED AND APPROVED BY THE CITY OF ANACORTES ON ALL MATERIAL USED IN THE RIGHT-OF-WAY. SEE THE CITY OF ANACORTES TESTING SCHEDULE.
 - F. ALL COMPACTION TEST SHALL BE APPROVED BY THE CITY OF ANACORTES ENGINEER AND PROJECT MANAGER PRIOR TO PLACING OF CRUSHED SURFACING, ASPHALT, CURB, GUTTER, SIDEWALK (INCLUDING TRENCH RESTORATION WHEN TEST MAY BE REQUIRED IN EACH LIFT).
 - G. CITY OF ANACORTES MAY REQUIRE ADDITIONAL TESTS ON SUB GRADE, TRENCHES, CONCRETE, OR ASPHALT. THE COSTS OF TESTING SHALL BE PAID FOR AS INDICATED IN THE CONTRACT DOCUMENTS.
- 4. TRAFFIC CONTROL AND PUBLIC SAFETY:
 - A. FLAGGING: ALL FLAGGERS MUST HAVE FLAGGING CERTIFICATES AND MUST HAVE ATTENDED A FLAGGING COURSE OR AN OFF DUTY POLICE OFFICER IS REQUIRED. THE JOB WILL BE SHUT DOWN IF ANY UNCERTIFIED PEOPLE ARE FLAGGING. A STOP WORK ORDER WILL BE GIVEN AND WORK WILL NOT PROCEED UNTIL A CERTIFIED PERSON IS FLAGGING.
 - B. SIGNAGE: ALL SIGNAGE MUST BE PER THE MANUAL UNIFORM TRAFFIC DEVICES. BEFORE JOB IS TO BEGIN, PROPER SIGNAGE WILL BE IN PLACE WITH FLAGGERS IN PLACE IF NEEDED. EXTRA SIGNAGE MAY BE NEEDED. BE READY TO RENT SIGNS IF NEEDED.
 - C. TRAFFIC CONTROL PLAN: NEEDS TO BE SUBMITTED AND APPROVED BY THE ASSISTANT CITY ENGINEER PRIOR TO CONSTRUCTION START. TRAFFIC CONTROL PLAN SHALL INCLUDE THE LOCATION OF SIGNAGE, FLAGGERS, WORK ZONE, SAFE ZONE, AND TRAFFIC FLOW AND NEEDED DIMENSIONS. NO DETOURS ALLOWED WITHOUT APPROVAL FROM THE ASSISTANT CITY ENGINEER.
 - D. FOR STREET CLOSURE: CALL 911.
 - E. CONSTRUCTION SAFETY: IS THE RESPONSIBILITY OF THE CONTRACTOR.

- 5. ROADWAY EMBANKMENT AND SUBGRADE CONSTRUCTION:
 - A. CRUSHED SURFACING SHALL BE COMPACTED TO 95% OF MAXIMUM DENSITY. NO RECYCLED MATERIAL ALLOWED.
 - B. EMBANKMENT AND SUB GRADE MUST BE COMPACTED TO 95% OF MAXIMUM DENSITY.
 - C. PROPER MOISTURE MUST BE MAINTAINED THROUGHOUT PLACING AND COMPACTION.
 - D. COMPACTION TESTING TO BE PERFORMED BY AN INDEPENDENT LAB. USE A "MODIFIED PROCTOR".
- 6. TRENCHES IN DEVELOPED RIGHT-OF-WAY:
SEE CITY OF ANACORTES STANDARD CONSTRUCTION DETAILS AND SECTION 7 OF THE CURRENT WSDOT SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION.
 - A. PIPE ZONE SHALL BE COMPACTED TO 90% OF MAXIMUM DENSITY.
 - B. TRENCH ZONE SHALL BE COMPACTED TO 95% OF MAXIMUM DENSITY IN 12-INCH LIFTS
 - C. CRUSHED SURFACING SHALL BE COMPACTED TO 95% OF MAXIMUM DENSITY. NO RECYCLED MATERIAL ALLOWED.
- 7. DRAINAGE SYSTEM CONSTRUCTION:
 - A. ANY PERMANENT FLOW CONTROL FACILITY USED AS A TEMPORARY SETTLING BASIN SHALL BE MODIFIED WITH THE NECESSARY EROSION CONTROL MEASURES AND SHALL PROVIDE ADEQUATE STORAGE CAPACITY. IF THE FACILITY IS TO FUNCTION AS AN INFILTRATION SYSTEM, THE TEMPORARY FACILITY MUST BE GRADED SO THAT THE BOTTOM AND SIDES ARE AT LEAST THREE (3) FEET ABOVE THE FINAL GRADE OF THE PERMANENT FACILITY.
 - B. OVERFLOWS, SPILLWAYS, GRAVEL FILTER WINDOWS, MUST BE CONSTRUCTED PER PLANS AND SPECIFICATIONS. NO DEVIATIONS. AS-BUILT FOR VERIFICATION REQUIRED.
 - C. QUARRY ROCK MUST BE SOUND "HARD" DURABLE ROCK. NO RECYCLED MATERIAL.
 - D. GRASS LINED SWALE SHALL BE CONSTRUCTED PER THE DETAILS PROVIDED. NO DEVIATION ALLOWED. ALL SWALES MUST BE OPERATIONAL BEFORE ACCEPTANCE.
 - E. CATCH BASINS MUST BE SET TO LINE GRADE USING NO MORE THAN TWO (2) ADJUSTMENT BRICKS.
 - F. MINIMUM 1-FOOT SEPARATION BETWEEN PIPES IN TYPE II CATCH BASINS.

- 8. RESTORATION OF RIGHT-OF-WAY:
 - A. CONTRACTOR MUST LEAVE THE RIGHT-OF-WAY, EQUAL TO EXISTING OR BETTER CONDITION
 - B. PLACE COMPACTED TOPSOIL (SECTION 9-14.1(1), (2) AND (3)) AND SEED ALL AREAS DISTURBED BY EXCAVATION. (SECTION 9-14.2)
 - C. ALL DRAINAGE SYSTEMS MUST BE FULLY CLEANED, RESTORED AND OPERATIONAL BEFORE FINAL ACCEPTANCE. (SECTION 7-07.3).
- 9. FINAL INSPECTION AND ACCEPTANCE:
SEE SECTION 1-05.11 AND SECTION 1-08.5)
 - A. WHEN CONTRACTOR HAS COMPLETED ALL OF THE WORK ON THE APPROVED PLANS, THE CONTRACTOR WILL:
 - COMPLETE THE "FINAL INSPECTION GUIDELINES FOR CONTRACTORS INSPECTION FORM".
 - GIVE THE COMPLETED "FINAL INSPECTION GUIDELINES FOR CONTRACTORS INSPECTION FORM" TO THE PW INSPECTOR AND REQUEST A SITE INSPECTION. ALL SITE INSPECTIONS ARE ON WEDNESDAYS BETWEEN 9 AM AND 12 PM.
 - B. THE PROJECT MANAGER, ENGINEER OF RECORD, INSPECTOR, CONTRACTOR AND OTHER CITY OF ANACORTES DEPARTMENTS WILL WALK THE SITE AND CREATE A PUNCH LIST. THE CONTRACTOR WILL COMPLETE THE PUNCH LIST AND CHECK OFF EACH ITEM, THEN RETURN IT TO THE INSPECTOR FOR RE-INSPECTION. THE INSPECTOR WILL VERIFY THAT ITEMS ON WALK THROUGH ARE COMPLETED.
 - C. THE CITY WILL NOT MAKE THE FINAL INSPECTION UNTIL THE PHYSICAL WORK REQUIRED BY THE CONTRACT AND APPROVED PLANS, INCLUDING FINAL CLEANUP AND ALL WORK ORDERED BY THE PROJECT MANAGER, HAVE BEEN COMPLETED. (SECTION 1-05.11)
 - D. FINAL APPROVAL OF THE PROJECT WILL NOT BE GRANTED UNTIL "AS BUILT" DRAWINGS (BOTH DIGITAL AND HARD COPY) HAVE BEEN RECEIVED AND APPROVED BY THE PROJECT MANAGER.
 - E. THE CONTRACTOR MUST FURNISH ALL DOCUMENTATION REQUIRED BY LAW, TO ALLOW THE CITY OF ANACORTES TO PROCESS FINAL ACCEPTANCE OF THE CONTRACT.

- 19. MISCELLANEOUS:
 - A. AS-BUILTS: THE DEVELOPER WILL SUPPLY TO THE CITY, ONE HARD COPY AND ONE ELECTRONIC FILE (AUTOCAD VERSION 2002) OF AS-BUILT DRAWINGS TO INCLUDE ALL CITY UTILITIES. THE AS-BUILT DRAWINGS WILL BE SUBMITTED TO THE PROJECT MANAGER AT SUBSTANTIAL COMPLETION FOR REVIEW AND APPROVAL PRIOR TO THE ISSUANCE OF FINAL PROJECT APPROVAL AND ACCEPTANCE.

UTILITY LOCATES NUMBER: 1.800.424.5555. REQUIRED BEFORE STARTING ANY GROUNDWORK.

ASPHALT CONSTRUCTION:
SEE SECTION 5-05 AND SECTION 9 OF THE CURRENT WSDOT SPECIFICATION FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION.

FOR NEW DEVELOPMENT AND REDEVELOPMENT, EACH PROJECT WILL BE REQUIRED TO IMPLEMENT LOW IMPACT DEVELOPMENT GUIDELINES WHERE APPLICABLE.

- A. ALL ASPHALT TO BE REMOVED MUST BE SAW CUT. A JACKHAMMER CAN BE USED IF A NICE EVEN CUT IS MADE. WHEEL CUTTING IS NOT AN APPROVED METHOD UNLESS APPROVED BY THE CITY OF ANACORTES ENGINEER IN ADVANCE. ANY DEVIATION FROM THIS SPECIFICATION SHALL BE IN WRITING 48-HOURS BEFORE SAW CUTTING TAKES PLACE.
- B. ADDITIONAL ASPHALT MAY BE REQUIRED FOR REMOVAL BY THE CITY OF ANACORTES ENGINEER OR INSPECTOR.
- C. ALL VERTICAL DROP-OFFS WITHIN THE TRAVELED WAY WILL BE BACKFILLED EACH NIGHT.
- D. ABUTTING EDGES AND CURBS MUST BE THOROUGHLY CLEANED.
- E. ALL ASPHALT EDGING WILL BE TACKED PRIOR TO ASPHALTING.
- F. ALL ASPHALT PATCHES MUST BE A SMOOTH TRANSITION. NO BUMPS OR HIGH/LOW SPOTS (SECTION 5-04.3(13)). SURFACE SMOOTHNESS MAXIMUM VARIATION IN 10-FEET PARALLEL TO THE CENTERLINE IS 1/8" AND TRANSVERSE 1/4".
- G. SUB GRADE WILL BE COMPACTED AND TESTED PRIOR TO ASPHALTING.
- H. A MINIMUM OF 3-INCH HMA PATCH TO BE COMPACTED TO 92% MAX RICE DNEISTY (SECTION 5-04.3(10)B).
- I. ALL FINAL JOINTS AND SAW CUTS TO BE SEALED (SECTION 5-05.3(8)B) USING A HOT POURED JOINT SEALANT (SECTION 9-04.2(1). A PREFERRED SEALANT IS AR-4000.
- J. IN AREAS WHERE ASPHALT HAS BEEN REMOVED AND CDF IS IN THE TRENCH CURING, A STEEL PLATE IS REQUIRED FOR COVER WHILE IT IS CURING. PROVIDE ASPHALT AROUND STEEL PLATE TO PREVENT THE PLATE FROM RATTLING. THE CONTRACTOR WILL BE CALLED OUT AT ANYTIME TO CORRECT ANY RATTLING THAT PROVIDES COMPLAINTS.
- K. WHERE LOCAL BUSINESSES ARE AFFECTED, NO ASPHALTING WILL HAPPEN IN THE LANE OF TRAVEL. WORK WILL PROCEED BEFORE OR AFTER BUSINESS HOURS.
- L. ON MAJOR STREETS WHERE TRAFFIC CONGESTION IS A PROBLEM, THE PATCH WILL BE PROTECTED WITH A 1/4 INCH STEEL PLATE UNTIL SUFFICIENTLY COOLED.

CONCRETE CONSTRUCTION:
SECTION 8-04 AND 8-14 OF THE CURRENT WSDOT SPECIFICATION FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION.

FOR NEW DEVELOPMENT AND REDEVELOPMENT, EACH PROJECT WILL BE REQUIRED TO IMPLEMENT LOW IMPACT DEVELOPMENT GUIDELINES WHERE APPLICABLE.

- A. CALL FOR A FORMS INSPECTION BEFORE PLACING OF CONCRETE. CALL 360.299.1951 TO SCHEDULE.
- B. NO MONOLITHIC POURS ALLOWED PER THE CITY OF ANACORTES CITY ENGINEER. IN OTHER WORDS, THE SIDEWALK, CURB & GUTTER, DRIVEWAYS, DRIVEWAY APRONS, WHEELCHAIR RAMPS, ETC. ARE TO BE INDIVIDUAL POURS AND SEPARATED BY A FABRIC EXPANSION JOINT.
- C. PROTECTING THE CONCRETE IS THE RESPONSIBILITY OF THE CONTRACTOR. NO GRAFFITI, FOOTPRINTS, FINISHING BLEMISHES OR OTHER OBJECTIONABLE MARKS ALLOWED. IF ANY OF THIS TAKES PLACE, THE SECTION THAT IS DAMAGED WILL BE REPLACED.
- D. CONCRETE SHALL BE A 5.5 SACK MIX WITH A 28-DAY STRENGTH OF 3000 PSI. ANY DEVIATION FROM THIS SPECIFICATION SHALL BE IN WRITING 48-HOURS BEFORE CONCRETE IS PLACED.
- E. THE PAN AND WINGS SHALL BE STAMPED. THE USE OF 1-INCH CONSTRUCTION FENCING ACCEPTABLE. ROLLING IS NOT AN OPTION.
- F. DURING THE FIRST 14-DAYS OF CURING, THE CONTRACTOR MUST PROTECT FROM FREEZING.

CURB/GUTTER AND SIDEWALK WORKMANSHIP AND AESTHETICS:
PER STR-06.5, CITY OF ANACORTES ENGINEERING DEPARTMENT CHAPTER 3:

- 1. CURB, GUTTER, AND SIDEWALK CONSTRUCTION SHALL FOLLOW A TRUE AND UNIFORM HORIZONTAL AND VERTICAL ALIGNMENT.
- 2. THE HORIZONTAL AND VERTICAL SURFACES SHALL BE A SMOOTH BROOM FINISH WITH NO DETECTABLE FINISHING BLEMISHES, UNDULATIONS, RIPPLES, SWELLS, WAVES, RUTS, FURROWS, GRAFFITI OR OTHER OBJECTIONABLE MARKS. THE END RESULT SHALL BE A NEAT PROFESSIONALLY FINISHED APPEARANCE. THE EDGE FINISH ADJACENT TO THE EXPANSION JOINT MATERIAL SHALL BE CLEAN AND FREE OF EXCESS SLURRY. THE EXPANSION JOINT MATERIAL SHALL BE TRIMMED TO A LEVEL EVEN WITH THE ADJACENT CONCRETE RESULTING IN A NEAT AND PROFESSIONALLY FINISHED APPEARANCE.
- 3. THE EDGE FINISH ADJACENT TO THE EXPANSION JOINT MATERIAL SHALL BE CLEAN AND FREE OF EXCESS SLURRY. THE EXPANSION JOINT MATERIAL SHALL BE TRIMMED TO A LEVEL EVEN WITH THE ADJACENT CONCRETE RESULTING IN A NEAT AND PROFESSIONALLY FINISHED APPEARANCE.
- 4. THE CITY ENGINEER, AT HIS/HER SOLE DISCRETION RESERVES THE AUTHORITY TO ORDER THE REMOVAL OF SECTIONS OF CURB, GUTTER AND SIDEWALK THAT DO NOT MEET THE WORKMANSHIP AND AESTHETIC STANDARD OF THE CITY OF ANACORTES.
- 5. SECTIONS OF NEWLY CONSTRUCTED CURB, GUTTER, AND SIDEWALK, THAT EXHIBIT CRACKING FOLLOWING CURING, SHALL BE SUBJECT TO REMOVAL AND REPLACEMENT. CRACKING RESULTING FROM SUB-BASE FAILURE, OR CONSTRUCTION SITE DAMAGE SHALL BE IMMEDIATELY REMOVED AND REPLACED TO THE NEAREST EXPANSION JOINT. MINOR HAIR LINE STRESS CRACKS MAY, AT THE DISCRETION OF THE PROJECT MANAGER, BE MONITORED AND RE-EVALUATED FOR POSSIBLE REMOVAL AT THE END OF THE MAINTENANCE PERIOD.

EX SYMBOL LEGEND:

- = EX MONUMENT
- = SET MAG NAIL
- = SET SPIKE
- = SET RAILROAD SPIKE
- = EX STORM DRAIN MANHOLE
- = EX STORM DRAIN CLEANOUT
- = EX CATCH BASIN
- = EX DOWNSPOUT
- = EX SANITARY SEWER MANHOLE
- = EX GATE VALVE
- = EX WATER METER
- = EX FIRE HYDRANT
- = EX HOSE BIB
- = EX FIRE STANDPIPE
- = EX IRRIGATION BOX
- = EX MONITORING WELL
- = EX BOLLARD
- = EX POST
- = EX STOP SIGN
- = EX STREET SIGN
- = EX FLAG POLE
- = EX POWER POLE W/DROP
- = EX STREET LIGHT POLE W/ DROP
- = EX GROUND GUY
- = EX DROP FROM POLE
- = EX TELEPHONE PEDESTAL/RISER
- = EX ELECTRIC METERSWITCH
- = SPOT ELEVATION ON EX GROUND

- = EX ASPHALT SURFACING
- = EX CONCRETE SURFACING
- = EX GRAVEL SURFACING

EX LINE LEGEND:

- = EX EDGE OF ASPHALT
- = EX EDGE OF CONCRETE
- = EX EDGE OF GRAVEL ROAD
- = EX CURB
- = EX SIDEWALK
- = EX STORM DRAIN LINE
- = EX SANITARY SEWER GRAVITY LINE
- = EX WATER LINE
- = EX OVERHEAD ELECTRIC & COMMUNICATION LINES
- = EX UNDERGROUND POWER
- = EX UNKNOWN UNDERGROUND UTILITY
- = EX UNDERGROUND COMMUNICATIONS LINE
- = EX OVERHEAD COMMUNICATIONS LINE
- = EX UNDERGROUND GAS LINE
- = EX TOP OF SLOPE LINE
- = EX TOE OF SLOPE LINE
- = EX GRADE INDEX CONTOUR
- = EX GRADE INTERVAL CONTOUR
- = EX CHAINLINK HIGH WATER LINE
- = EX CHAINLINK FENCE
- = EX HANDRAIL

SURVEY NOTES:

- 1) THIS TOPOGRAPHIC SURVEY WAS PERFORMED AND PREPARED IN ACCORDANCE WITH WAC 352-130-145.
- 2) DATA FOR THIS SURVEY WAS GATHERED BY FIELD TRAVERSE UTILIZING ELECTRONIC DATA COLLECTION IN OCTOBER AND NOVEMBER 2022.
- 3) EQUIPMENT USED: THEOMAT 0001.5" EDM: ± 2 PPM, ± 3 MM
- 4) HORIZONTAL DATUM: NAD 83/91
- 5) VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW) ON NOAA TIDAL DATUM EPOCH 1941-1969. BASED ON PORT OF ANACORTES SURVEY CONTROL MONUMENT "JETTY-2"
- 6) CONTOURS DEPICTED HEREON MEET OR EXCEED NATIONAL MAPPING STANDARDS FOR 1-FOOT ACCURACY TOPOGRAPHIC SURVEYS AND HAVE BEEN COMPUTER GENERATED FROM GROUND FIELD TOPOGRAPHY GATHERED FOR THIS SURVEY UTILIZING ELECTRONIC DATA COLLECTION.
- 7) CONDUCTIBLE UNDERGROUND UTILITY LOCATES SERVICES WERE PERFORMED AND PAINTED ON-SITE BY APPLIED PROFESSIONAL SERVICES AND SURVEYED BY PSE FIELD CREWS IN NOVEMBER 2022. UTILITIES ARE KNOWN TO EXIST WITHIN THE LIMITS OF THIS SURVEY THAT WERE UNDETECTABLE. ADDITIONAL UTILITY VERIFICATION MAY BE WARRANTED IN AREAS CONSIDERED FOR CONSTRUCTION.
- 8) UTILITY LOCATION AREAS AND LEVEL OF LOCATE ACCURACY WERE DETERMINED BY SURVEYOR AND CLIENT PRIOR TO COMMENCEMENT OF FIELD SURVEY WORK.
- 9) THIS MAP IS NOT INTENDED TO REPRESENT A FORMAL BOUNDARY SURVEY. NOR DOES IT REFLECT ELEMENTS THAT A BOUNDARY SURVEY MAY DISCLOSE. BOUNDARY RELATED ELEMENTS DEPICTED HEREON ARE SHOWN PER AVAILABLE RECORD INFORMATION AND OR PUBLICLY AVAILABLE GIS DATA.
- 10) A CURRENT TITLE REPORT WAS NOT PROVIDED FOR THIS SURVEY. EASEMENTS AND/OR TITLE ENCUMBRANCES MAY EXIST THAT ARE NOT NOTED THEREIN.



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NO.	DATE	BY	REVISION



PORT OF ANACORTES
CURTIS WHARF
PROJECT #MRT-64

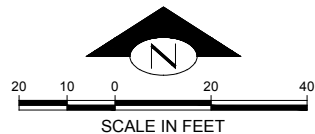
GENERAL NOTES

DRAWN: GR	PROJECT NO.: XXX
DESIGN: DO, SS	SCALE: AS NOTED
CHECKED: DO	DATE: 4/28/23
SHEET NO.	

C02

C:\P\CLIENTS\CIVIL\PUBLIC\ANACORTES\PORT OF ANACORTES WHARF ENTRANCE REDEVELOPMENT DESIGN & BID SUPPORT\DWG\DRAWING\CURTIS WHARF REDEVELOPMENT.DWG
LAST MODIFIED BY: NDavis DATE: 4/28/2023 4:08 PM SHEET SET: XXXX - ORIGINAL SHEET SIZE: ANSI FULL BLEED 2 (34.00 X 22.00 INCHES)
AUTOCAD VERSION: CIVIL 3D 2013

P:\CLIENTS\CIVIL\PUBLIC\ANACORTES\PORT OF ANACORTES WHARF ENTRANCE REDEVELOPMENT DESIGN & BID SUPPORT\DWG\DRAWING\CURTIS WHARF REDEVELOPMENT.DWG TAB: C03 TESC-EX COND MODIFIED BY NDavis ON APR 28, 2023 - 16:08



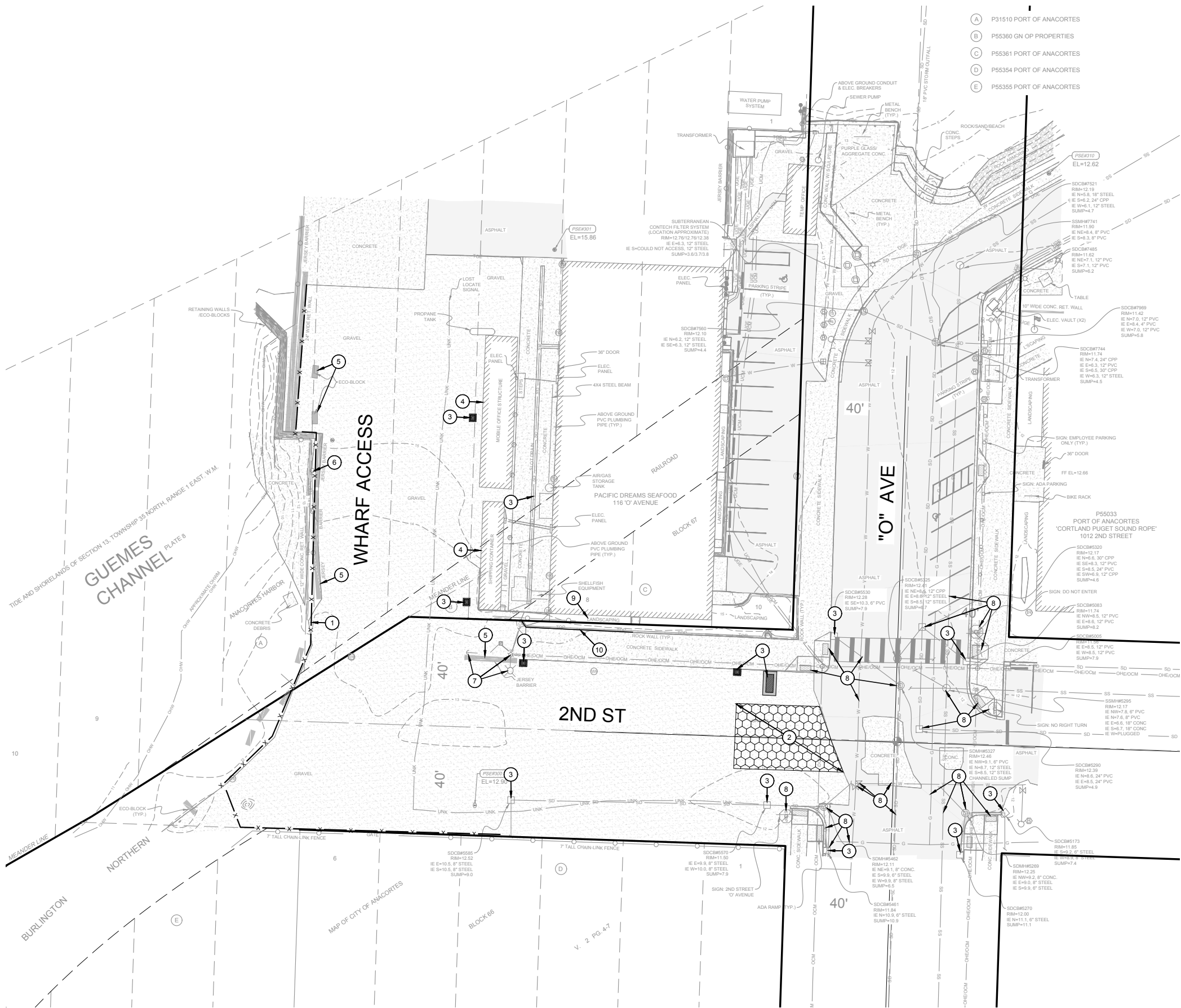
KEY NOTES		
KEY	DESCRIPTION	DETAIL/ SHEET
1	APPROX 315 LF SILT FENCING OR STRAW WATTLES AS NECESSARY BY CONTRACTOR	B/C07 & C/C07
2	STABILIZED CONSTRUCTION ENTRANCE	A/C07
3	INSTALL TEMPORARY INLET PROTECTION	D/C07
4	TEMPORARY STRUCTURES TO BE REMOVED PRIOR TO CONSTRUCTION	-
5	EXISTING ECOLOGY BLOCKS TO BE REMOVED	-
6	APPROX 75 LF OF EXISTING FENCE TO BE REMOVED	-
7	REMOVE EX UTILITY POLE, STREET LIGHT BOOM, GUY WIRE ANCHOR AND ASSOCIATED UTILITY LINES. ESTABLISH NEW CONNECTIONS TO BUILDING AS REQUIRED	-
8	PROTECT EX UTILITIES AND FEATURES (TYP)	-
9	CONTRACTOR TO REMOVE AND DISCARD LANDSCAPED MUCUH FOR GATE PREPARATION	-
10	CONTRACTOR TO DEMO 40 LF OF ROCKERY WALL FOR PROPOSED CONCRETE	-

LEGEND:

	STABILIZED CONSTRUCTION ENTRANCE
	SILT FENCE AND/OR STRAW WATTLE
	PROPERTY LINE
	EXISTING ASPHALT
	EXISTING CONCRETE
	EXISTING GRAVEL

NOTES:

1. REMOVE AND STOCKPILE EX ECOLOGY BLOCKS, JERSEY BARRIERS AN OTHER SURFACE FEATURES AS NEEDED.



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PORT OF ANACORTES
CURTIS WHARF
PROJECT #MRT-64

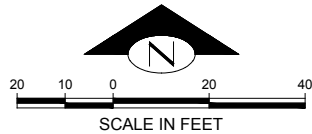
EXISTING CONDITIONS, DEMO, & TESC PLAN

DRAWN: GR	PROJECT NO.: XXX
DESIGN: DO, SS	SCALE: AS NOTED
CHECKED: DO	DATE: 4/28/23
SHEET NO.	

C03

CAD FILE NUMBER: P:\CLIENTS\CIVIL\PUBLIC\ANACORTES, PORT OF CURTIS WHARF ENTRANCE REDEVELOPMENT DESIGN & BID SUPPORT\DWG\DRAWING\CURTIS WHARF REDEVELOPMENT.DWG
DATE: 4/28/2023 4:08 PM - SHEET SET: XXXX - ORIGINAL SHEET SIZE: ANSI FULL BLEED D (34.00 X 22.00 INCHES)
AUTOCAD VERSION: CIVIL 3D 2013

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KEY NOTES		
KEY	DESCRIPTION	DETAIL/ SHEET
1	PROPOSED ENTRANCE AND SLIDING GATE	P/C11
2	248 LF CONCRETE VERTICAL CURB	I/C08
3	ASPHALT PAVEMENT (APPROX 18,450 SF FOR WHARF & 2ND ST) (APPROX 4,550 SF FOR 2ND ST INTERSECTION)	F/C07
4	CONCRETE SIDEWALK	E/C07
5	PROPOSED SWING GATE	O/C10
6	FLUSH/ MATCH SURFACE GRADE	-
7	CURB RETURN - 20' RADIUS	-
8	6' MANGATE	Q/C09
9	PROTECT EX FEATURES AND ADJUST RIMS, ETC. TO FG SURFACE AS NEEDED	R/C13
10	RESTORE EX CROSSWALK AND OTHER PAVEMENT MARKINGS IN KIND	-
11	21 LF EXTRUDED CONC CURB	G/C07
12	OPTION: SAWCUT AND REMOVE EX SURFACE PAVING MATERIALS. REPLACE WITH NEW ASPHALT. MATCH AT ALL SURFACE EDGES MAINTAINING EX GRADES (APPROX 4,540 SF)	-
13	CROSSWALK	K/C08
14	STREET SIGN INSTALLATION (IF REPLACEMENT IS NECESSARY)	J/C08
15	261 LF PROPOSED CHAINLINK FENCE	M/C09
16	CONTRACTOR TO CONNECT TO EXISTING FENCELINE	-
17	EXISTING LANDSCAPE. CONTRACTOR TO PROTECT IN PLACE AND ADD TOPSOIL AS NECESSARY	-

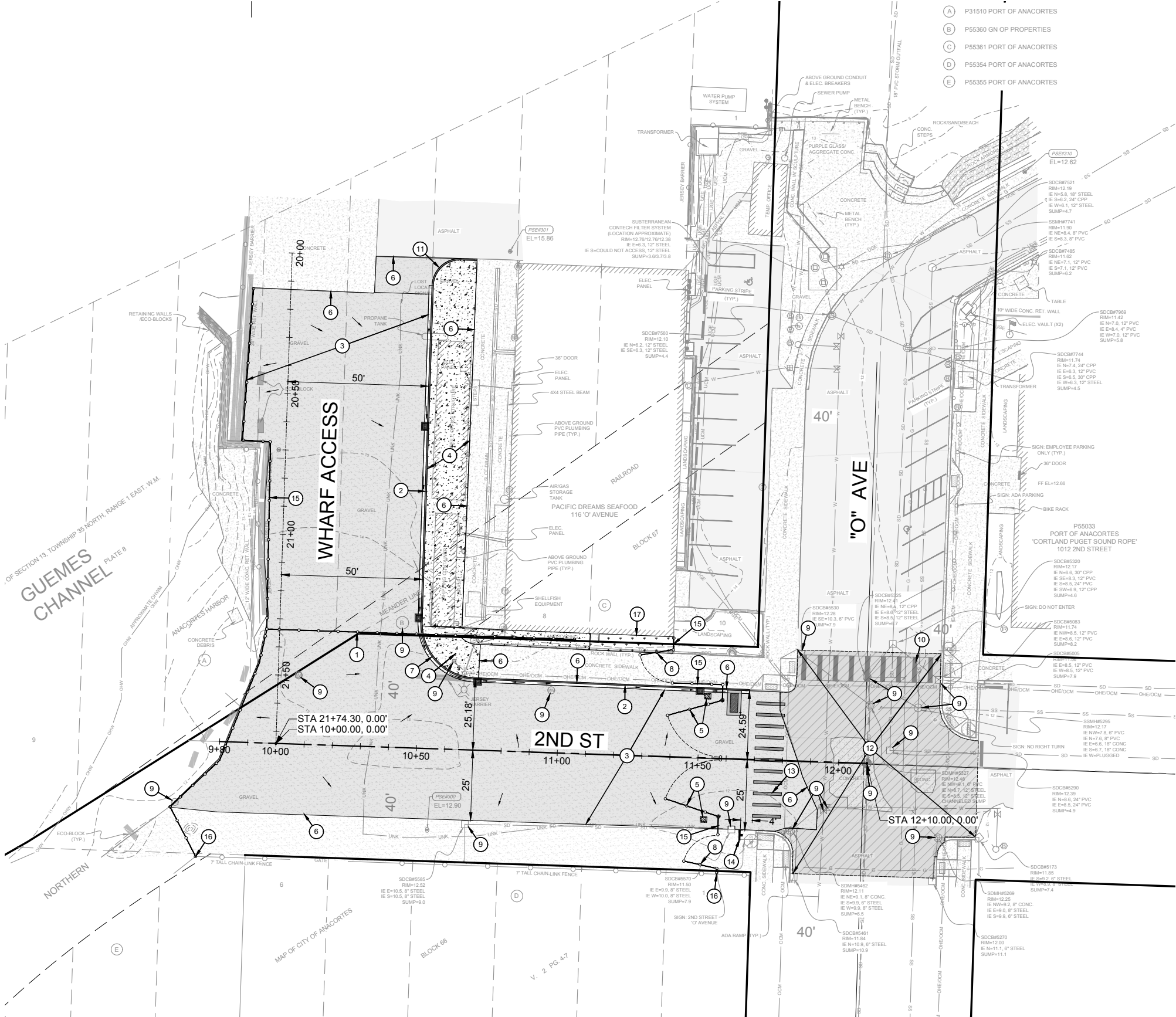
LEGEND:

-
- PROPOSED CONCRETE

 PROPOSED LANDSCAPE PROPOSED ASPHALT OPTION: REPLACE EXISTING
SURFACE PAVING EXISTING ASPHALT EXISTING CONCRETE EXISTING GRAVEL PROPERTY/ R.O.W. LINE PROPOSED FENCE PROPOSED GRADE BREAK DRAINAGE ARROW

NOTES:

1. REMOVE AND STOCKPILE EX ECOLOGY
BLOCKS, JERSEY BARRIERS AN OTHER
SURFACE FEATURES AS NEEDED.



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PORT OF ANACORTES
CURTIS WHARF
PROJECT #MRT-64

SITE PLAN

DRAWN: GR	PROJECT NO.: XXX
DESIGN: DO, SS	SCALE: AS NOTED
CHECKED: DO	DATE: 4/28/23
SHEET NO.	

C04

KEY NOTES		
KEY	DESCRIPTION	DETAIL/ SHEET
1	STA 20+60.00, 49.17' LT CB #1, TYPE 1 RIM 14.95 IE 8" (S) 12.75	H/C08
2	68 LF 8" SD @ 3.00%	N/C09
3	STA 21+28.16, 49.17' LT CB #2, TYPE 1 RIM 12.93 IE 8" (N) 10.71 IE 8" (SE) 10.71	H/C08
4	30 LF 8" SD @ 1.43%	N/C09
5	STA 10+70.88, 24.34' LT CB #3, TYPE 1 RIM 12.30 IE 8" (NW) 10.28 IE 12" (E) 9.95	H/C08
6	80 LF 12" SD @ 0.50%	N/C09
7	STA 11+50.00, 23.65' LT CB #4, TYPE 1 RIM 12.12 IE 12" (W) 9.55 IE 12" (E) 9.55	H/C08
8	10 LF 12" SD @ 0.50%	N/C09
9	EX SDMH #5327 RIM 12.46 IE 6" (NW) 9.1 IE 12" (S) 8.5 IE 12" (W) 8.70 IE 12" (N) 8.7	-
10	BREAK IN VERTICAL CURB FOR GATE CHANNEL GUIDE TO PASS THROUGH. CHANNEL GUIDE FOR SLIDING GATE TO BE SET AT UNIFORM SLOPE (1.30% PER PLAN)	-
11	FLUSH/ MATCH SURFACE GRADE	-

12	RETAINING WALL (FUTURE DESIGN)	-
13	MODULAR WETLAND TREATMENT FACILITY RIM 12.35 IE 12" (W) 9.50 IE 12" (E) 8.93	L/C09
14	44 LF 12" SD @ 0.50%	N/C09

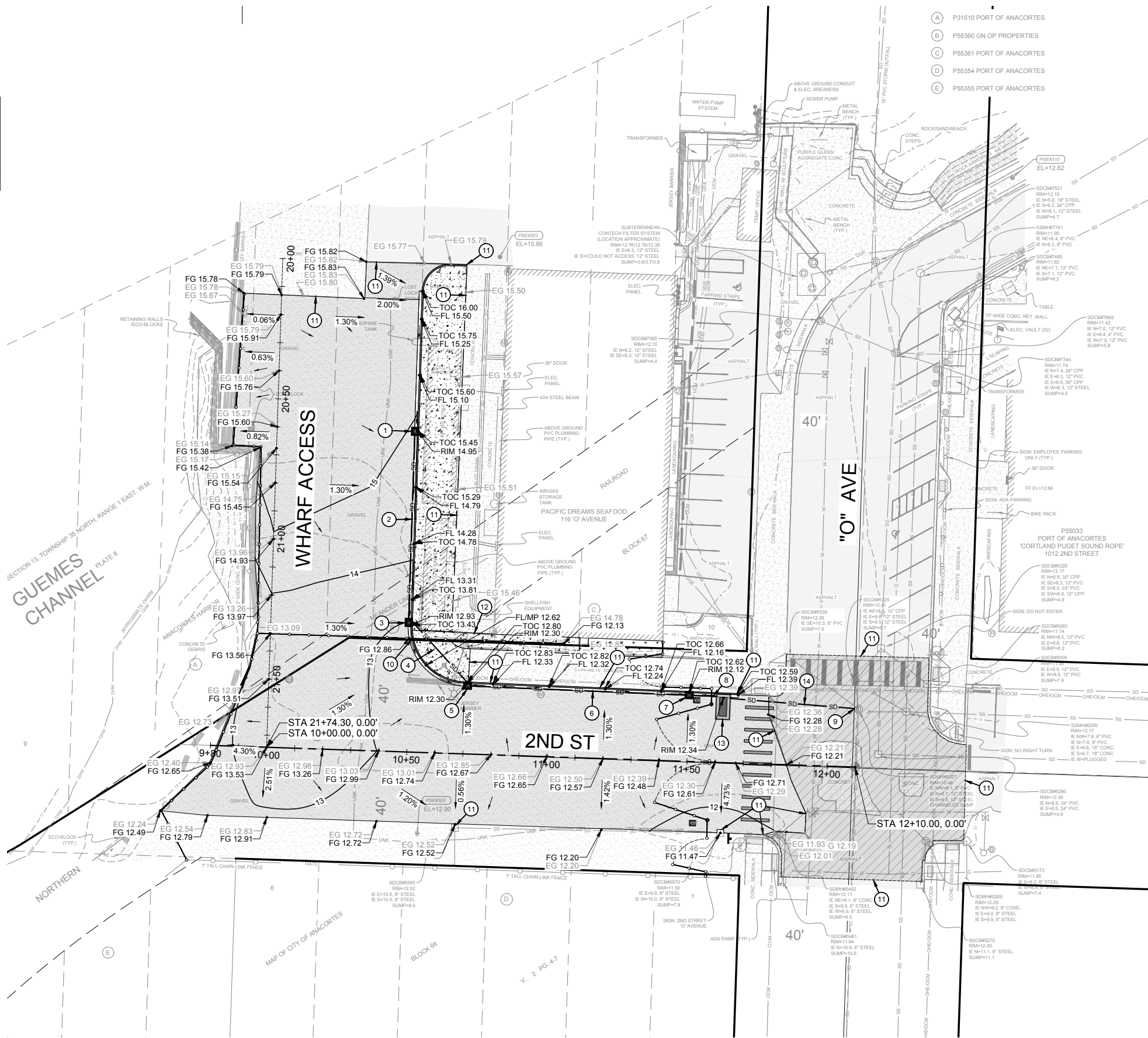
LEGEND:

- PROPOSED CONCRETE
- PROPOSED ASPHALT
- OPTION: REPLACE EXISTING SURFACE PAVING
- EXISTING ASPHALT
- EXISTING CONCRETE
- EXISTING GRAVEL
- PROPERTY LINE
- PROPOSED STORM LINE
- EXISTING STORM LINE
- SPOT ELEVATION
- SURFACE FLOW DIRECTION
- FINISHED CONTOUR ELEVATION
- PROPOSED FENCE
- PROPOSED GRADE BREAK

NOTES:

- SEE SHEET C06 FOR PROFILES.
- SD PIPES TO MAINTAIN 2 FEET OF COVER IN PAVED AREAS. CONTRACTOR TO VERIFY WITH GRADES IN FIELD.

GRADING QUANTITY ESTIMATE:	
TOTAL:	
CUT:	60 CY's
FILL:	100 CY's
GRADING QUANTITIES GENERATED USING CIVIL 3D SOFTWARE TO COMPARE TRIANGULATED IRREGULAR NETWORKS (TINS) BETWEEN EG AND FG SURFACES. ALL EXCESS CUT MATERIAL WILL BE SPREAD ON SITE PER THESE GRADING PLANS. IMPORT OF BACKFILL MATERIALS ARE EXPECTED SUCH AS FOR UTILITY TRENCHES AND ROAD BASES SHALL BE TRANSPORTED TO THE SITE.	
VOLUMES ARE FOR PERMIT ONLY. CONTRACTOR SHALL PROVIDE INDEPENDENT TAKEOFF FOR BIDDING.	



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PORT OF ANACORTES
CURTIS WHARF
PROJECT #MRT-64

GRADING & DRAINAGE PLAN

DRAWN: GR	PROJECT NO.: XXX
DESIGN: DO, SS	SCALE: AS NOTED
CHECKED: DO	DATE: 4/28/23
SHEET NO.	

C05

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DATE: 4/28/23 4:08 PM - SHEET SET: XXXX - ORIGINAL SHEET SIZE: ANSI FULL BLEED D (34.00 X 22.00 INCHES)
AUTOCAD VERSION: CIVIL 3D 2013

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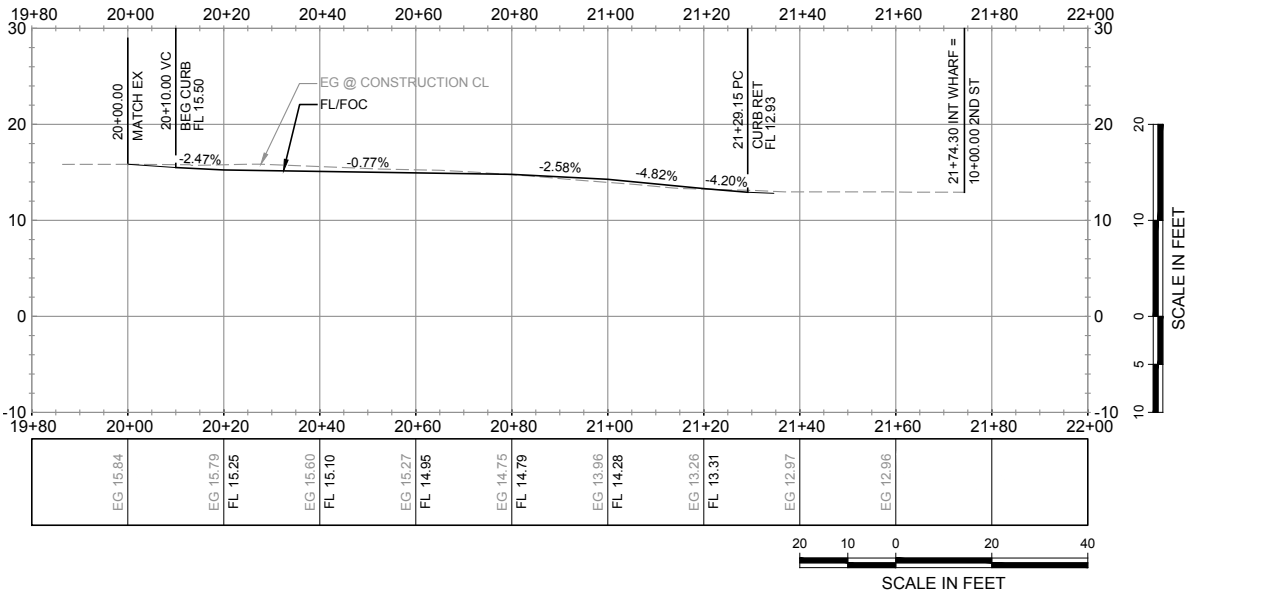
NO.	DATE	BY	REVISION



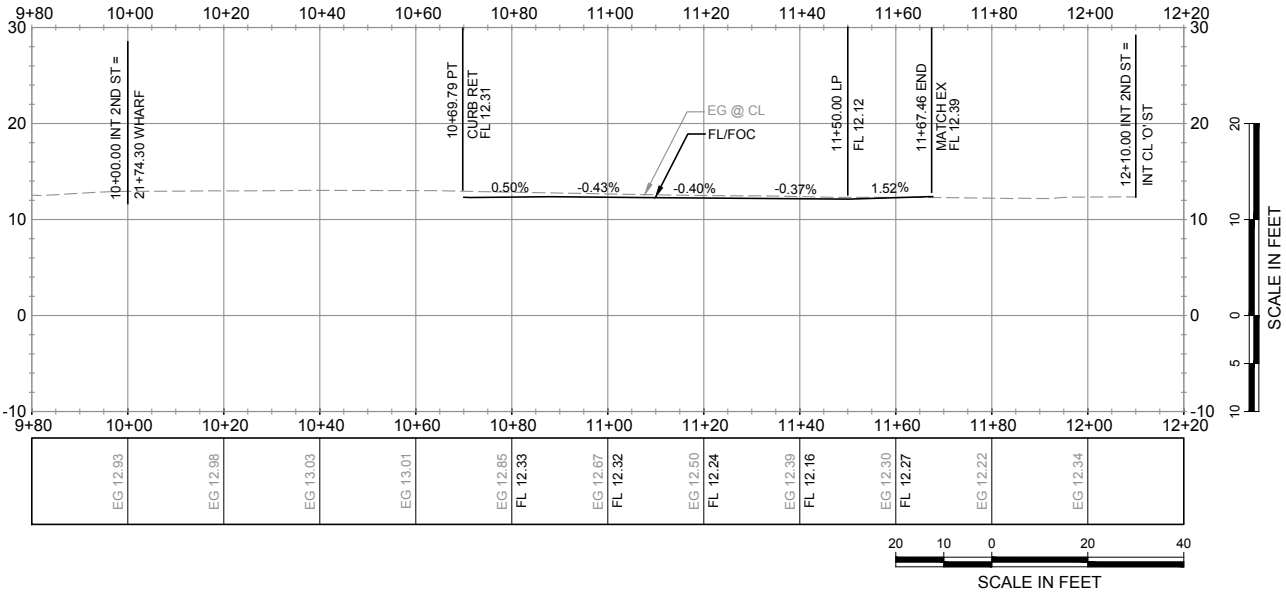
PORT OF ANACORTES
CURTIS WHARF
PROJECT #MRT-64

ROAD & DRAINAGE PROFILES

DRAWN: GR	PROJECT NO.: XXX
DESIGN: DO, SS	SCALE: AS NOTED
CHECKED: DO	DATE: 4/28/23
SHEET NO.	C06

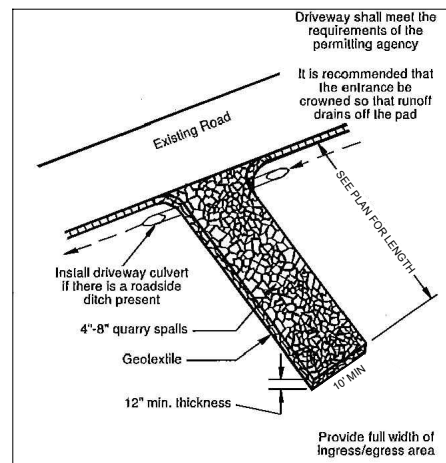


PROPOSED WHARF PROFILE
SCALE AS SHOWN

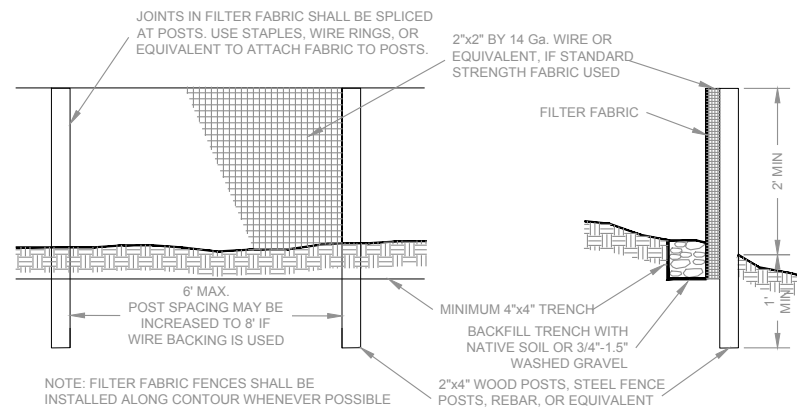


PROPOSED 2ND ST PROFILE
SCALE AS SHOWN

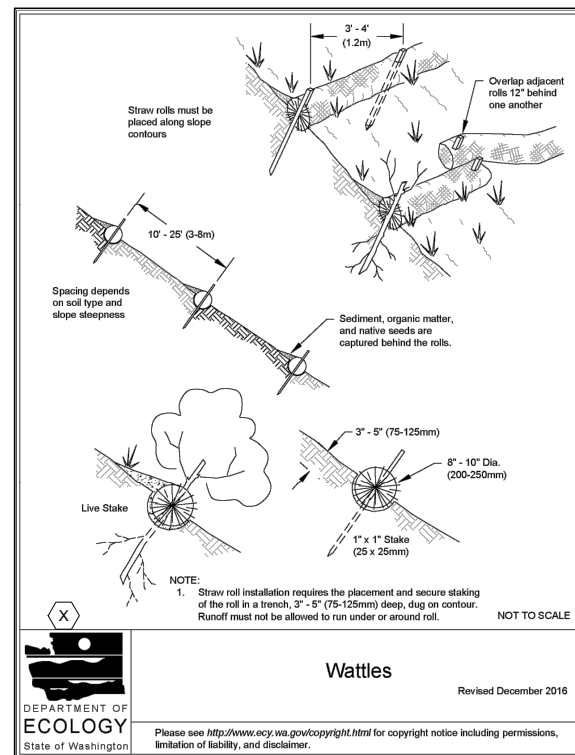
100% CONSTRUCTION SET



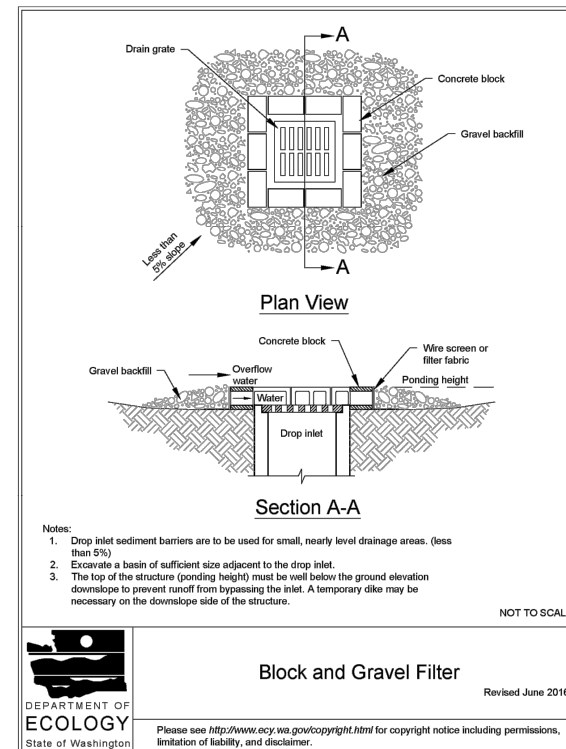
STABILIZED CONSTRUCTION ENTRANCE
PER D.O.E. FIG. 4.2
NOT TO SCALE



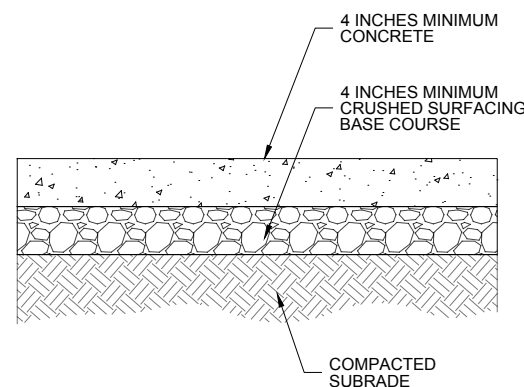
FILTER FABRIC SILT FENCE
PER D.O.E. FIG. 4.20
NOT TO SCALE



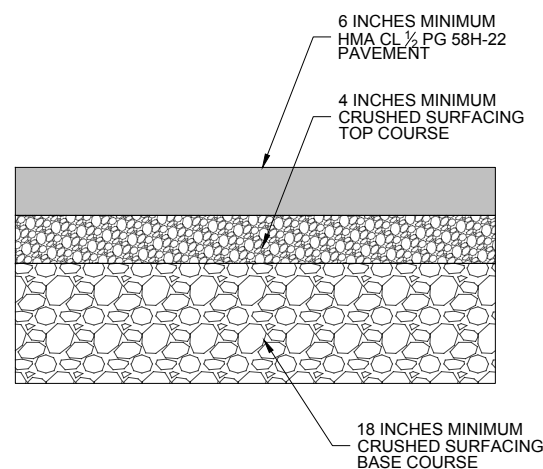
STRAW WATTLES
PER D.O.E. FIG. 3.24
NOT TO SCALE



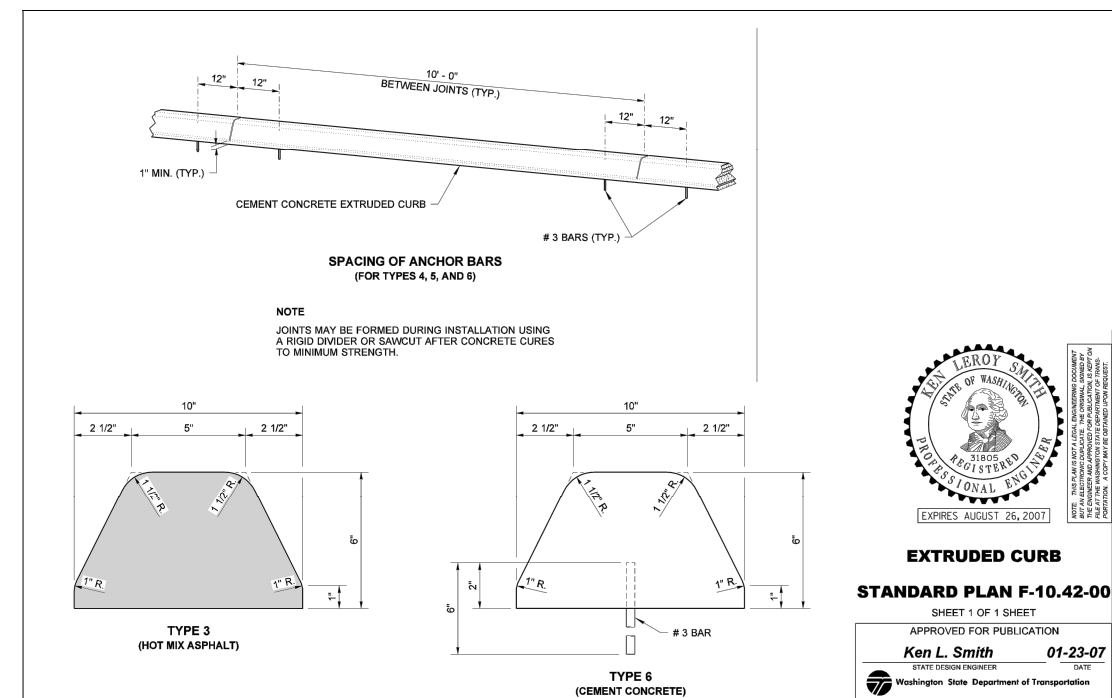
TEMPORARY INLET PROTECTION DETAIL
PER 2019 D.O.E. FIG. V2.3 PG 359
NOT TO SCALE



CONCRETE TYPICAL SECTION
NOT TO SCALE



ASPHALT TYPICAL SECTION
NOT TO SCALE

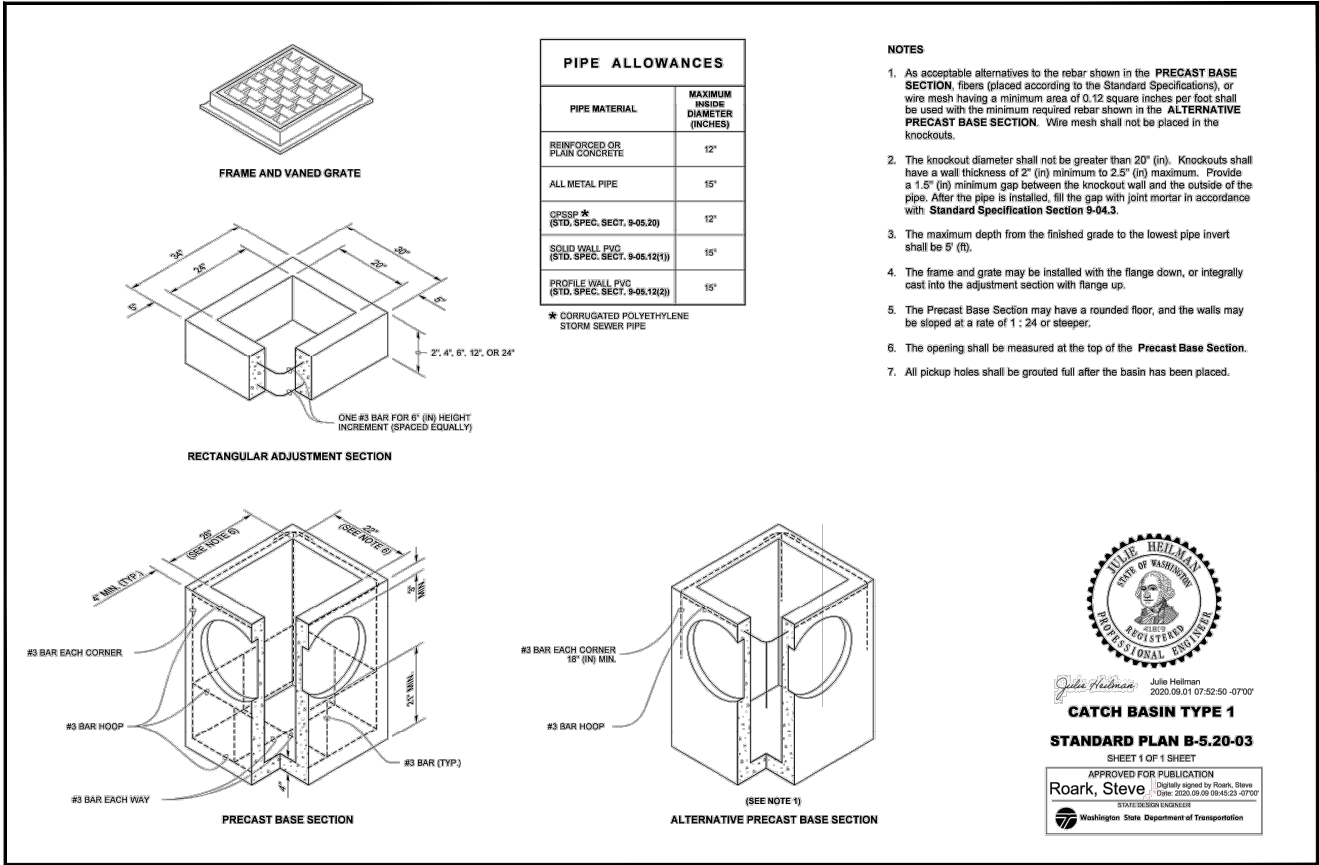


EXTRUDED CONCRETE CURB DETAIL
STD PLAN F-10.42-00
NOT TO SCALE

[illegible]

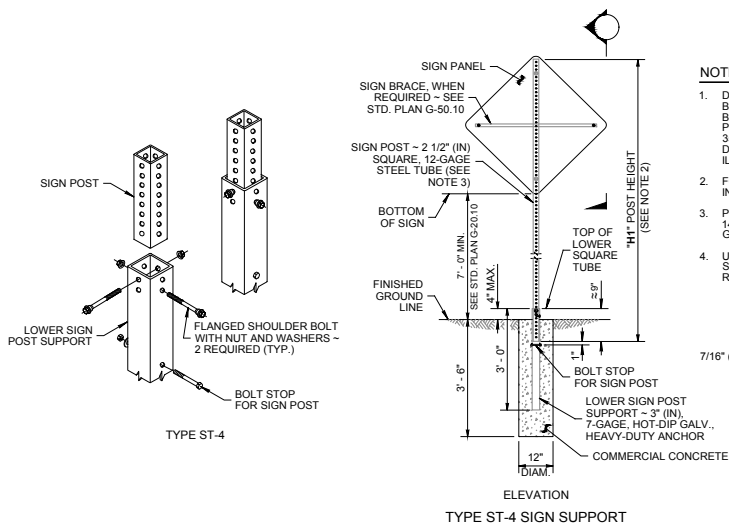
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PLOT DATE: 4/28/2023 4:08 PM - SHEET SET: XXXX - ORIGINAL SHEET SIZE: ANSI FULL BLEED D (34.00 X 22.00 INCHES)
AUTOCAD VERSION: CIVIL 3D 2013

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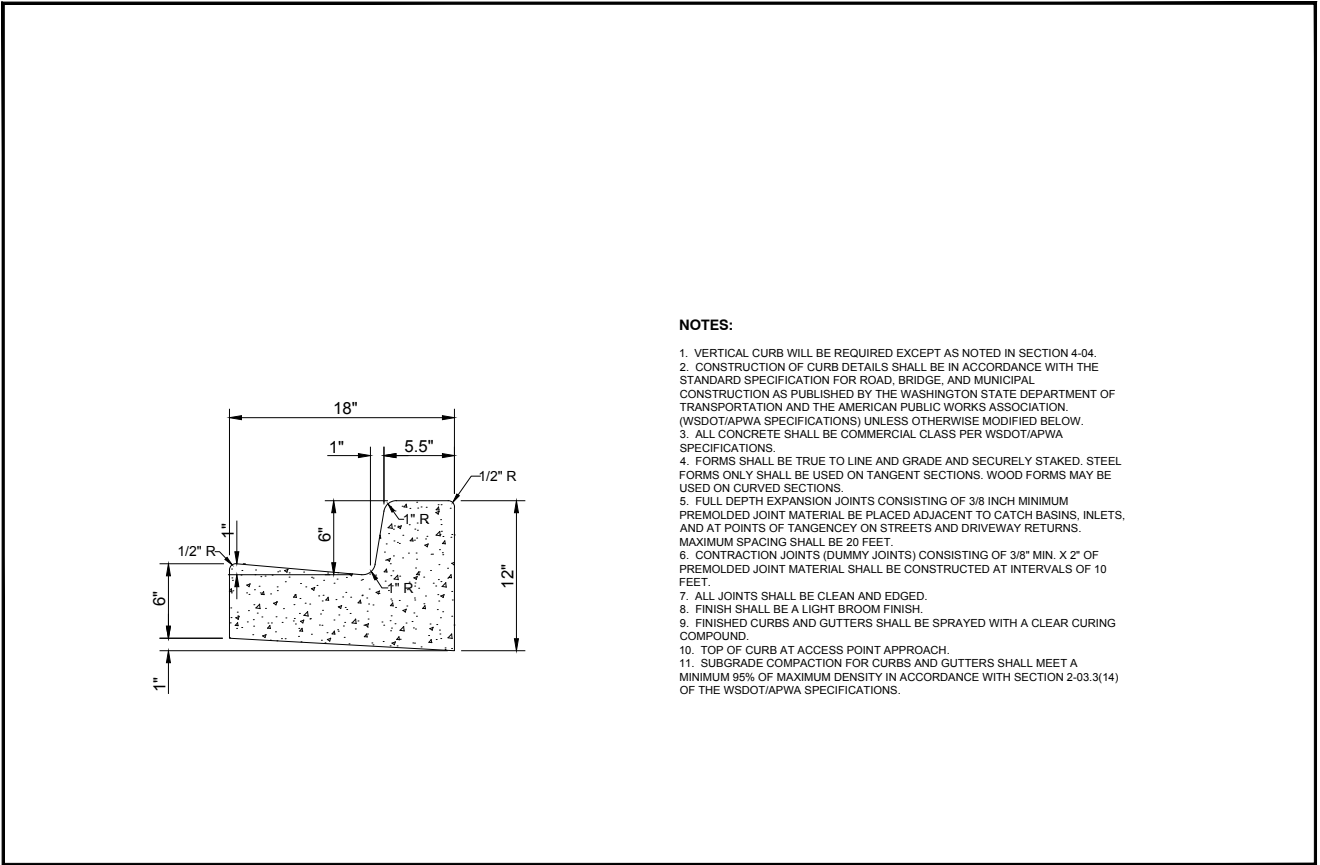
CB TYPE 1 W/ GRATE DETAIL
WSDOT STD PLAN B-5.20-03
NOT TO SCALE

H
C05



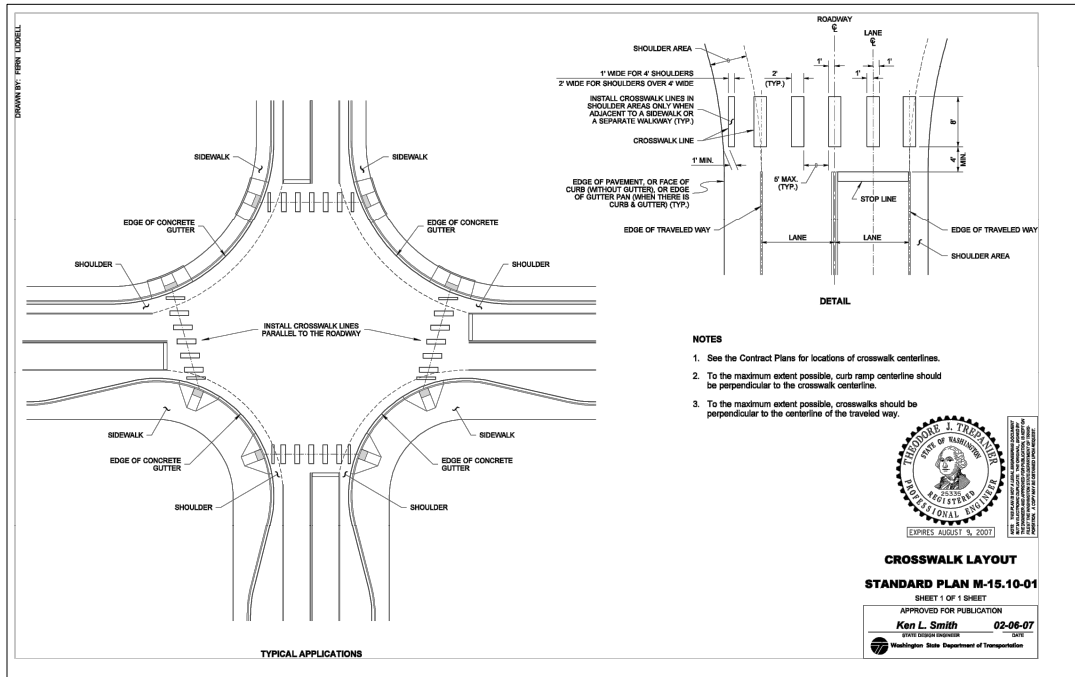
STREET SIGN INSTALLATION DETAIL
PER WSDOT STD PLAN G-24.50-05
NOT TO SCALE

J
C04



CONCRETE VERTICAL CURB DETAIL
NOT TO SCALE

I
C04



CROSSWALK DETAIL
NOT TO SCALE

K
C04



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PORT OF ANACORTES
CURTIS WHARF
PROJECT #MRT-64

DETAILS

DRAWN: GR	PROJECT NO.: XXX
DESIGN: DO, SS	SCALE: AS NOTED
CHECKED: DO	DATE: 4/28/23
SHEET NO.	

C08

CAD FILE NUMBER: P:\CLIENTS\CIVIL\PUBLIC\ANACORTES, PORT OF CURTIS WHARF ENTRANCE REDEVELOPMENT DESIGN & BID SUPPORT\DWG\DRAWING\CURTIS WHARF REDEVELOPMENT.DWG
C:\Users\p\Documents\Public\ANACORTES, PORT OF CURTIS WHARF ENTRANCE REDEVELOPMENT DESIGN & BID SUPPORT\DWG\DRAWING\CURTIS WHARF REDEVELOPMENT.DWG
AUTOCAD VERSION: CIVIL 3D 2013

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SITE SPECIFIC DATA			
PROJECT NUMBER	748488		
PROJECT NAME	Curtis Wharf		
PROJECT LOCATION	Anacortes, WA		
STRUCTURE ID	WQ 1		
TREATMENT REQUIRED			
FLOW BASED (CFS)			
0.0435			
PEAK BYPASS REQUIRED (CFS) - IF APPLICABLE			
0.3048			
PIPE DATA	L.E.	MATERIAL	DIAMETER
INLET PIPE 1	9.50	PVC	12
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	8.93	PVC	12
PRETREATMENT		BIOFILTRATION	DISCHARGE
RIM ELEVATION	12.35		
SURFACE LOAD		DIRECT TRAFFIC	
NOTES:			

INSTALLATION NOTES

- CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
- UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
- CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATER TIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
- CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL PIPES, RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO USE GROUT AND/OR BRICKS TO MATCH COVERS WITH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
- VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
- CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.

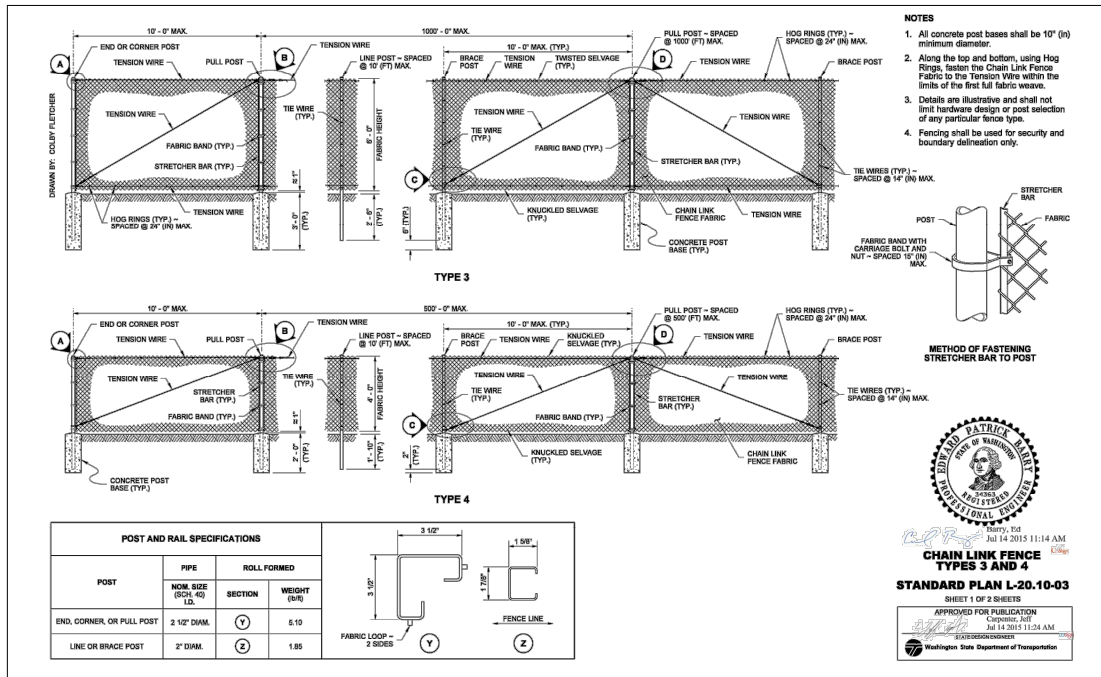
GENERAL NOTES

- MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
- ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT CONTECH.

MODULAR WETLAND VAULT DETAIL

MWS-L-4-8-V-UG
NOT TO SCALE

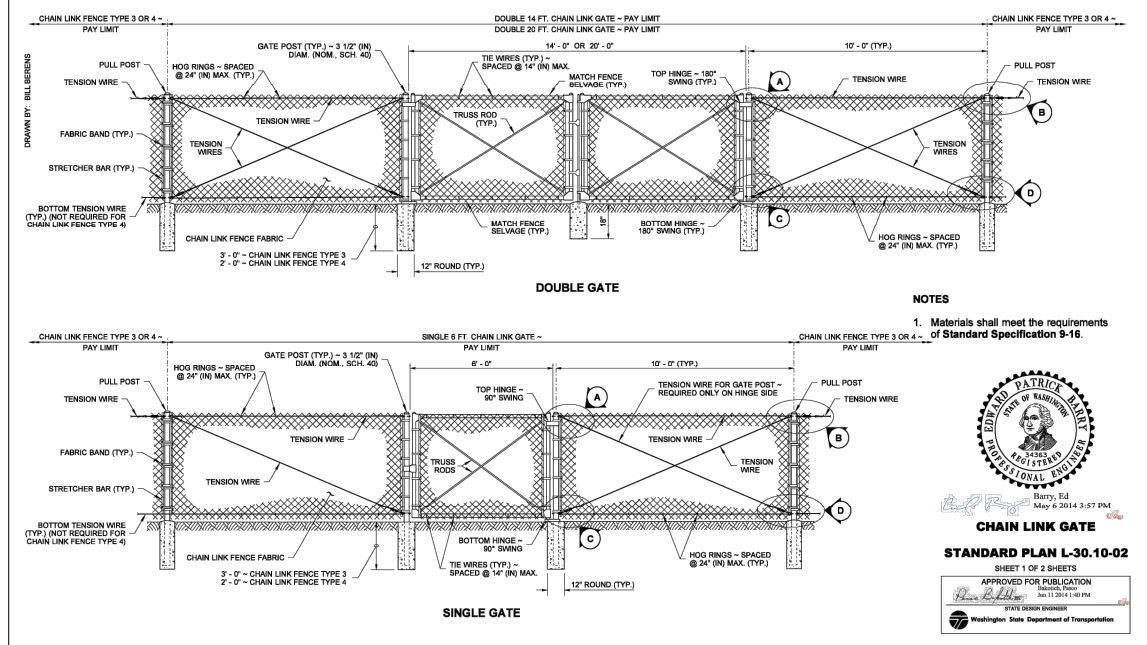
L
C05



CHAIN LINK FENCE DETAIL

NOT TO SCALE

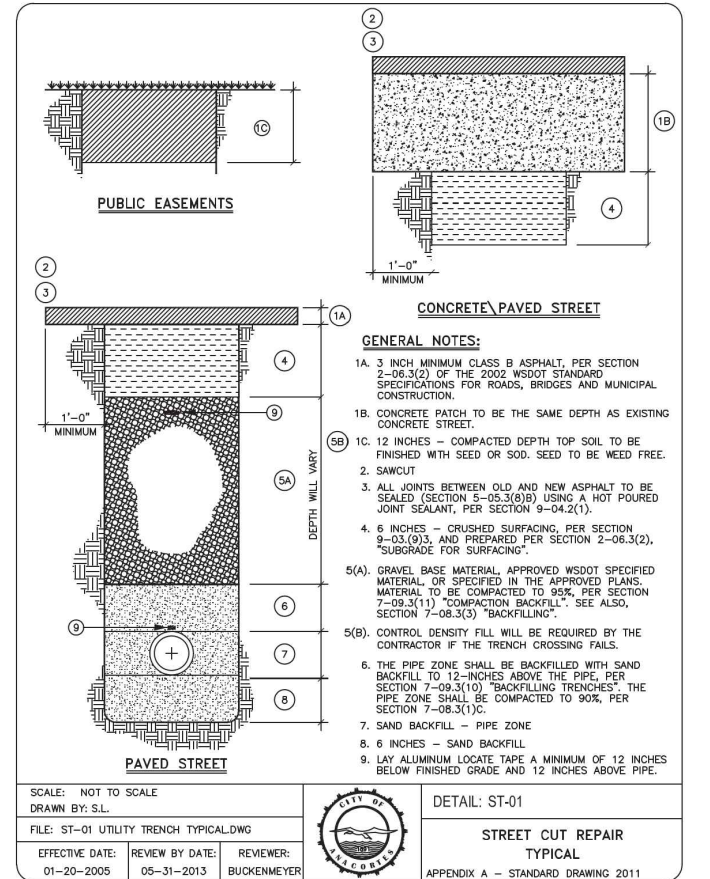
M
C04



CHAN LINK GATE DETAIL

NOT TO SCALE

Q
C04



STREET REPAIR DETAIL

PER ANACORTES STD DETAIL ST-01
NOT TO SCALE

N
C05



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PROJECT #MRT-64

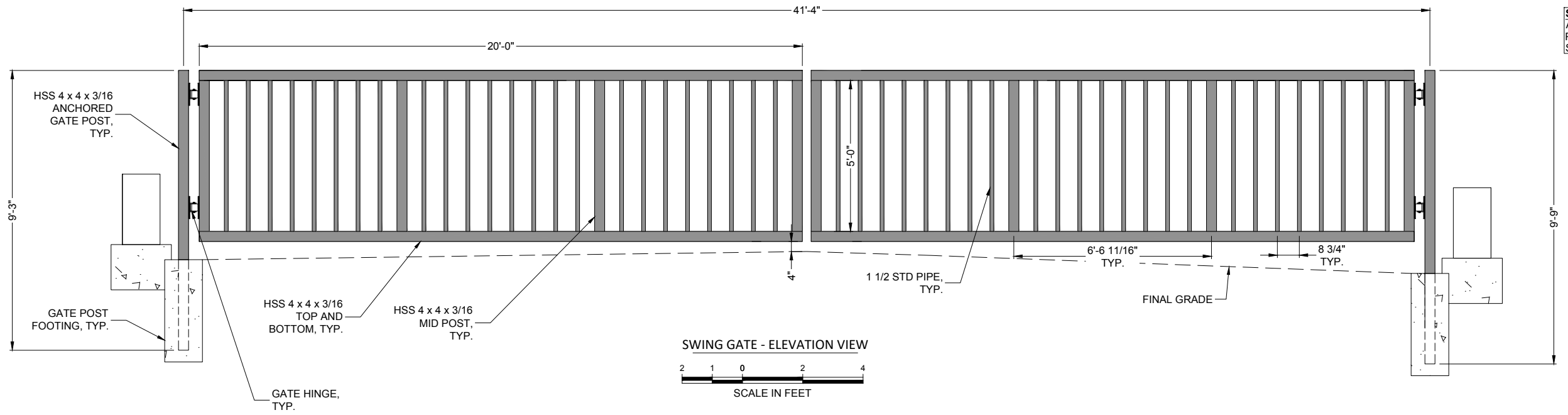
DETAILS

DRAWN: GR	PROJECT NO.: XXX
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SHEET NO.	

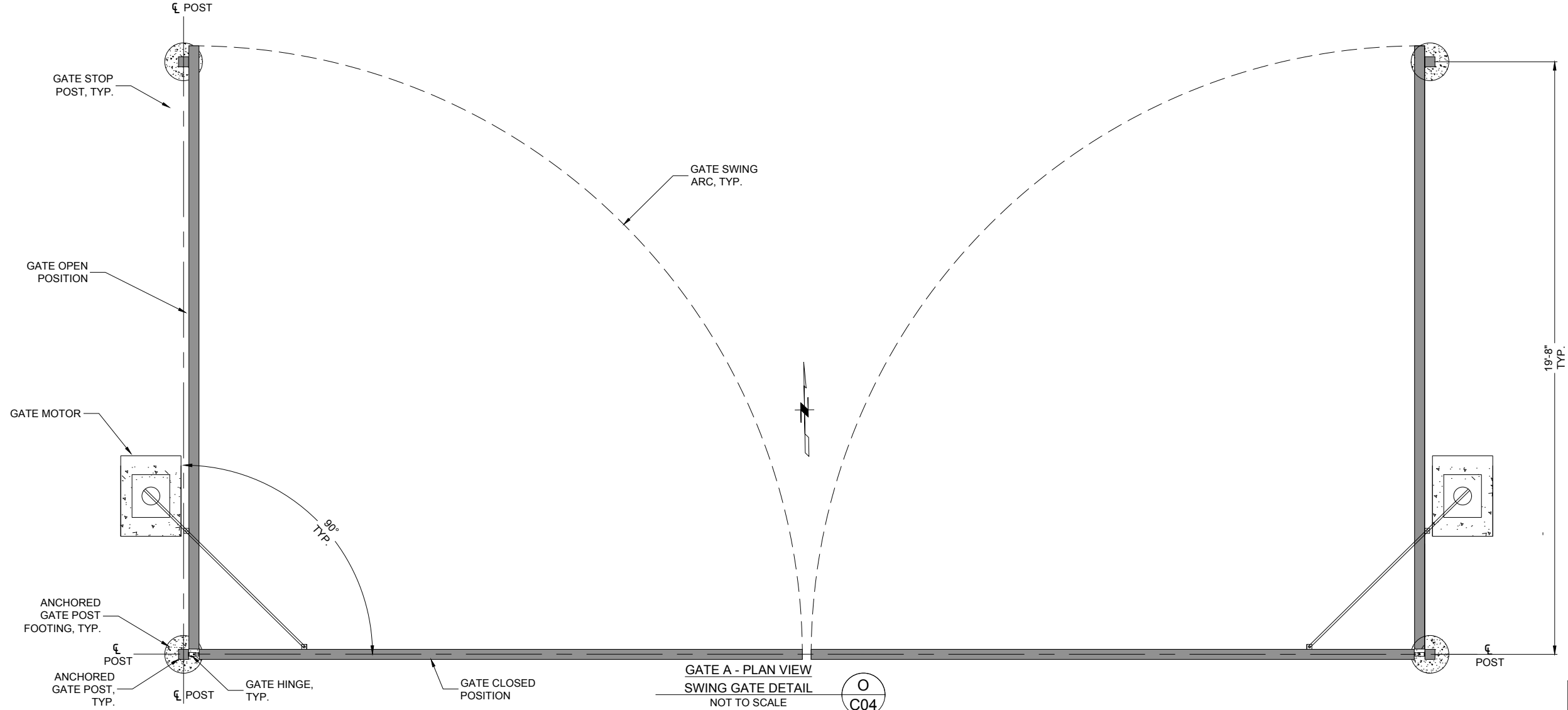
C09

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STRUCTURAL NOTES:
ALL WELDS ARE COMPLETE JOINT
PENETRATING WELDS UNLESS
SPECIFIED OTHERWISE.



NOTE:
SEE ASSOCIATED GATE DETAILS
ON SHEETS C12 & C13.



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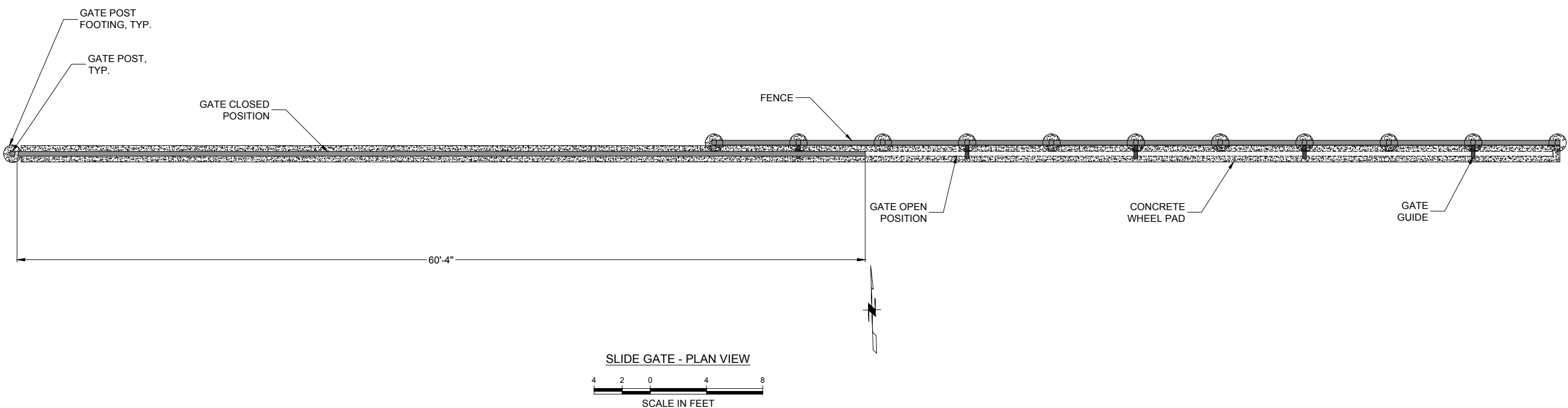
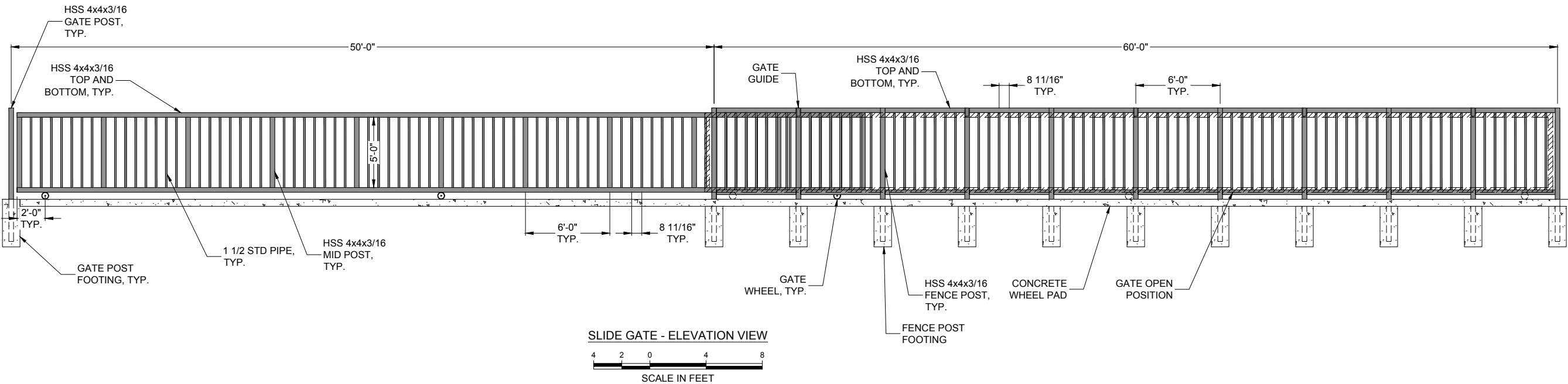
PORT OF ANACORTES
CURTIS WHARF
PROJECT #MRT-64

DETAILS

DRAWN: GR	PROJECT NO.: XXX
DESIGN: DO, SS	SCALE: AS NOTED
CHECKED: DO	DATE: 4/28/23
SHEET NO.	

C10

STRUCTURAL NOTES:
ALL WELDS ARE COMPLETE JOINT
PENETRATING WELDS UNLESS
SPECIFIED OTHERWISE.



SLIDING GATE DETAIL
NOT TO SCALE

P
C04

NOTE:
SEE ASSOCIATED GATE DETAILS
ON SHEETS C12 & C13.

P:\CLIENTS\CIVIL\PUBLIC\ANACORTES, PORT OF\CURTIS WHARF ENTRANCE REDEVELOPMENT DESIGN & BID SUPPORT\DWG\DRAWING\CURTIS WHARF REDEVELOPMENT.DWG
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DATE: 4/28/23 4:08 PM - SHEET SET: XXXX - ORIGINAL SHEET SIZE: ANSI FULL BLEED D (34.00 X 22.00 INCHES)
AUTOCAD VERSION: CIVIL 3D 2013

P:\CLIENTS\CIVIL\PUBLIC\ANACORTES, PORT OF\CURTIS WHARF ENTRANCE REDEVELOPMENT DESIGN & BID SUPPORT\DWG\DRAWING\CURTIS WHARF REDEVELOPMENT.DWG
TAB: C11 DET MODIFIED BY NDAVIS ON APR 28, 2023 - 16:09



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PORT OF ANACORTES
CURTIS WHARF
PROJECT #MRT-64

DETAILS

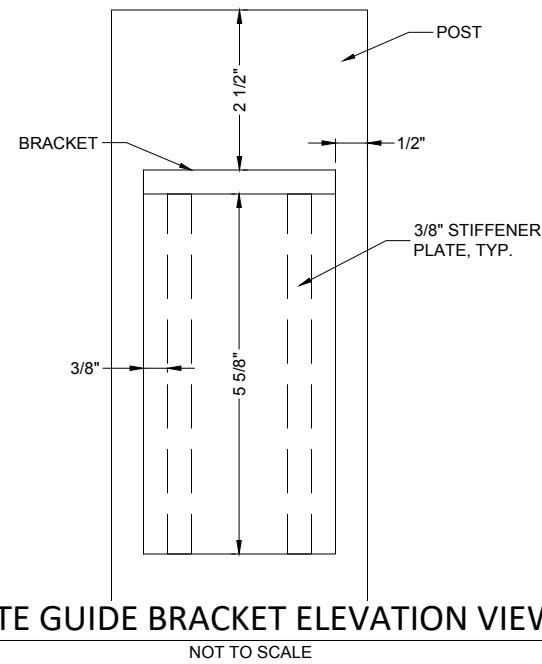
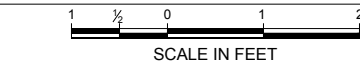
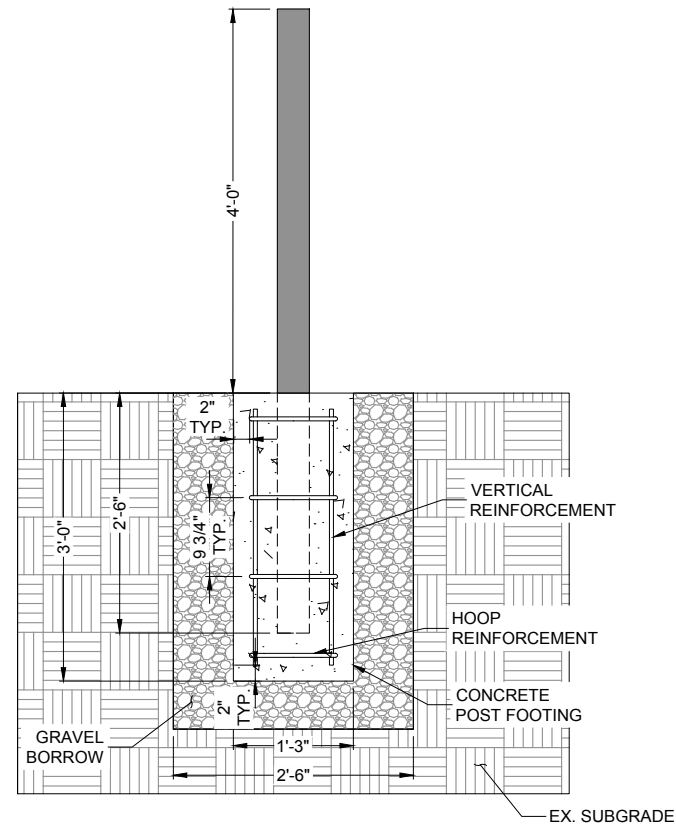
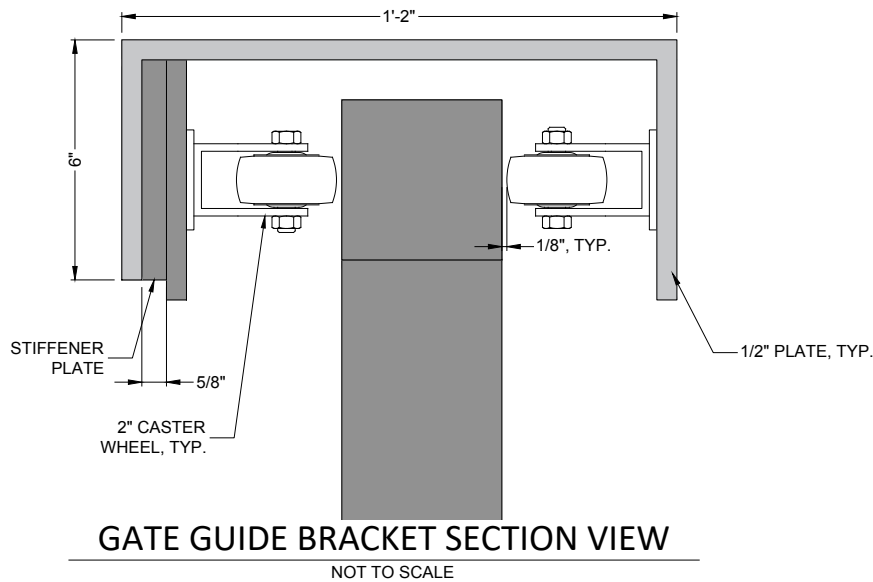
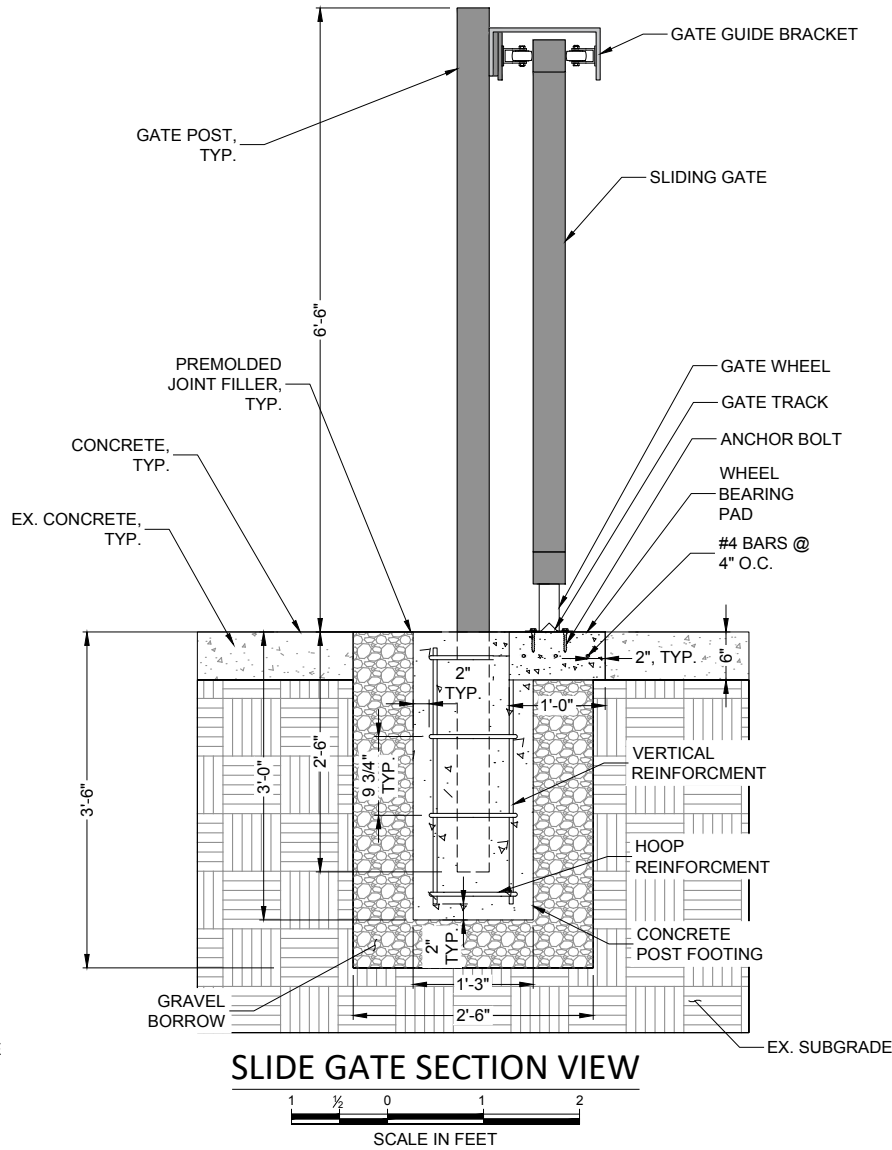
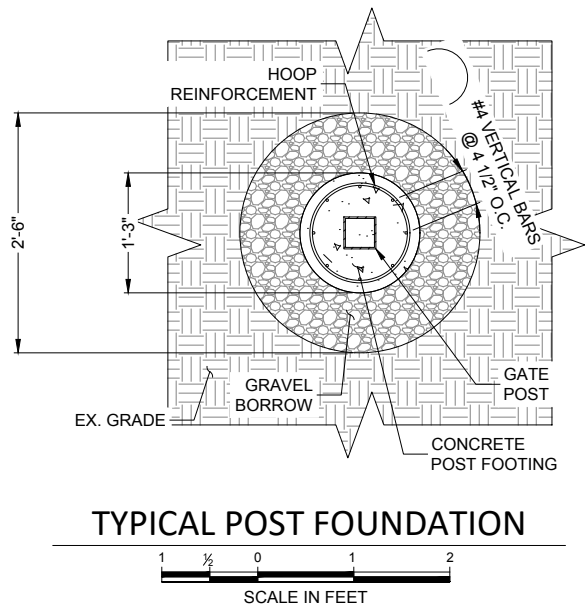
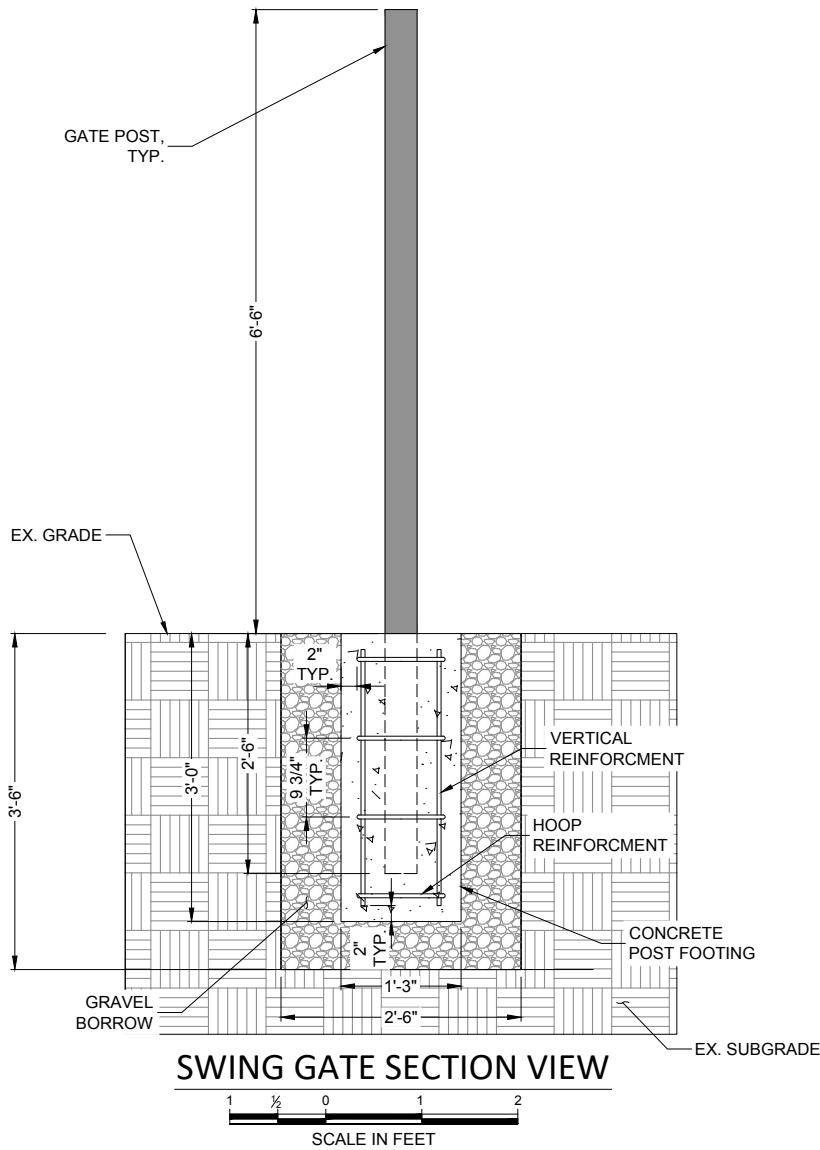
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CHECKED: DO	DATE: 4/28/23
SHEET NO.	

C11

100% CONSTRUCTION SET

P:\CLIENTS-CIVIL\PUBLIC\ANACORTES, PORT OF CURTIS WHARF ENTRANCE REDEVELOPMENT DESIGN & BID SUPPORT\DWG\DRAWING\CURTIS WHARF REDEVELOPMENT.DWG\TAB\C12 DET MODIFIED BY NDAVIS ON APR 28, 2023 - 16:09

CAD FILE NUMBER: P:\CLIENTS-CIVIL\PUBLIC\ANACORTES, PORT OF CURTIS WHARF ENTRANCE REDEVELOPMENT DESIGN & BID SUPPORT\DWG\DRAWING\CURTIS WHARF REDEVELOPMENT.DWG
DATE: 4/28/23 4:08 PM - 5:00 PM
SHEET SET: XXXX - ORIGINAL SHEET SIZE: ANSI FULL BLEED D (34.00 X 22.00 INCHES)
AUTOCAD VERSION: CIVIL 3D 2013



STRUCTURAL NOTES
ALL WELDS ARE COMPLETE JOINT
PENETRATING WELDS UNLESS
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PORT OF ANACORTES
CURTIS WHARF
PROJECT #MRT-64

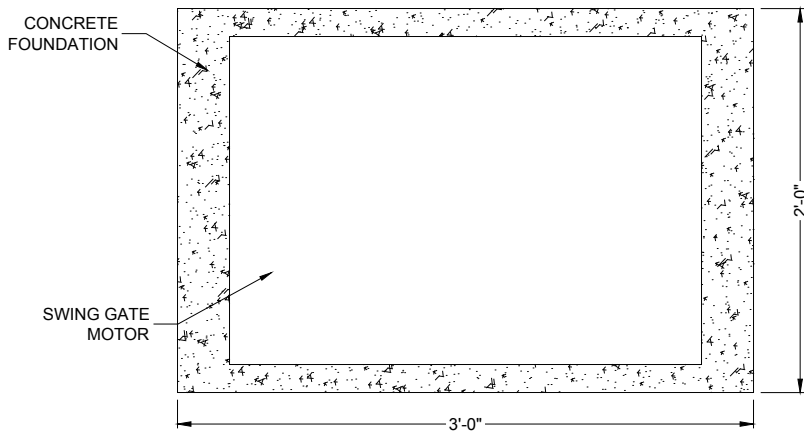
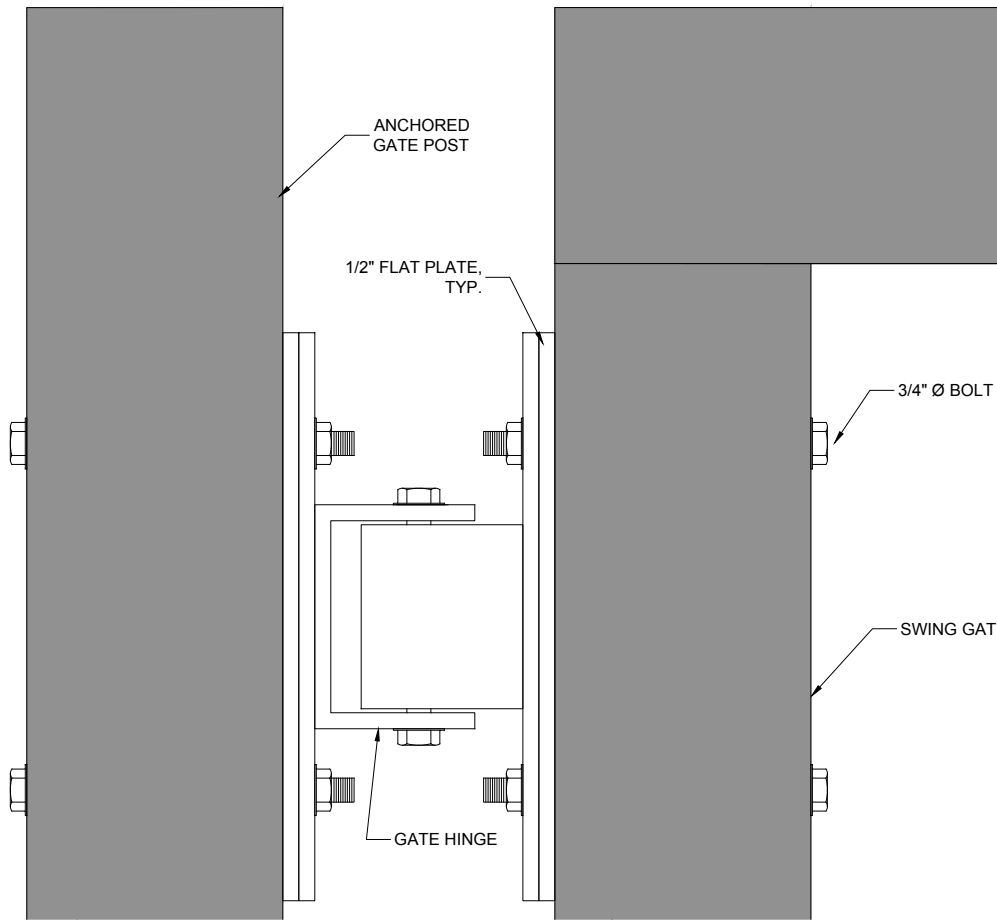
DETAILS

DRAWN: GR	PROJECT NO.: XXX
DESIGN: DO, SS	SCALE: AS NOTED
CHECKED: DO	DATE: 4/28/23
SHEET NO.	

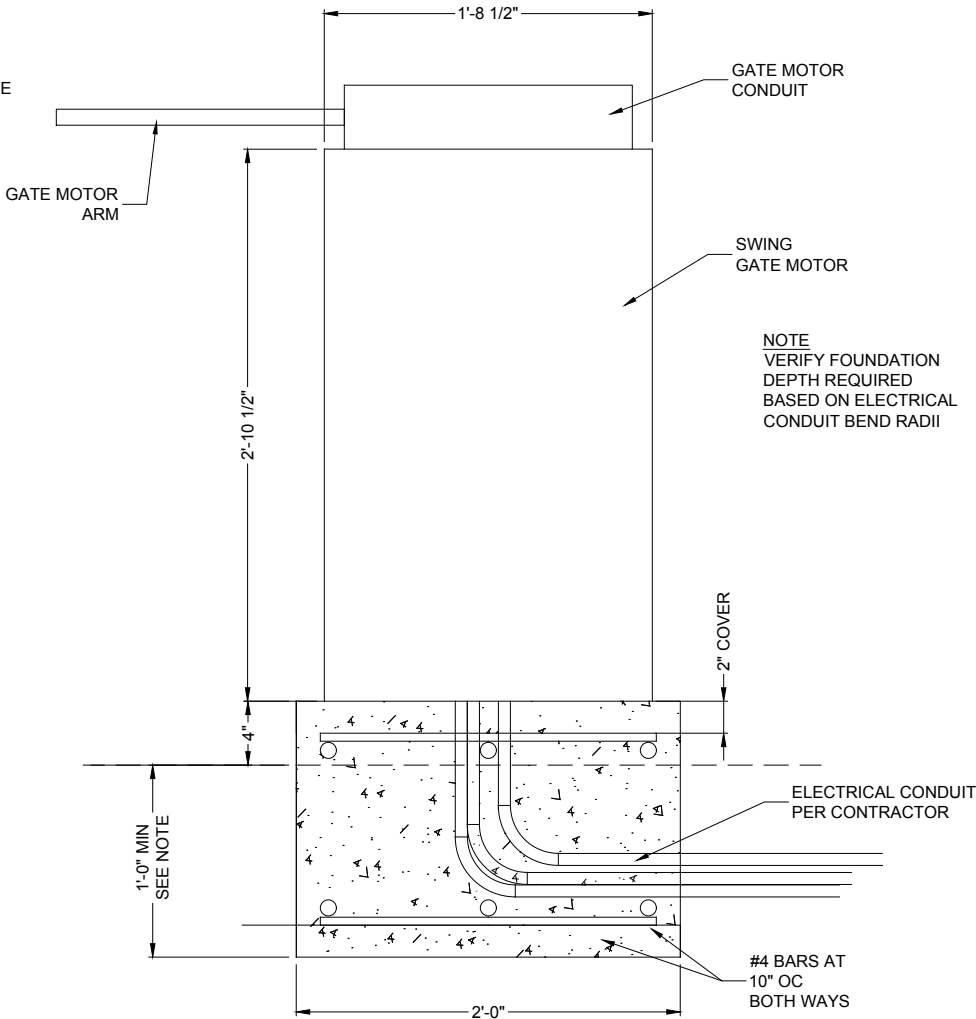
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AUTOCAD VERSION: CIVIL 3D 2013
DATE: 4/28/2023 4:08 PM - SHEET SET: XXXX - ORIGINAL SHEET SIZE: ANSI FULL BLEED D (34.00 X 22.00 INCHES)

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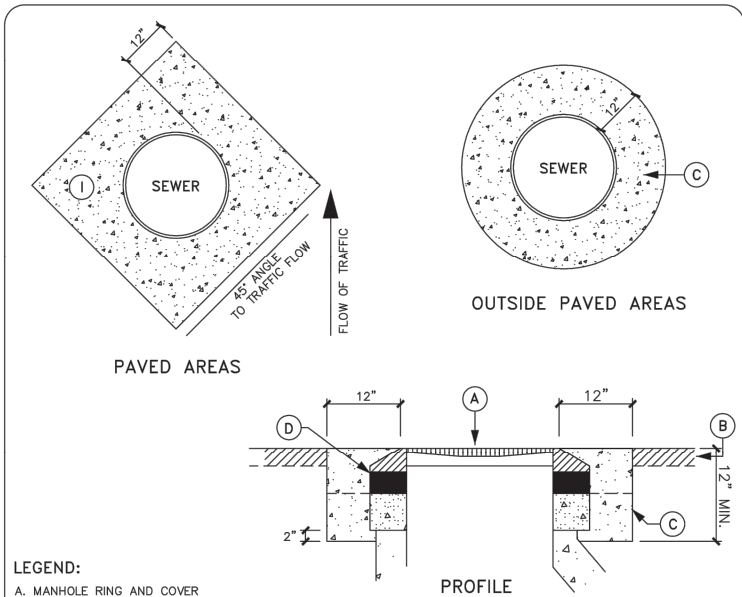


1/2 1/4 0 1/2 1
SCALE IN FEET



1/2 1/4 0 1/2 1
SCALE IN FEET

STRUCTURAL NOTES
ALL WELDS ARE COMPLETE JOINT
PENETRATING WELDS UNLESS
SPECIFIED OTHERWISE.



- LEGEND:**
- A. MANHOLE RING AND COVER
 - B. EXISTING SURFACE
 - C. 3000 P.S.I. CEMENT CONCRETE PERIMETER SEAL
 - D. INSTALL PRECAST ADJUSTMENT RINGS OR CONCRETE BLOCKS AS NECESSARY TO MATCH FINAL GRADE.
- NOTES:**
- THE CONCRETE SHALL CONFORMING TO THE CURRENT WSDOT 9-03.1(4) AND BE 5.5 SACK MIX. (MINIMUM 3000-PSI 28-DAY STRENGTH).
 - WHERE DEPTH OF NECK EXCEEDS 24 INCHES, ADJUST MANHOLE TO GRADE BY INSERTING A NEW MANHOLE BARREL SECTION BETWEEN THE CONE AND EXISTING BARREL.
 - ADJUSTMENT RINGS/BLOCK SHALL BE SET IN 3/4" NON-SHRINK GROUT, PLASTER SMOOTH INSIDE AND OUT.
 - STEPS OR RUNGS SHALL BE ADDED AS NEEDED.
 - PRECAST ADJUSTMENT RINGS SHALL BE CAST WITH GROOVE TO ALLOW FIELD INSTALLATION OF SAFETY STEP.
 - MORTAR SHALL BE PLACED BETWEEN EACH LEVEL OF ADJUSTMENT CONCRETE BLOCKS, ADJUSTMENT RINGS, TOP OF CONE SECTION AND BOTTOM OF IRON RING.
 - THE CONCRETE PERIMETER SEAL SHALL EXTEND TO 12 INCH MINIMUM OR 2 INCHES BELOW THE BOTTOM OF THE ADJUSTMENT RINGS OR BLOCKS.
 - THE UTILITY SHOWN IS A SANITARY SEWER MANHOLE. UTILITY CASINGS LIKE WATER VALVES, MONUMENTS, GAS VALVES, ETC. WILL FOLLOW THE SAME PROCEDURE AND GUIDELINES.

SCALE: NOT TO SCALE		DETAIL: ST-02
DRAWN BY: S.L.		STRUCTURE ADJUSTMENT AND PERIMETER SEAL
FILE: ST-02 STRUCTURE ADJUST.DWG		APPENDIX A - STANDARD DRAWING 2011
EFFECTIVE DATE: 01-20-2005		REVIEW BY DATE: 05-31-2013

REVIEWER: BUCKENMEYER

STRUCTURE ADJUSTMENT AND PERIMETER SEAL

R
C04



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PORT OF ANACORTES
CURTIS WHARF
PROJECT #MRT-64

DETAILS

DRAWN: GR	PROJECT NO.: XXX
DESIGN: DO, SS	SCALE: AS NOTED
CHECKED: DO	DATE: 4/28/23
SHEET NO.	

C13

100% CONSTRUCTION SET

APPENDIX B NRCS Soil Survey Report



Skagit County Area, Washington

31—Clallam-Urban land complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2hvf

Elevation: 30 to 150 feet

Mean annual precipitation: 23 inches

Mean annual air temperature: 48 degrees F

Frost-free period: 160 to 200 days

Farmland classification: Not prime farmland

Map Unit Composition

Clallam and similar soils: 45 percent

Urban land: 40 percent

Minor components: 5 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clallam

Setting

Landform: Hillslopes

Parent material: Glacial drift

Typical profile

H1 - 0 to 11 inches: gravelly ashy loam

H2 - 11 to 27 inches: very gravelly loam

H2 - 27 to 60 inches: very gravelly sandy loam

Properties and qualities

Slope: 0 to 8 percent

Depth to restrictive feature: 20 to 40 inches to densic material

Drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low
to moderately low (0.00 to 0.06 in/hr)

Depth to water table: About 18 to 36 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Very low (about 2.6 inches)

Interpretive groups

Land capability classification (irrigated): 3w

Land capability classification (nonirrigated): 4s

Hydrologic Soil Group: C

Ecological site: F002XA001WA - Puget Lowlands Dry Forest

Forage suitability group: Limited Depth Soils (G002XN302WA)

Other vegetative classification: Limited Depth Soils
(G002XN302WA)

Hydric soil rating: No

Description of Urban Land

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydric soil rating: No

Minor Components

Bow

Percent of map unit: 5 percent

Landform: Terraces

Other vegetative classification: Seasonally Wet Soils
(G002XN202WA)

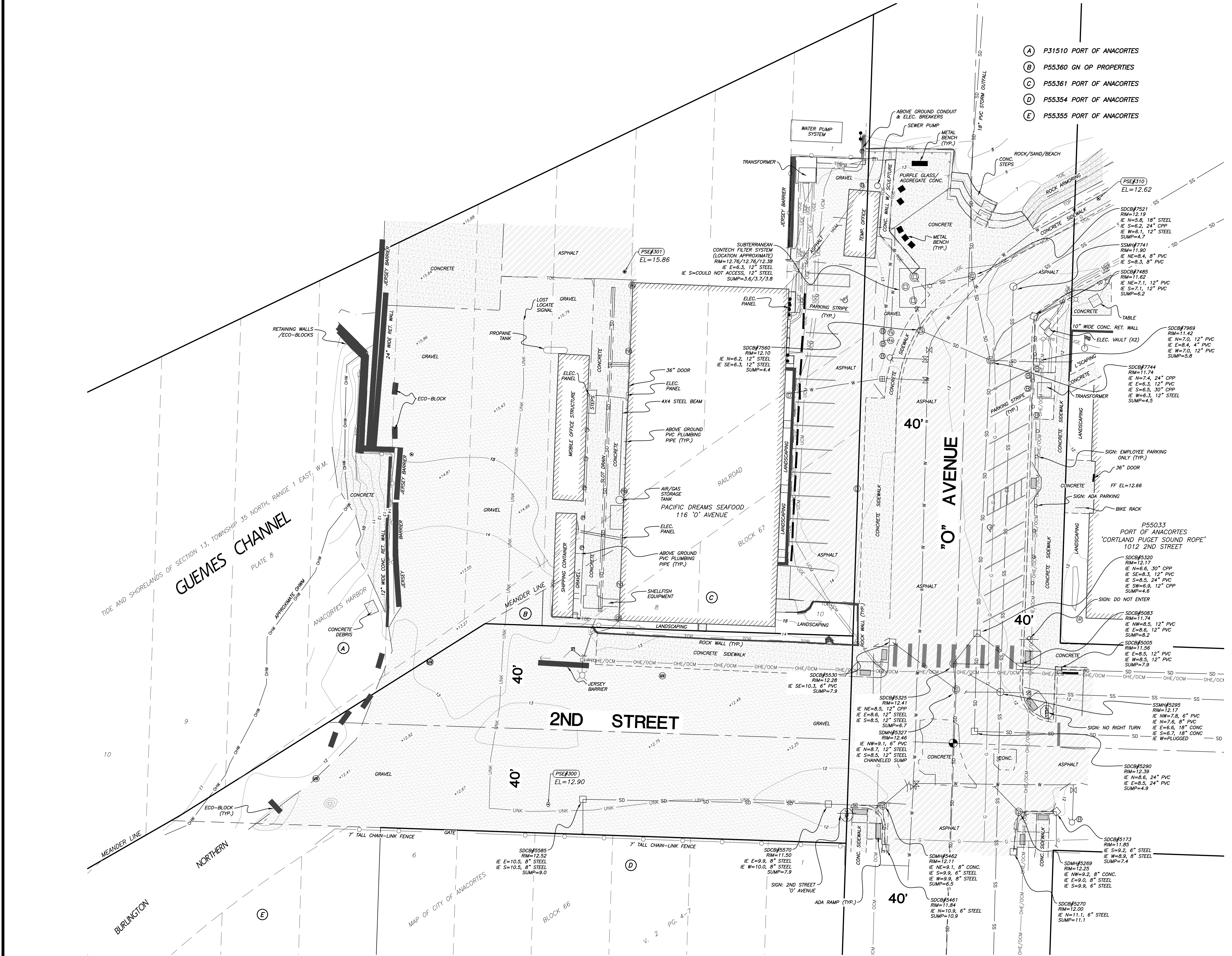
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Skagit County Area, Washington

Survey Area Data: Version 21, Aug 31, 2021

APPENDIX C Survey



EXISTING SYMBOL LEGEND:

- EXISTING MONUMENT
- SET MAG NAIL
- SET SPIKE
- SET RAILROAD SPIKE
- EXISTING STORM DRAIN MANHOLE
- EXISTING STORM DRAIN CLEANOUT
- EXISTING CATCH BASIN
- EXISTING DOWNSPOUT
- EXISTING SANITARY SEWER MANHOLE
- EXISTING GATE VALVE
- EXISTING WATER METER
- EXISTING FIRE HYDRANT
- EXISTING HOSE BIB
- EXISTING FIRE STANDPIPE
- EXISTING IRRIGATION BOX
- EXISTING MONITORING WELL
- EXISTING BOLLARD
- EXISTING POST
- EXISTING STOP SIGN
- EXISTING STREET SIGN
- EXISTING FLAG POLE
- EXISTING POWER POLE W/DROP
- EXISTING STREET LIGHT POLE W/ DROP
- EXISTING GROUND GUY
- EXISTING DROP FROM POLE
- EXISTING TELEPHONE PEDESTAL/RISER
- EXISTING ELECTRIC METER/SWITCH
- SPOT ELEVATION ON EXISTING GROUND
- EXISTING ASPHALT SURFACING
- EXISTING CONCRETE SURFACING
- EXISTING GRAVEL SURFACING

EXISTING LINE LEGEND:

- EXISTING EDGE OF ASPHALT
- EXISTING EDGE OF CONCRETE
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING CURB
- EXISTING SIDEWALK
- EXISTING STORM DRAIN LINE
- EXISTING SANITARY SEWER GRAVITY LINE
- EXISTING WATER LINE
- EXISTING OVERHEAD ELECTRIC & COMMUNICATION LINES
- EXISTING UNDERGROUND POWER
- EXISTING UNKNOWN UNDERGROUND UTILITY
- EXISTING UNDERGROUND COMMUNICATIONS LINE
- EXISTING OVERHEAD COMMUNICATIONS LINE
- EXISTING UNDERGROUND GAS LINE
- EXISTING TOP OF SLOPE LINE
- EXISTING TOE OF SLOPE LINE
- EXISTING GRADE INDEX CONTOUR
- EXISTING GRADE INTERVAL CONTOUR
- EXISTING ORDINARY HIGH WATER LINE
- EXISTING CHAINLINK FENCE
- EXISTING HANDRAIL

TOPO NOTES:

- THIS TOPOGRAPHIC SURVEY WAS PERFORMED AND PREPARED IN ACCORDANCE WITH WAC 332-130-145.
- DATA FOR THIS SURVEY WAS GATHERED BY FIELD TRAVERSE UTILIZING ELECTRONIC DATA COLLECTION IN OCTOBER AND NOVEMBER 2022.
- EQUIPMENT USED: THEOMAT 00'01.5" EDM: ± 2 PPM, ± 3 MM
- HORIZONTAL DATUM: NAD 83/91
- VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW) ON NOAA TIDAL DATUM EPOCH 1941-1959, BASED ON PORT OF ANACORTES SURVEY CONTROL MONUMENT "JETTY-2"
- TEMPORARY BENCH MARK: PSE CONTROL ON-SITE, AS SHOWN
- CONTOURS DEPICTED HEREON MEET OR EXCEED NATIONAL MAPPING STANDARDS FOR 1-FOOT ACCURACY TOPOGRAPHIC SURVEYS AND HAVE BEEN COMPUTER GENERATED FROM GROUND FIELD TOPOGRAPHY GATHERED FOR THIS SURVEY UTILIZING ELECTRONIC DATA COLLECTION.
- CONDUCTIBLE UNDERGROUND UTILITY LOCATES WERE PERFORMED AND PRINTED ON-SITE BY APPLIED PROFESSIONAL SERVICES AND SURVEYED BY PSE FIELD CREWS IN NOVEMBER 2022. UTILITIES ARE KNOWN TO EXIST WITHIN THE LIMITS OF THIS SURVEY THAT WERE UNDETECTABLE. ADDITIONAL UTILITY VERIFICATION MAY BE WARRANTED IN AREAS CONSIDERED FOR CONSTRUCTION.
- UTILITY LOCATION AREAS AND LEVEL OF LOCATE ACCURACY WERE DETERMINED BY SURVEYOR AND CLIENT PRIOR TO COMMENCEMENT OF FIELD SURVEY WORK.
- THIS MAP IS NOT INTENDED TO REPRESENT A FORMAL BOUNDARY SURVEY, NOR DOES IT REFLECT ELEMENTS THAT A BOUNDARY SURVEY MAY DISCLOSE. BOUNDARY RELATED ELEMENTS DEPICTED HEREON ARE SHOWN PER AVAILABLE RECORD INFORMATION AND OR PUBLICLY AVAILABLE GIS DATA.
- A CURRENT TITLE REPORT WAS NOT PROVIDED FOR THIS SURVEY. EASEMENTS AND/OR TITLE ENCUMBRANCES MAY EXIST THAT ARE NOT NOTED THEREIN.

CALL BEFORE YOU DIG 1-800-424-5555

REVISION	DATE	DESCRIPTION	ISSUE	DATE	DESCRIPTION
			1	11/29/22	FINAL TOPOGRAPHIC SURVEY

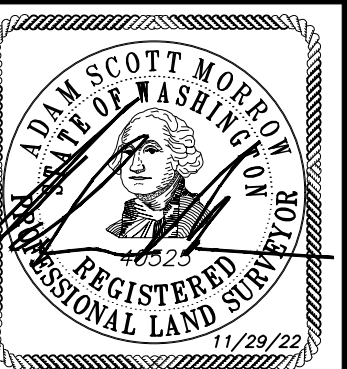
PORT OF ANACORTES
100 COMMERCIAL AVENUE
ANACORTES, WA 98221

TOPOGRAPHIC SURVEY
CURTIS WHARF
ANACORTES, WA 98221

SITUATE IN A PORTION OF THE SOUTHWEST 1/4 OF SECTION 18, TOWNSHIP 35 NORTH, RANGE 2 EAST AND THE SOUTHEAST 1/4 OF SECTION 13, TOWNSHIP 35 NORTH, RANGE 1 EAST, CITY OF ANACORTES, SKAGIT COUNTY, WASHINGTON

PACIFIC SURVEYING & ENGINEERING, INC.
909 Squakam Way, Suite 111 | BELLEVUE, WA 98005
T: 360.671.7387 | F: 360.671.4685
WWW.PSESURVEY.COM | INFO@PSESURVEY.COM

DATA	DRAWN BY	CHECKED BY	FIELD BOOKS
BASE	TJM	ASM	DESIGN: 716 SERIES
DESIGN			STAKING:
XREF:	N/A		ASBUILT:
DWG:	2022301		DATUM
HORIZ. SCALE:	1" = 20'		
VERT. SCALE:	N/A		HORIZ.: NAD 83/91
JOB#:	2022301		VERT.: MLLW NOAA TIDAL
SHEET	1	OF	1



APPENDIX D WWHM Summary

WWHM2012
PROJECT REPORT

General Model Information

Project Name: default[29]
Site Name:
Site Address:
City:
Report Date: 4/18/2023
Gage: Burlington
Data Start: 1948/10/01
Data End: 2009/09/30
Timestep: 15 Minute
Precip Scale: 0.833
Version Date: 2019/09/13
Version: 4.2.17

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass: No

GroundWater: No

Pervious Land Use acre
C, Forest, Flat 0.329

Pervious Total 0.329

Impervious Land Use acre

Impervious Total 0

Basin Total 0.329

Element Flows To:		
Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROADS FLAT	0.28
SIDEWALKS FLAT	0.049
Impervious Total	0.329
Basin Total	0.329

Element Flows To:		
Surface	Interflow	Groundwater

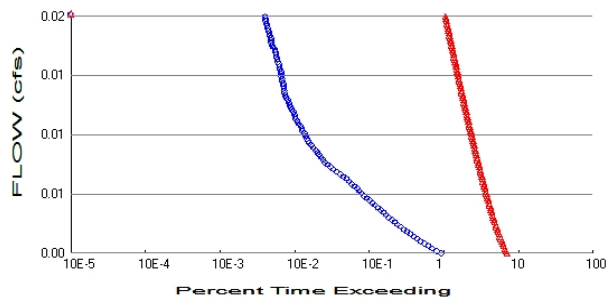
Routing Elements

Predeveloped Routing

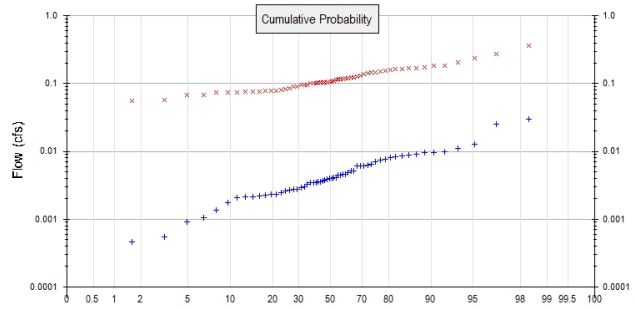
Mitigated Routing

Analysis Results

POC 1



+ Predeveloped x Mitigated



Predeveloped Landuse Totals for POC #1

Total Pervious Area: 0.329
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1

Total Pervious Area: 0
Total Impervious Area: 0.329

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.004081
5 year	0.007881
10 year	0.01087
25 year	0.015065
50 year	0.018436
100 year	0.021977

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.109121
5 year	0.153032
10 year	0.18536
25 year	0.230032
50 year	0.266171
100 year	0.304833

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.013	0.161
1950	0.008	0.084
1951	0.008	0.138
1952	0.005	0.148
1953	0.002	0.167
1954	0.003	0.083
1955	0.004	0.078
1956	0.003	0.056
1957	0.006	0.166
1958	0.003	0.074

1959	0.007	0.077
1960	0.004	0.125
1961	0.003	0.076
1962	0.000	0.128
1963	0.002	0.080
1964	0.003	0.095
1965	0.006	0.234
1966	0.002	0.100
1967	0.004	0.185
1968	0.009	0.146
1969	0.002	0.074
1970	0.001	0.183
1971	0.009	0.108
1972	0.004	0.068
1973	0.004	0.121
1974	0.008	0.091
1975	0.025	0.171
1976	0.002	0.206
1977	0.002	0.090
1978	0.003	0.165
1979	0.002	0.102
1980	0.005	0.115
1981	0.004	0.104
1982	0.010	0.108
1983	0.005	0.096
1984	0.010	0.103
1985	0.001	0.131
1986	0.006	0.075
1987	0.004	0.076
1988	0.006	0.170
1989	0.003	0.115
1990	0.006	0.104
1991	0.011	0.148
1992	0.004	0.117
1993	0.004	0.058
1994	0.001	0.077
1995	0.001	0.069
1996	0.007	0.140
1997	0.030	0.270
1998	0.005	0.110
1999	0.003	0.054
2000	0.002	0.156
2001	0.000	0.102
2002	0.004	0.075
2003	0.002	0.094
2004	0.004	0.357
2005	0.003	0.123
2006	0.009	0.117
2007	0.005	0.105
2008	0.010	0.104
2009	0.003	0.121

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0300	0.3573
2	0.0249	0.2704
3	0.0129	0.2339

4	0.0112	0.2057
5	0.0098	0.1846
6	0.0097	0.1829
7	0.0095	0.1711
8	0.0091	0.1697
9	0.0087	0.1675
10	0.0086	0.1657
11	0.0084	0.1655
12	0.0081	0.1613
13	0.0076	0.1555
14	0.0075	0.1484
15	0.0070	0.1482
16	0.0064	0.1460
17	0.0062	0.1404
18	0.0061	0.1384
19	0.0061	0.1305
20	0.0061	0.1284
21	0.0052	0.1249
22	0.0052	0.1228
23	0.0048	0.1211
24	0.0046	0.1209
25	0.0046	0.1172
26	0.0045	0.1171
27	0.0044	0.1151
28	0.0041	0.1146
29	0.0041	0.1104
30	0.0040	0.1081
31	0.0040	0.1077
32	0.0039	0.1051
33	0.0037	0.1045
34	0.0036	0.1039
35	0.0036	0.1037
36	0.0036	0.1026
37	0.0035	0.1022
38	0.0034	0.1019
39	0.0034	0.1000
40	0.0033	0.0956
41	0.0030	0.0952
42	0.0029	0.0943
43	0.0027	0.0907
44	0.0027	0.0903
45	0.0027	0.0844
46	0.0026	0.0831
47	0.0025	0.0804
48	0.0023	0.0779
49	0.0023	0.0773
50	0.0023	0.0772
51	0.0022	0.0762
52	0.0022	0.0758
53	0.0021	0.0752
54	0.0021	0.0746
55	0.0017	0.0738
56	0.0013	0.0738
57	0.0011	0.0687
58	0.0009	0.0676
59	0.0005	0.0578
60	0.0005	0.0564
61	0.0005	0.0544

Duration Flows

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0020	19603	150385	767	Fail
0.0022	17066	145102	850	Fail
0.0024	14936	140311	939	Fail
0.0025	13205	135733	1027	Fail
0.0027	11644	131541	1129	Fail
0.0029	10367	127606	1230	Fail
0.0030	9315	123841	1329	Fail
0.0032	8438	120419	1427	Fail
0.0034	7567	117189	1548	Fail
0.0035	6821	113960	1670	Fail
0.0037	6188	110965	1793	Fail
0.0039	5638	108142	1918	Fail
0.0040	5135	105554	2055	Fail
0.0042	4688	102944	2195	Fail
0.0044	4261	100442	2357	Fail
0.0045	3897	98110	2517	Fail
0.0047	3587	95886	2673	Fail
0.0049	3302	93854	2842	Fail
0.0050	3039	91758	3019	Fail
0.0052	2772	89705	3236	Fail
0.0054	2541	87694	3451	Fail
0.0055	2340	85876	3669	Fail
0.0057	2141	84122	3929	Fail
0.0058	1967	82411	4189	Fail
0.0060	1811	80785	4460	Fail
0.0062	1682	79160	4706	Fail
0.0063	1566	77534	4951	Fail
0.0065	1461	75930	5197	Fail
0.0067	1351	74476	5512	Fail
0.0068	1251	73064	5840	Fail
0.0070	1163	71631	6159	Fail
0.0072	1065	70262	6597	Fail
0.0073	959	68957	7190	Fail
0.0075	872	67631	7755	Fail
0.0077	777	66412	8547	Fail
0.0078	706	65129	9225	Fail
0.0080	636	63910	10048	Fail
0.0082	588	62691	10661	Fail
0.0083	544	61493	11303	Fail
0.0085	513	60381	11770	Fail
0.0087	484	59311	12254	Fail
0.0088	459	58220	12684	Fail
0.0090	431	57194	13270	Fail
0.0092	410	56210	13709	Fail
0.0093	384	55204	14376	Fail
0.0095	356	54178	15218	Fail
0.0097	334	53215	15932	Fail
0.0098	323	52317	16197	Fail
0.0100	309	51397	16633	Fail
0.0102	302	50499	16721	Fail
0.0103	287	49601	17282	Fail
0.0105	273	48788	17871	Fail
0.0107	266	47911	18011	Fail
0.0108	257	47120	18334	Fail

0.0110	246	46307	18823	Fail
0.0111	233	45537	19543	Fail
0.0113	222	44767	20165	Fail
0.0115	216	43997	20368	Fail
0.0116	212	43312	20430	Fail
0.0118	205	42585	20773	Fail
0.0120	196	41901	21378	Fail
0.0121	189	41173	21784	Fail
0.0123	183	40468	22113	Fail
0.0125	178	39826	22374	Fail
0.0126	171	39206	22927	Fail
0.0128	164	38585	23527	Fail
0.0130	159	37901	23837	Fail
0.0131	157	37302	23759	Fail
0.0133	155	36682	23665	Fail
0.0135	154	36126	23458	Fail
0.0136	152	35548	23386	Fail
0.0138	150	34971	23314	Fail
0.0140	147	34372	23382	Fail
0.0141	144	33816	23483	Fail
0.0143	142	33281	23437	Fail
0.0145	141	32768	23239	Fail
0.0146	139	32276	23220	Fail
0.0148	137	31762	23183	Fail
0.0150	134	31249	23320	Fail
0.0151	131	30757	23478	Fail
0.0153	127	30329	23881	Fail
0.0155	124	29816	24045	Fail
0.0156	121	29324	24234	Fail
0.0158	120	28918	24098	Fail
0.0160	117	28468	24331	Fail
0.0161	116	27998	24136	Fail
0.0163	111	27527	24799	Fail
0.0164	107	27100	25327	Fail
0.0166	104	26693	25666	Fail
0.0168	103	26308	25541	Fail
0.0169	102	25859	25351	Fail
0.0171	99	25474	25731	Fail
0.0173	98	25068	25579	Fail
0.0174	94	24683	26258	Fail
0.0176	92	24319	26433	Fail
0.0178	91	23934	26301	Fail
0.0179	90	23549	26165	Fail
0.0181	87	23164	26625	Fail
0.0183	86	22758	26462	Fail
0.0184	85	22437	26396	Fail

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.

The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume: 0.0297 acre-feet

On-line facility target flow: 0.0435 cfs.

Adjusted for 15 min: 0.0435 cfs.

Off-line facility target flow: 0.0247 cfs.

Adjusted for 15 min: 0.0247 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Failed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

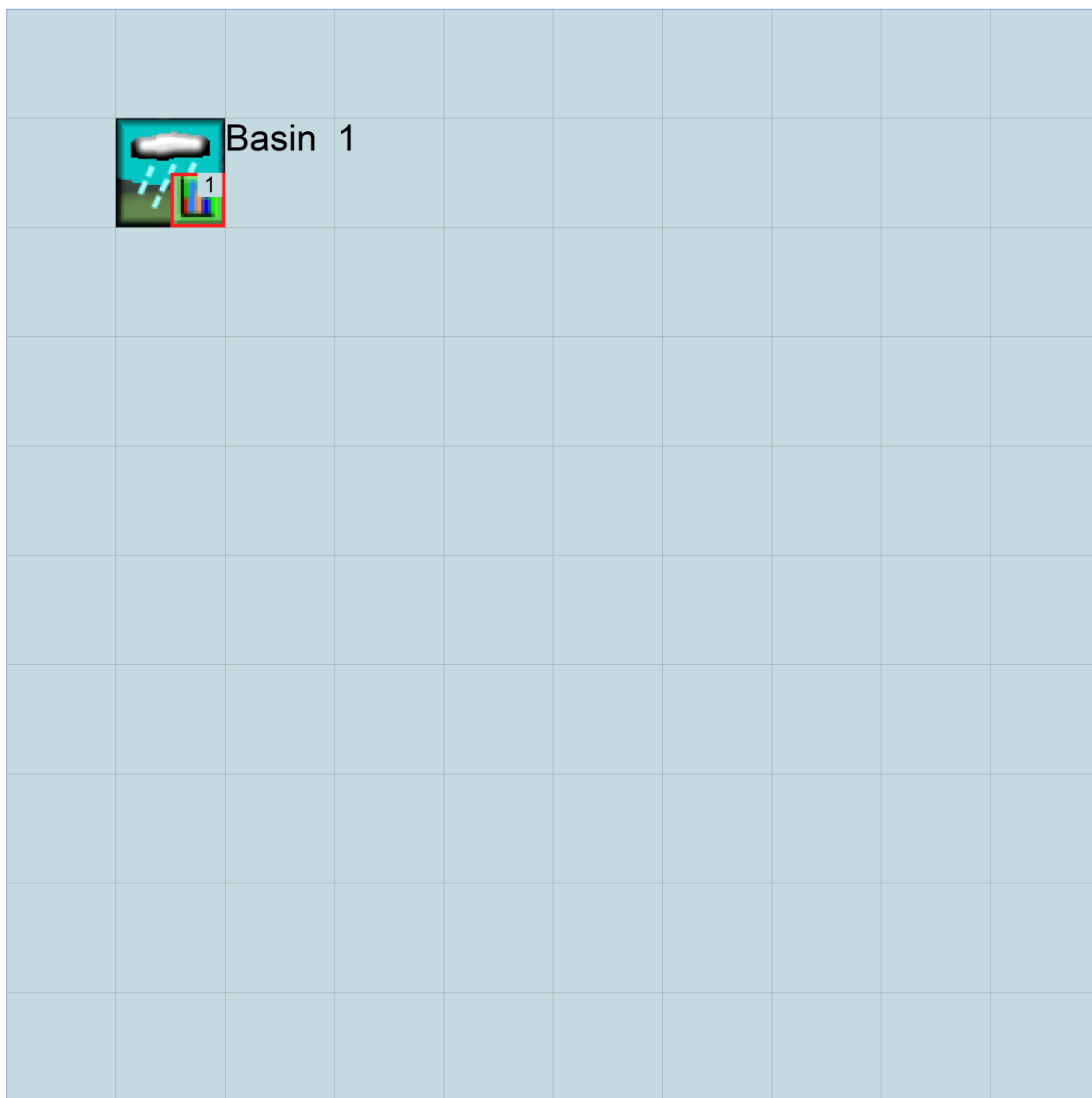
Appendix

Predeveloped Schematic



Basin 1
0.33ac

Mitigated Schematic



Predeveloped UCI File

RUN

GLOBAL

```
WWM4 model simulation
START      1948 10 01      END      2009 09 30
RUN INTERP OUTPUT LEVEL    3      0
RESUME     0 RUN      1      UNIT SYSTEM      1
END GLOBAL
```

FILES

```
<File>  <Un#>  <-----File Name----->***
<-ID->                                     ***
WDM      26      default[29].wdm
MESSU    25      Predefault[29].MES
          27      Predefault[29].L61
          28      Predefault[29].L62
          30      POCdefault[29]1.dat
```

END FILES

OPN SEQUENCE

```
INGRP                      INDELT 00:15
  PERLND      10
  COPY        501
  DISPLY      1
```

END INGRP

END OPN SEQUENCE

DISPLY

DISPLY-INF01

```
# - #<-----Title----->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
1   Basin 1                      MAX          1   2   30   9
```

END DISPLY-INF01

END DISPLY

COPY

TIMESERIES

```
# - # NPT NMN ***
1   1   1
501 1   1
```

END TIMESERIES

END COPY

GENER

OPCODE

```
#   # OPCD ***
```

END OPCODE

PARM

```
#   #           K ***
```

END PARM

END GENER

PERLND

GEN-INFO

```
<PLS ><-----Name----->NBLKS      Unit-systems      Printer ***
# - #      User      t-series      Engl Metr ***
```

```
in out
```

```
10      C, Forest, Flat      1      1      1      1      27      0
```

END GEN-INFO

*** Section PWATER***

ACTIVITY

```
<PLS > ***** Active Sections *****
```

```
# - # ATMP SNOW PWAT SED PST PWG PQAL MSTL PEST NITR PHOS TRAC ***
```

```
10      0      0      1      0      0      0      0      0      0      0      0      0
```

END ACTIVITY

PRINT-INFO

```
<PLS > ***** Print-flags ***** PIVL PYR
```

```
# - # ATMP SNOW PWAT SED PST PWG PQAL MSTL PEST NITR PHOS TRAC *****
```

```
10      0      0      4      0      0      0      0      0      0      0      0      0      1      9
```

END PRINT-INFO

```

PWAT-PARM1
<PLS > PWATER variable monthly parameter value flags ***
# - # CSNO RTOP UZFG VCS VUZ VNN VIFW VIRC VLE INFC HWT ***
10 0 0 0 0 0 0 0 0 0 0 0
END PWAT-PARM1

PWAT-PARM2
<PLS > PWATER input info: Part 2 ***
# - # ***FOREST LZSN INFILT LSUR SLSUR KVARY AGWRC
10 0 4.5 0.08 400 0.05 0.5 0.996
END PWAT-PARM2

PWAT-PARM3
<PLS > PWATER input info: Part 3 ***
# - # ***PETMAX PETMIN INFEXP INFILD DEEPFR BASETP AGWETP
10 0 0 2 2 0 0 0
END PWAT-PARM3

PWAT-PARM4
<PLS > PWATER input info: Part 4 ***
# - # CEPSC UZSN NSUR INTFW IRC LZETP ***
10 0.2 0.5 0.35 6 0.5 0.7
END PWAT-PARM4

PWAT-STATE1
<PLS > *** Initial conditions at start of simulation
ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
# - # *** CEPS SURS UZS IFWS LZS AGWS GWVS
10 0 0 0 0 2.5 1 0
END PWAT-STATE1

END PERLND

IMPLND
GEN-INFO
<PLS ><-----Name-----> Unit-systems Printer ***
# - # User t-series Engl Metr ***
in out ***

END GEN-INFO
*** Section IWATER***

ACTIVITY
<PLS > ***** Active Sections *****
# - # ATMP SNOW IWAT SLD IWG IQAL ***
END ACTIVITY

PRINT-INFO
<ILS > ***** Print-flags ***** PIVL PYR
# - # ATMP SNOW IWAT SLD IWG IQAL *****
END PRINT-INFO

IWAT-PARM1
<PLS > IWATER variable monthly parameter value flags ***
# - # CSNO RTOP VRS VNN RTLI ***
END IWAT-PARM1

IWAT-PARM2
<PLS > IWATER input info: Part 2 ***
# - # *** LSUR SLSUR NSUR RETSC
END IWAT-PARM2

IWAT-PARM3
<PLS > IWATER input info: Part 3 ***
# - # ***PETMAX PETMIN
END IWAT-PARM3

IWAT-STATE1
<PLS > *** Initial conditions at start of simulation
# - # *** RETS SURS
END IWAT-STATE1

```

END IMPLND

SCHEMATIC

<-Source->		<--Area-->		<-Target->	MBLK	***
<Name>	#	<-factor->		<Name>	#	Tbl#
Basin	1***					
PERLND	10	0.329		COPY	501	12
PERLND	10	0.329		COPY	501	13

*****Routing*****

END SCHEMATIC

NETWORK

<-Volume->	<-Grp>	<-Member->	<--Mult-->	Tran	<-Target vols>	<-Grp>	<-Member->	***
<Name>	#	<Name>	#	<-factor->	strg	<Name>	#	<Name>
COPY	501	OUTPUT	MEAN	1 1	48.4	DISPLY	1	INPUT
								TIMSER 1

<-Volume->	<-Grp>	<-Member->	<--Mult-->	Tran	<-Target vols>	<-Grp>	<-Member->	***
<Name>	#	<Name>	#	<-factor->	strg	<Name>	#	<Name>

END NETWORK

RCHRES

GEN-INFO

RCHRES	Name	Nexits	Unit Systems	Printer	***
# - #	<----->	<---->	User T-series	Engl Metr LKFG	***
			in out		***

END GEN-INFO

*** Section RCHRES***

ACTIVITY

<PLS > ***** Active Sections *****

# - #	HYFG	ADFG	CNFG	HTFG	SDFG	GQFG	OXFG	NUFG	PKFG	PHFG	***
-------	------	------	------	------	------	------	------	------	------	------	-----

END ACTIVITY

PRINT-INFO

<PLS > ***** Print-flags ***** PIVL PYR

# - #	HYDR	ADCA	CONS	HEAT	SED	GQL	OXRX	NUTR	PLNK	PHCB	PIVL	PYR	*****
-------	------	------	------	------	-----	-----	------	------	------	------	------	-----	-------

END PRINT-INFO

HYDR-PARM1

RCHRES	Flags for each HYDR Section	***	ODGTFG for each	***	FUNCT for each	***
# - #	VC A1 A2 A3	ODFVFG for each	***	ODGTFG for each	FUNCT for each	***
	FG FG FG FG	possible exit	***	possible exit	possible exit	***
	* * * *	* * * *		* * * *		

END HYDR-PARM1

HYDR-PARM2

# - #	FTABNO	LEN	DELTH	STCOR	KS	DB50	***
<----->	<----->	<----->	<----->	<----->	<----->	<----->	***

END HYDR-PARM2

HYDR-INIT

RCHRES	Initial conditions for each HYDR section	***
# - #	*** VOL Initial value of COLIND Initial value of OUTDGT	
	*** ac-ft for each possible exit for each possible exit	
<----->	<----->	*** <----->

END HYDR-INIT

END RCHRES

SPEC-ACTIONS

END SPEC-ACTIONS

FTABLES

END FTABLES

EXT SOURCES

<-Volume->	<Member>	SsysSgap	<--Mult-->	Tran	<-Target vols>	<-Grp>	<-Member->	***
<Name>	#	<Name>	#	tem strg	<-factor->	strg	<Name>	#
WDM	2	PREC	ENGL	0.833			PERLND	1
WDM	2	PREC	ENGL	0.833			IMPLND	1
							999 EXTNL	PREC
							999 EXTNL	PREC

WDM	1	EVAP	ENGL	0.76	PERLND	1	999	EXTNL	PETINP
WDM	1	EVAP	ENGL	0.76	IMPLND	1	999	EXTNL	PETINP

END EXT SOURCES

EXT TARGETS

<-Volume->	<-Grp>	<-Member->	<--Mult-->	Tran	<-Volume->	<Member>	Tsys	Tgap	Amd	***	
<Name>	#	<Name>	#	#<-factor->	strg	<Name>	#	<Name>	tem	strg	strg***
COPY	501	OUTPUT	MEAN	1	1	48.4	WDM	501	FLOW	ENGL	REPL

END EXT TARGETS

MASS-LINK

<Volume>	<-Grp>	<-Member->	<--Mult-->	<Target>	<-Grp>	<-Member->	***
<Name>	#	<Name>	#	#<-factor->	<Name>	#	#***
MASS-LINK	12						
PERLND	PWATER	SURO		0.083333	COPY	INPUT	MEAN
END MASS-LINK	12						

MASS-LINK	13						
PERLND	PWATER	IFW0		0.083333	COPY	INPUT	MEAN
END MASS-LINK	13						

END MASS-LINK

END RUN

Mitigated UCI File

RUN

GLOBAL

```
WWM4 model simulation
START      1948 10 01      END      2009 09 30
RUN INTERP OUTPUT LEVEL    3      0
RESUME     0 RUN      1
UNIT SYSTEM      1
END GLOBAL
```

FILES

```
<File> <Un#> <-----File Name----->***
<-ID->                                     ***
WDM      26      default[29].wdm
MESSU    25      Mitdefault[29].MES
          27      Mitdefault[29].L61
          28      Mitdefault[29].L62
          30      POCdefault[29]1.dat
```

END FILES

OPN SEQUENCE

```
INGRP      INDELT 00:15
  IMPLND      1
  IMPLND      8
  COPY      501
  DISPLY      1
```

END INGRP

END OPN SEQUENCE

DISPLY

DISPLY-INFO1

```
# - #<-----Title----->***TRAN PIVL DIG1 FIL1 PYR DIG2 FIL2 YRND
1      Basin 1      MAX      1      2      30      9
```

END DISPLY-INFO1

END DISPLY

COPY

TIMESERIES

```
# - # NPT NMN ***
1      1      1
501      1      1
```

END TIMESERIES

END COPY

GENER

OPCODE

```
#      # OPCD ***
```

END OPCODE

PARM

```
#      #      K ***
```

END PARM

END GENER

PERLND

GEN-INFO

```
<PLS ><-----Name----->NBLKS Unit-systems Printer ***
# - # User t-series Engl Metr ***
      in out      ***
```

END GEN-INFO

*** Section PWATER***

ACTIVITY

```
<PLS > ***** Active Sections *****
# - # ATMP SNOW PWAT SED PST PWG PQAL MSTL PEST NITR PHOS TRAC ***
```

END ACTIVITY

PRINT-INFO

```
<PLS > ***** Print-flags ***** PIVL PYR
# - # ATMP SNOW PWAT SED PST PWG PQAL MSTL PEST NITR PHOS TRAC *****
```

END PRINT-INFO

PWAT-PARM1

```
<PLS > PWATER variable monthly parameter value flags ***
```

```

# - # CSNO RTOP UZFG VCS VUZ VNN VIFW VIRG VLE INFC HWT ***
END PWAT-PARM1

PWAT-PARM2
<PLS > PWATER input info: Part 2 ***
# - # ***FOREST LZSN INFILT LSUR SLSUR KVARV AGWRC
END PWAT-PARM2

PWAT-PARM3
<PLS > PWATER input info: Part 3 ***
# - # ***PETMAX PETMIN INFEXP INFILD DEEPFR BASETP AGWETP
END PWAT-PARM3

PWAT-PARM4
<PLS > PWATER input info: Part 4 ***
# - # CEPSC UZSN NSUR INTFW IRC LZETP ***
END PWAT-PARM4

PWAT-STATE1
<PLS > *** Initial conditions at start of simulation
ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
# - # *** CEPS SURS UZS IFWS LZS AGWS GWVS
END PWAT-STATE1

END PERLND

IMPLND
GEN-INFO
<PLS ><-----Name-----> Unit-systems Printer ***
# - # User t-series Engl Metr ***
in out ***
1 ROADS/FLAT 1 1 1 27 0
8 SIDEWALKS/FLAT 1 1 1 27 0
END GEN-INFO
*** Section IWATER***

ACTIVITY
<PLS > ***** Active Sections *****
# - # ATMP SNOW IWAT SLD IWG IQAL ***
1 0 0 1 0 0 0
8 0 0 1 0 0 0
END ACTIVITY

PRINT-INFO
<ILS > ***** Print-flags ***** PIVL PYR
# - # ATMP SNOW IWAT SLD IWG IQAL *****
1 0 0 4 0 0 0 1 9
8 0 0 4 0 0 0 1 9
END PRINT-INFO

IWAT-PARM1
<PLS > IWATER variable monthly parameter value flags ***
# - # CSNO RTOP VRS VNN RTLI ***
1 0 0 0 0 0
8 0 0 0 0 0
END IWAT-PARM1

IWAT-PARM2
<PLS > IWATER input info: Part 2 ***
# - # *** LSUR SLSUR NSUR RETSC
1 400 0.01 0.1 0.1
8 400 0.01 0.1 0.1
END IWAT-PARM2

IWAT-PARM3
<PLS > IWATER input info: Part 3 ***
# - # ***PETMAX PETMIN
1 0 0
8 0 0
END IWAT-PARM3

```

```

IWAT-STATE1
<PLS > *** Initial conditions at start of simulation
# - # *** RETS      SURS
1      0      0
8      0      0
END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->          <--Area-->      <-Target->      MBLK      ***
<Name> #          <-factor->      <Name> #      Tbl#      ***
Basin 1***
IMPLND 1          0.28      COPY 501      15
IMPLND 8          0.049     COPY 501      15

*****Routing*****
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member-> ***
<Name> #      <Name> # #<-factor->strg <Name> # #      <Name> # #      ***
COPY 501 OUTPUT MEAN 1 1 48.4      DISPLY 1      INPUT TIMSER 1

<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member-> ***
<Name> #      <Name> # #<-factor->strg <Name> # #      <Name> # #      ***
END NETWORK

RCHRES
GEN-INFO
RCHRES      Name      Nexits      Unit Systems      Printer      ***
# - #<-----><----> User T-series Engl Metr LKFG      ***
in out      ***
END GEN-INFO
*** Section RCHRES***

ACTIVITY
<PLS > ***** Active Sections *****
# - # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
END ACTIVITY

PRINT-INFO
<PLS > ***** Print-flags ***** PIVL PYR
# - # HYDR ADCA CONS HEAT SED GQL OXRX NUTR PLNK PHCB PIVL PYR *****
END PRINT-INFO

HYDR-PARM1
RCHRES      Flags for each HYDR Section      ***
# - # VC A1 A2 A3 ODFVFG for each *** ODGTFG for each FUNCT for each
FG FG FG FG possible exit *** possible exit possible exit
* * * * * * * * * * * * * * * * * * * * * *
END HYDR-PARM1

HYDR-PARM2
# - # FTABNO      LEN      DELTH      STCOR      KS      DB50      ***
<-----><-----><-----><-----><-----><-----><----->      ***
END HYDR-PARM2

HYDR-INIT
RCHRES      Initial conditions for each HYDR section      ***
# - # *** VOL      Initial value of COLIND      Initial value of OUTDGT
*** ac-ft      for each possible exit      for each possible exit
<-----><----->      <---><---><---><---><---> *** <---><---><---><---><--->
END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES

```


END FTABLES

EXT SOURCES

<-Volume->	<Member>	SsysSgap<--Mult-->Tran	<-Target	vols>	<-Grp>	<-Member->	***
<Name>	#	<Name> # tem strg<-factor->strg	<Name>	#	#	<Name> # #	***
WDM	2	PREC ENGL 0.833	PERLND	1	999	EXTNL PREC	
WDM	2	PREC ENGL 0.833	IMPLND	1	999	EXTNL PREC	
WDM	1	EVAP ENGL 0.76	PERLND	1	999	EXTNL PETINP	
WDM	1	EVAP ENGL 0.76	IMPLND	1	999	EXTNL PETINP	

END EXT SOURCES

EXT TARGETS

<-Volume->	<-Grp>	<-Member-><--Mult-->Tran	<-Volume->	<Member>	Tsys	Tgap	Amd	***
<Name>	#	<Name> # #<-factor->strg	<Name>	#	<Name>	tem	strg	strg***
COPY	1	OUTPUT MEAN 1 1 48.4	WDM	701	FLOW	ENGL	REPL	
COPY	501	OUTPUT MEAN 1 1 48.4	WDM	801	FLOW	ENGL	REPL	

END EXT TARGETS

MASS-LINK

<Volume>	<-Grp>	<-Member-><--Mult-->	<Target>	<-Grp>	<-Member->***
<Name>		<Name> # #<-factor->	<Name>		<Name> # #***
MASS-LINK		15			
IMPLND	IWATER	SURO 0.083333	COPY	INPUT	MEAN
END MASS-LINK		15			

END MASS-LINK

END RUN

Disclaimer

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APPENDIX E Operation & Maintenance Manual

Table V-A.5: Maintenance Standards - Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%. Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe. Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height. Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No Trash or debris located immediately in front of catch basin or on grate opening. No trash or debris in the catch basin. Inlet and outlet pipes free of trash or debris. No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch. (Intent is to make sure no material is running into basin). Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Top slab is free of holes and cracks. Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound. Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Basin replaced or repaired to design standards. Pipe is regouted and secure at basin wall.
	Settlement/ Mis-alignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening. Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation blocking opening to basin. No vegetation or root growth present.
	Contamination and Pollution	See Table V-A.1: Maintenance Standards - Detention Ponds	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Cover/grate is in place, meets design standards, and is secured
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place, meets the design standards, and is installed and aligned with the flow path.

Modular Wetlands[®] Linear Operation & Maintenance Manual



**MODULAR WETLANDS® LINEAR
OPERATION & MAINTENANCE MANUAL**

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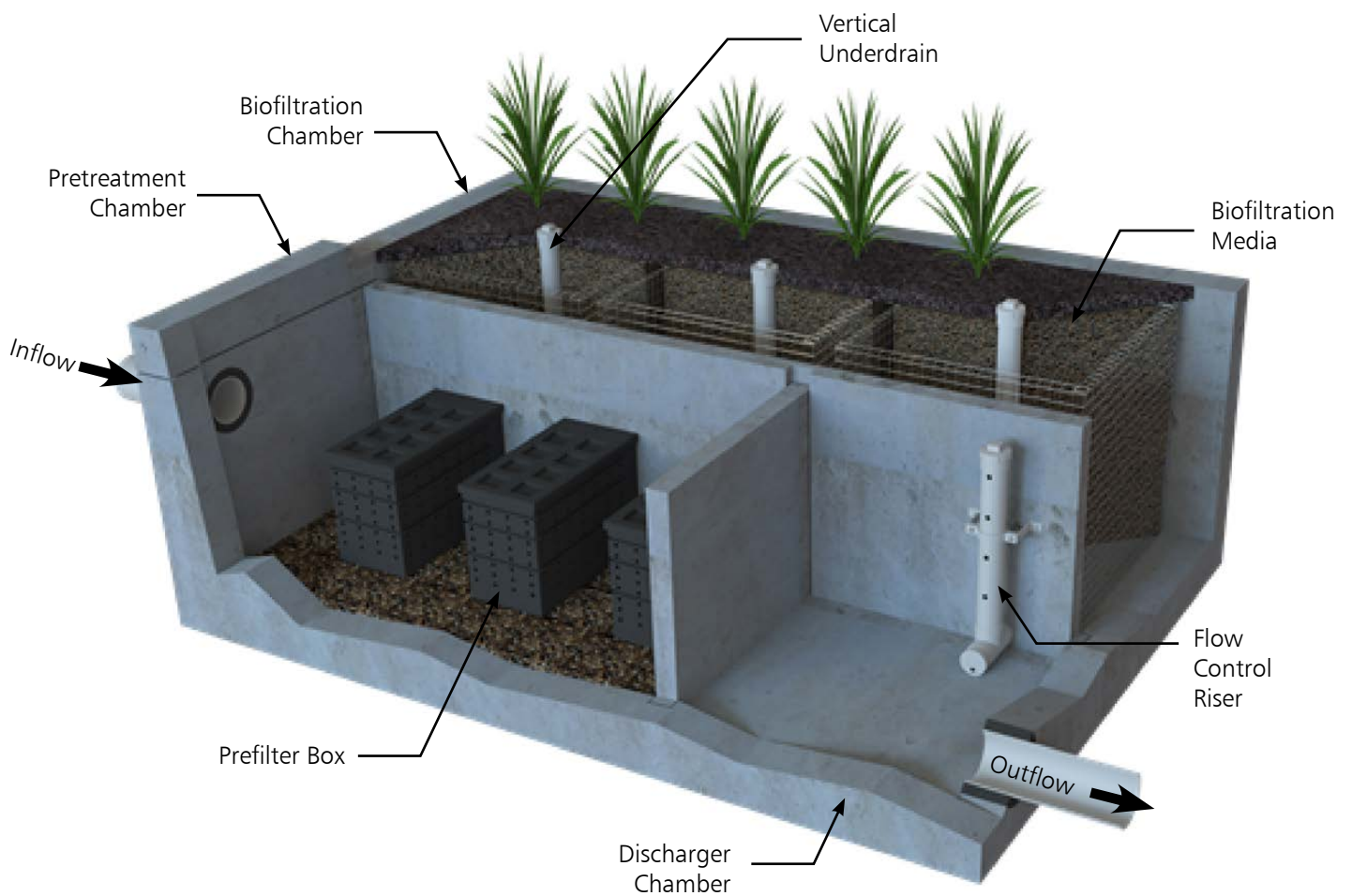
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OVERVIEW

The Modular Wetlands® Linear Biofilter is designed to remove high levels of trash, debris, sediments, nutrients, metals, and hydrocarbons. Its simple design allows for quick and easy installation. The system is housed in a standard precast structure and can be installed at various depths to meet site-specific conditions.

INTRODUCTION

This is the Modular Wetlands Linear Biofilter operation and maintenance manual. Before starting, read the instructions and equipment lists closely. It is important to follow all necessary safety procedures associated with state and local regulations. Some steps required confined space entry. Please contact Contech for more information on pre-authorized third party contractors who can provide installation services in your area. For a list of service providers in your area please visit: www.conteches.com/maintenance.



INSTRUCTIONS

INSPECTION SUMMARY

Stormwater regulations require BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess the site specific loading conditions. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years to ensure appropriate maintenance is provided.

- Inspect pre-treatment, biofiltration, and discharge chambers an average of once every six to twelve months. Varies based on site specific and local conditions.
- Average inspection time is approximately 15 minutes. Always ensure appropriate safety protocol and procedures are followed.

The following is a list of equipment required to allow for simple and effective inspection of the Modular Wetlands Linear:

- Modular Wetlands Linear Inspection Form
- Flashlight
- Manhole hook or appropriate tools to remove access hatches and covers
- Appropriate traffic control signage and procedures
- Measuring pole and/or tape measure
- Protective clothing and eye protection
- 7/16" open or closed ended wrench
- Large permanent black marker (initial inspections only - first year)

Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections of the system

INSPECTION AND MAINTENANCE NOTES

1. Following maintenance and/or inspection, it is recommended that the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.
2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.
3. Transport all debris, trash, organics, and sediments to approved facility for disposal in accordance with local and state requirements.
4. Entry into chambers may require confined space training based on state and local regulations.
5. No fertilizer shall be used in the biofiltration chamber.
6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may not require irrigation after initial establishment.

INSPECTION PROCESS

1. Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other information (see inspection form).
2. Observe the inside of the system through the access covers. If minimal light is available and vision into the unit is impaired, utilize a flashlight to see inside the system and all of its chambers.
3. Look for any out of the ordinary obstructions in the inflow pipe, pre-treatment chamber, biofiltration chamber, discharge chamber or outflow pipe. Write down any observations on the inspection form.
4. Through observation and/or digital photographs, estimate the amount of trash, debris accumulated in the pre-treatment chamber. Utilizing a tape measure or measuring stick, estimate the amount of sediment in this chamber. Record this depth on the inspection form.
5. Through visual observation, inspect the condition of the pre-filter cartridges. Look for excessive build-up of sediment on the cartridges, any build-up on the tops of the cartridges, or clogging of the holes. Record this information on the inspection form. The prefilter cartridges can be further inspected by removing the cartridge tops and assessing the color of the BioMediaGREEN filter cubes (requires entry into pre-treatment chamber - see notes previous notes regarding confined space entry). Record the color of the material. New material is a light green color. As the media becomes clogged, it will turn darker in color, eventually becoming dark brown or black. The closer to black the media is the higher percentage that the media is exhausted and is in need of replacement.



6. The biofiltration chamber is generally maintenance-free due to the system’s advanced pre-treatment chamber. For units which have open planters with vegetation, it is recommended that the vegetation be inspected. Look for any plants that are dead or showing signs of disease or other negative stressors. Record the general health of the plants on the inspection form and indicate through visual observation or digital photographs if trimming of the vegetation is required.
7. The discharge chamber houses the orifice control structure, drain down filter (only in California - older models), and is connected to the outflow pipe. It is important to check to ensure the orifice is in proper operating conditions and free of any obstructions. It is also important to assess the condition of the drain down filter media which utilizes a block form of the BioMediaGREEN. Assess in the same manner as the cubes in the pre-filter cartridge as mentioned above. Generally, the discharge chamber will be clean and free of debris. Inspect the water marks on the side walls. If possible, inspect the discharge chamber during a rain event to assess the amount of flow leaving the system while it is at 100% capacity (pre-treatment chamber water level at peak HGL - top of bypass weir). The water level of the flowing water should be compared to the watermark level on the side walls, which is an indicator of the highest discharge rate the system achieved when initially installed. Record on the form if there is any difference in level from the watermark in inches.

NOTE: During the first few storms, the water level in the outflow chamber should be observed and a 6" long horizontal watermark line drawn (using a large permanent marker) at the water level in the discharge chamber while the system is operating at 100% capacity. The diagram below illustrates where the line should be drawn. This line is a reference point for future inspections of the system.

Water level in the discharge chamber is a function of flow rate and pipe size. Observation of the water level during the first few months of operation can be used as a benchmark level for future inspections. The initial mark and all future observations shall be made when the system is at 100% capacity (water level at maximum level in the pre-treatment chamber). If future water levels are below this mark when the system is at 100% capacity, this is an indicator that maintenance to the pre-filter cartridges may be needed.

8. Finalize the inspection report for analysis by the maintenance manager to determine if maintenance is required.



MAINTENANCE INDICATORS

Based upon the observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components or cartridges
- Obstructions in the system or its inlet and/or outlet pipes
- Excessive accumulation of floatables in the pretreatment chamber in which the length and width of the chamber is fully impacted more than 18". See photo below.
- Excessive accumulation of sediment in the pretreatment chamber of more than 6" in depth.
- Excessive accumulation of sediment on the BioMediaGREEN media housed within the pretreatment cartridges. The following chart shows photos of the condition of the BioMediaGREEN contained within the pre-filter cartridges. When media is more than 85% clogged, replacement is required.
- Excessive accumulation of sediment on the BioMediaGREEN media housed within the pretreatment cartridges. When media is more than 85% clogged, replacement is required. The darker the BioMediaGREEN, the more clogged it is and in need of replacement.



INSPECTION PROCESS

- Excessive accumulation of sediment on the BioMediaGREEN media housed within the drain down filter (California only - older models). The following photos show the condition of the BioMediaGREEN contained within the drain down filter. When media is more than 85% clogged, replacement is required.



- Overgrown vegetation.



- Water level in the discharge chamber during 100% operating capacity (pretreatment chamber water level at max height) is lower than the water mark by 20%.

MAINTENANCE SUMMARY

The time has come to maintain your Modular Wetlands® Linear. All necessary pre-maintenance steps must be carried out before maintenance occurs. Once traffic control has been set up per local and state regulations and access covers have been safely opened, the maintenance process can begin. It should be noted that some maintenance activities require confined space entry. All confined space requirements must be strictly followed before entry into the system. In addition, the following is recommended:

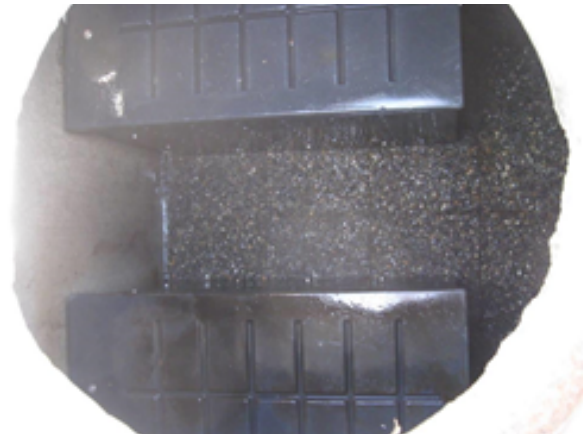
- Prepare the maintenance form by writing in the necessary information including project name, location, date & time, unit number and other info (see maintenance form).
- Set up all appropriate safety and cleaning equipment.
- Ensure traffic control is set up and properly positioned.
- Prepared pre-checks (OSHA, safety, confined space entry) are performed.

The following is a list of equipment to required for maintenance of the Modular Wetlands® Linear:

- Modular Wetlands Linear Maintenance Form
- Manhole hook or appropriate tools to access hatches and covers
- Protective clothing, flashlight, and eye protection
- 7/16" open or closed ended wrench
- Vacuum assisted truck with pressure washer
- Replacement BioMediaGREEN for pre-filter cartridges if required (order from one of Contech's Maintenance Team members at <https://www.conteches.com/maintenance>).

MAINTENANCE | PRETREATMENT CHAMBER

1. Remove access cover over pre-treatment chamber and position vacuum truck accordingly.
2. With a pressure washer, spray down pollutants accumulated on walls and pre-filter cartridges.
3. Vacuum out pre-treatment chamber and remove all accumulated pollutants including trash, debris, and sediments. Be sure to vacuum the floor until the pervious pavers are visible and clean.
4. If pre-filter cartridges require media replacement, continue to step 5. If not, replace access cover and move to step 11.



MAINTENANCE | PREFILTER CARTRIDGES

5. After successfully cleaning out the pre-treatment chamber (previous page) enter the pre-treatment chamber.
6. Unscrew the two bolts (circles shown below) holding the lid on each cartridge filter and remove lid.



7. Place the vacuum hose over each individual media filter to suck out filter media.



8. Once filter media has been sucked out, use a pressure washer to spray down the inside of the cartridge and it's media cages. Remove cleaned media cages and place to the side. Once removed, the vacuum hose can be inserted into the cartridge to vacuum out any remaining material near the bottom of the cartridge.
9. Reinstall media cages and fill with new media from the manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase. Utilize the manufacture-provided refilling tray and place on top of the cartridge. Fill the tray with new bulk media and shake down into place. Using your hands, lightly compact the media into each filter cage. Once the cages are full, remove the refilling tray and replace the cartridge top, ensuring bolts are properly tightened.



10. Exit the pre-treatment chamber. Replace access hatch or manhole cover.

MAINTENANCE | BIOFILTRATION CHAMBER

11. In general, the biofiltration chamber is maintenance-free with the exception of maintaining the vegetation. The Modular Wetlands Linear utilizes vegetation similar to surrounding landscape areas, therefore trim vegetation to match surrounding vegetation. If any plants have died, replace them with new ones.



12. Each vertical under drain on the biofiltration chamber has a removable (threaded cap) that can be taken off to check any blockages or root growth. Once removed, a jetting attachment can be used to clean out the under drain and orifice riser.
13. As with all biofilter systems, at some point the biofiltration media (WetlandMedia) will need to be replaced. Either because of physical clogging of sorptive exhaustion of the media ion exchange capacity (to remove dissolved metals and phosphorous). The general life of this media is 10 to 20 years based on site specific conditions and pollutant loading. Utilize the vacuum truck to vacuum out the media by placing the hose into the chamber. Once all the media is removed use the power washer to spray down all the netting on the outer metal cage. Inspect the netting for any damage or holes. If the netting is damaged it can be repaired or replaced with guidance by the manufacturer.
14. Contact one of Contech's Maintenance Team members at <https://www.conteches.com/maintenance> to order new WetlandMedia. The quantity of media needed can be determined by providing the model number and unit depth. Media will be provided in super sacks for easy installation. Each sack will weigh between 1000 and 2000 lbs. A lifting apparatus (backhoe, boom truck, or other) is recommended to position the super sack over the biofiltration chamber. Fill the media cages up to the same level as the old media. Replant with vegetation.



MAINTENANCE | DISCHARGE CHAMBER

15. Remove access hatch or manhole cover over discharge chamber.
16. Enter chamber to gain access to the drain down filter. Unlock the locking mechanism and lift up drain down filter housing to remove used BioMediaGREEN filter block as shown below. *NOTE: Drain down filter is only found on units installed in California prior to 2023. If no drain down filter is present, skip steps 16 and 17.*



17. Insert a new BioMediaGREEN filter block and lock drain down filter housing back in place.
18. Replace access hatch or manhole cover over discharge chamber.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Inspection Report Modular Wetlands Linear

Project Name _____		For Office Use Only
Project Address _____ (city) (Zip Code)		
Owner / Management Company _____		
Contact _____	Phone () - _____	
Inspector Name _____		(Reviewed By)
Date ____ / ____ / ____		(Date) Office personnel to complete section to the left.
Time ____ AM / PM		
Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes		
Weather Condition _____		Additional Notes _____

Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): _____ Size (22', 14' or etc.): _____

Structural Integrity:	Yes	No	Comments
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?			
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?			
Working Condition:			
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?			
Is there standing water in inappropriate areas after a dry period?			
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?			
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.			Depth:
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber:
Any signs of improper functioning in the discharge chamber? Note issues in comments section.			
Other Inspection Items:			
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?			
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.			
Is there a septic or foul odor coming from inside the system?			

Waste:	Yes	No
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes: _____



Cleaning and Maintenance Report Modular Wetlands Linear

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____

Phone () -

Inspector Name _____

Date ____ / ____ / ____ Time ____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint

☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____

Additional Notes _____

For Office Use Only
(Reviewed By)
(Date) Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat:	MWS Catch Basins						
	Long:							
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments:



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Modular Wetlands Maintenance Guide 1/2023

APPENDIX F Prior Storm Water Quality Treatment Report

Stormwater Treatment Report

For The

Port of Anacortes Job Development Fund Infrastructure Improvements

The purpose of this report is to examine the development of the stormwater treatment being installed as part of the Port of Anacortes Job Development Fund Infrastructure Improvements.

The Port of Anacortes Job Development Fund Infrastructure Improvements take place at the north ends of "O" through "T" Avenues in the City of Anacortes. This report is concerned with the treatment of stormwater from Basins G19 and G20 as defined in the "Anacortes Stormwater Management Plan 2007" by Gray & Osborne, Inc. These basins are in Section 18, Township 35 North, Range 2 East W.M.

The Port of Anacortes' design team met with City of Anacortes staff in March of 2008 to discuss the City's concerns and requirements for the project. As part of the discussion the City stated that it wanted Vortechs units installed at the end of the City owned storm mains servicing basins G19 and G20 to improve the quality of the stormwater being released. The Vortechs units are planned at the north end of "O" Avenue to treat Basin G19 and on "Q" Avenue just south of the 4th Street intersection to treat Basin G20.

During the project approximately three and a half blocks of Commercial will be rerouted from basin 20 into the basin 19 outlet. Dakota Creek Industries will be treating their own stormwater. DCI is part of basin 20 and is downstream from the proposed treatment device, so the DCI area is not included in the treatment calculations.

StormShed was used to calculate treatment flows. Table 2-2 Anacortes Subbasin Areas and Land Cover from the Anacortes Stormwater management Plan was used to determine land use for both basins and the area of Basin G19. A copy of the City's cad file for Basin G20 was used to determine the area of the basin being re-routed to Basin G19, and the area feeding the Basin G20 treatment device. Basin G19 covers 21.9-acres is 87% impervious surfaces and 13% pervious surfaces. Basin G20 covers 57.5-acres is 96% impervious surfaces and 4% pervious surfaces.

Below is the data used to calculate the runoff rates for the 2, 10 and 100-Year, 24-Hour storms.

Table 1: Areas Used in Calculations

	Impervious	Open Space (Fair) Type C	Total Area
Basin G19	26.45-acres	3.15-acres	29.60-acres
Basin G20	30.21-acres	1.26-acres	31.47-acres

- Soil Type: Clallam, Hydrologic Type C
- Rainfall Values for Basin Area:

6-Months, 24-Hour Storm:	0.9 inches
2-Year, 24-Hour Storm:	1.5 inches
10-Year, 24-Hour Storm:	2.5 inches
100-Year, 24-Hour Storm:	3.5 inches

- Estimated CN Values over Type D Soil:

Open Spaces (Fair): 90
Impervious: 98

- Time of Concentration

Basin G19 Time (min)
Developed: Pervious: 42.96
Impervious: 26.67

Basin G20 Time (min)
Developed: Pervious: 24.77
Impervious: 29.53

Table 2: Basin Flows

24- Hour Storm	Basin G19	Basin G20
6-Month	3.44-cfs	3.78-cfs
2-Year	6.50-cfs	7.06-cfs
10-Year	11.62-cfs	12.49-cfs
100-Year	16.73-cfs	17.86-cfs

The Washington State Department of Ecology (DOE) has classified Vortechs units with the General Use Level Designation (GULD) for pretreatment use. The DOE has developed a chart of the maximum treatment flow each Vortechs model can treat while meeting the DOE GULD, the chart is attached. With a treatment capacity of 3.9 cubic feet per second, a Vortechs 7000 unit is capable of treating each of the two basins of concern. Vortechs units have a maximum flow that can pass through the unit before pollutants are stripped. The Vortechs 7000 unit has a maximum flow of 11-cfs. The Vortechs units will be installed in an off-line configuration to prevent pollutant stripping during the 10-year flow. Flows will be diverted into the Vortechs units using pipes with full flow capacities equal to the treatment flows. Flows higher than the treatment flow will bypass the Vortechs units through pipes set above the crown of the treatment pipes.

In order to provide some spare treatment capacity in the system for unknown future changes to the basins the Vortechs units were increased by one unit size to a Vortechs 9000. Vortechs 9000 have a treatment capacity of 5.0 cfs.

Thank You,

Tavis Gann 10/17/08

Tavis Gann, P.E.

/tng

G19 Event Summary:

BasinID	Peak Q	Peak T	Peak Vol	Area	Method	Raintype	Event
-----	(cfs)	(hrs)	(ac-ft)	ac	/Loss		
G19	6.50	8.17	3.0010	29.60	SBUH/SCS	TYPE1A	2 yr
G19	11.62	8.17	5.4066	29.60	SBUH/SCS	TYPE1A	10 yr
G19	16.73	8.17	7.8424	29.60	SBUH/SCS	TYPE1A	100 yr
G19	3.44	8.17	1.5977	29.60	SBUH/SCS	TYPE1A	6-month

Drainage Area: G19

Hyd Method:	SBUH Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min
	Area	TC	
Pervious	3.1500 ac	90.00	0.72 hrs
Impervious	26.4500 ac	98.00	0.44 hrs
Total	29.6000 ac		

Supporting Data:**Pervious CN Data:**

Lawns	90.00	3.1500 ac
-------	-------	-----------

Impervious CN Data:

Asphalt, roofs, sidewalk	98.00	26.4500 ac
--------------------------	-------	------------

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	Flow across Grass	122.00 ft	2.00%	0.1500	16.78 min
Shallow	Curb and Gutter	310.00 ft	2.00%	27.0000	1.35 min
Channel	Flow through pipe	2212.00 ft	0.50%	21.0000	24.83 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	Flow across parking	20.00 ft	2.00%	0.0110	0.49 min
Shallow	Flow across parking	310.00 ft	2.00%	27.0000	1.35 min
Channel	Flow through pipe	2212.00 ft	0.50%	21.0000	24.83 min

G20 Event Summary:

BasinID	Peak Q (cfs)	Peak T (hrs)	Peak Vol (ac-ft)	Area ac	Method /Loss	Raintype	Event
G20	7.06	8.17	3.2945	31.47	SBUH/SCS	TYPE1A	2 yr
G20	12.49	8.17	5.8770	31.47	SBUH/SCS	TYPE1A	10 yr
G20	17.86	8.17	8.4803	31.47	SBUH/SCS	TYPE1A	100 yr
G20	3.78	8.17	1.7748	31.47	SBUH/SCS	TYPE1A	6-month

Drainage Area: G20

Hyd Method: SBUH Hyd

Peak Factor: 484.00

Storm Dur: 24.00 hrs

	Area	CN
Pervious	1.2600 ac	90.00

Impervious	30.2100 ac	98.00
------------	------------	-------

Total	31.4700 ac	
-------	------------	--

Loss Method: SCS CN Number

SCS Abs: 0.20

Intv: 10.00 min

TC

0.41 hrs

0.49 hrs

Supporting Data:**Pervious CN Data:**

Lawns	90.00	1.2600 ac
-------	-------	-----------

Impervious CN Data:

Asphalt, roofs, sidewalk	98.00	30.2100 ac
--------------------------	-------	------------

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	Flow across Grass	100.00 ft	2.00%	0.1500	14.31 min
Shallow	Curb and Gutter	200.00 ft	2.00%	27.0000	0.87 min
Channel	Flow through pipe	854.00 ft	0.50%	21.0000	9.59 min

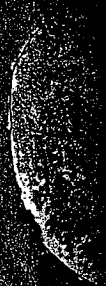
Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	Flow across parking	109.00 ft	2.00%	0.0110	1.90 min
Shallow	Flow across parking	109.00 ft	2.00%	27.0000	0.48 min
Channel	Flow through pipe	2420.00 ft	0.50%	21.0000	27.16 min

TABLE 16.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth Ft	Kind	Months
31*: Clallam----- Urban land.	C	None-----	---	---	1.5-3.0	Perched	Jan-Apr
32, 33----- Clendenen	D	None-----	---	---	1.0-1.5	Perched	Nov-Jun
34----- Cokedale	D	Occasional-----	Brief-----	Dec-Mar	0.5-2.0	Apparent	Dec-Apr
35, 36----- Coveland	D	None-----	---	---	0-1.5	Perched	Nov-Apr
37*, 38*: Coveland-----	D	None-----	---	---	0-1.5	Perched	Nov-Apr
Bow-----	D	None-----	---	---	0.5-1.5	Perched	Nov-May
39*, 40*: Crinker----- Rock outcrop.	C	None-----	---	---	>6.0	---	---
41, 42----- Cupples	C	None-----	---	---	1.5-3.0	Perched	Dec-Apr
43, 44----- Diobsud	C	None-----	---	---	1.5-3.0	Perched	Nov-May
45*: Diobsud-----	C	None-----	---	---	1.5-3.0	Perched	Nov-May
Crinker-----	C	None-----	---	---	>6.0	---	---
46, 47----- Dystric Xerochrepts	C	None-----	---	---	>6.0	---	---
48*: Dystric Xerochrepts----- Rock outcrop.	C	None-----	---	---	>6.0	---	---
49----- Dystric Xerorthents	C	Frequent-----	Brief-----	Dec-May	1.5-3.0	Apparent	Dec-May
50----- Dystric Xerorthents	A	None-----	---	---	>6.0	---	---
51----- Dystric Xerorthents	B	None-----	---	---	>6.0	---	---
52----- Elwell	C	None-----	---	---	1.5-3.0	Perched	Nov-Jun
53*: Elwell-----	C	None-----	---	---	1.5-3.0	Perched	Nov-Jun
Rinker-----	C	None-----	---	---	>6.0	---	---
54----- Etach	C	None-----	---	---	>6.0	---	---

See footnote at end of table.



STORMWATER MANAGEMENT MANUAL FOR THE PUGET SOUND BASIN

Table III-1.3 SCS Western Washington Runoff Curve Numbers
(Published by SCS in 1982) Runoff curve numbers for selected agricultural, suburban and urban land use for Type 1A rainfall distribution, 24-hour storm duration.

LAND USE DESCRIPTION		CURVE NUMBERS BY HYDROLOGIC SOIL GROUP			
		A	B	C	D
Cultivated land(1):	winter condition	86	91	94	95
Mountain open areas:	low growing brush & grasslands	74	82	89	92
Meadow or pasture:		65	78	85	89
Wood or forest land:	undisturbed	42	64	76	81
Wood or forest land:	young second growth or brush	55	72	81	86
Orchard:	with cover crop	81	88	92	94
Open spaces, lawns, parks, golf courses, cemeteries, landscaping.					
Good condition:	grass cover on $\geq 75\%$ of the area	68	80	86	90
Fair condition:	grass cover on 50-75% of the area	77	85	90	92
Gravel roads & parking lots:		76	85	89	91
Dirt roads & parking lots:		72	82	87	89
Impervious surfaces, pavement, roofs etc.		98	98	98	98
Open water bodies:	lakes, wetlands, ponds etc.	100	100	100	100
Single family residential(2):		Separate curve number shall be selected for pervious & impervious portions of the site or basin			
Dwelling Unit/Gross Acre	%Impervious(3)				
1.0 DU/GA	15				
1.5 DU/GA	20				
2.0 DU/GA	25				
2.5 DU/GA	30				
3.0 DU/GA	34				
3.5 DU/GA	38				
4.0 DU/GA	42				
4.5 DU/GA	46				
5.0 DU/GA	48				
5.5 DU/GA	50				
6.0 DU/GA	52				
6.5 DU/GA	54				
7.0 DU/GA	56				
PUD's, condos, apartments, commercial businesses & industrial areas	%impervious must be computed				

- (1) For a more detailed description of agricultural land use curve numbers refer to National Engineering Handbook, Sec. 4, Hydrology, Chapter 9, August 1972.
- (2) Assumes roof and driveway runoff is directed into street/storm system.
- (3) The remaining pervious areas (lawn) are considered to be in good condition for these curve numbers.



November 19, 2003
(Updated August 2007)

GENERAL USE LEVEL DESIGNATION FOR PRETREATMENT (TSS)

For

CONTECH Stormwater Solutions Inc. Vortechs® System

Ecology's Decision:

Based on the CONTECH Stormwater Solutions Inc. (CONTECH) application submissions for the Vortechs System® and recommendations by the Technical Review Committee (TRC), Ecology hereby issues the following use designations for the Vortechs technology:

1. General Use Level Designation (GULD) for pretreatment use, as defined in the Ecology Manual Volume I, (a) ahead of infiltration treatment or (b) to protect and extend the maintenance cycle of a Basic or Enhanced Treatment device (e.g., sand or media filter). This GULD applies to Vortechs units sized at an operating rate of no more than 35 gpm/sf of grit chamber area at the Water Quality design flow rate as determined using the Western Washington Hydrology Model (WWHM). The following table shows flow rates associated with various grit chamber sizes:

Washington State Vortechs System Sizing		
Vortechs System	Grit Chamber Diameter	35 gpm/sf Flow Rate
Model ID	ft	cfs
1000	3	0.55
2000	4	1.0
3000	5	1.5
4000	6	2.2
5000	7	3.0
7000	8	3.9
9000	9	5.0
11000	10	6.1
16000	12	8.8

2. Properly designed and operated Vortechs systems may also have applicability in other situations (example: low-head situations such as bridges or ferry docks), for TSS and oil/grease removal where, on a case-by-case basis, it is found to be infeasible or impracticable to use any other approved practice. Local jurisdictions should follow established variance or exception procedures in approving such applications.

Draft Interim Action Work Plan

Quiet Cove Site
Anacortes, Washington
Ecology Agreed Order No. DE 11346

for

**Washington State Department of Ecology
on Behalf of Port of Anacortes**

August 19, 2019



Draft Interim Action Work Plan

Quiet Cove Site
Anacortes, Washington
Ecology Agreed Order No. DE 11346

for

**Washington State Department of Ecology
on Behalf of Port of Anacortes**

August 19, 2019



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Draft Interim Action Work Plan

Quiet Cove Site Anacortes, Washington

File No. 5147-024-07

August 19, 2019

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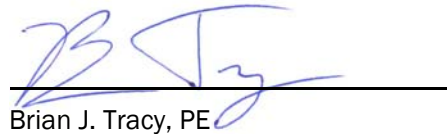
Attention: Arianne Fernandez

On Behalf of:

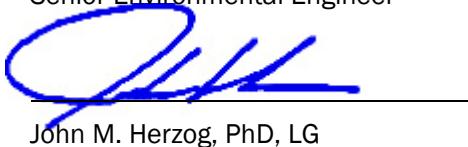
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ACRONYMS AND ABBREVIATIONS

ADA	Americans with Disabilities Act
ARI	Analytical Resources, Inc.
bgs	below ground surface
BMPs	best management practices
CAP	Cleanup Action Plan
CFR	Code of Federal Regulations
City	City of Anacortes
CMP/QAPP	Compliance Monitoring and Quality Assurance Project Plan
CSWGP	Construction Stormwater General Permit
CY	cubic yards
DAHP	Department of Archaeology and Historic Preservation
DIP	ductile iron pipe
DNS	Determination of Non-Significance
DOT	Department of Transportation
Ecology	Washington State Department of Ecology
EIM	Ecology's Environmental Information Management
FS	Feasibility Study
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
H:V	horizontal to vertical
IAWP	Interim Action Work Plan
ID	identification
IHSs	indicator hazardous substances
ISIS	Washington State Department of Ecology Integrated Site Information System
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MTCA	Model Toxic Control Act
NAVD88	North American Vertical Datum of 1988
NPDES	National Pollutant Discharge Elimination System
PUD	Public Utility Department
PVC	polyvinyl chloride

QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
OSHA	Occupational Safety and Health Administration
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
ROW	right-of-way
SEPA	State Environmental Policy Act
SWMMWW	Stormwater Management Manual for Western Washington
TESC	temporary erosion and sediment control
TCLP	toxicity leaching characteristic procedure
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act
WSDOT	Washington State Department of Transportation

1.0 INTRODUCTION

This Interim Action Work Plan has been prepared for the Quiet Cove Cleanup Site (Site) on behalf of the Port of Anacortes (Port). The Site is situated along the southeast shoreline of Guemes Channel at 202 O Avenue (at the intersection of 2nd Street and O Avenue) in Anacortes, Washington (Figure 1) and is part of the Washington State Department of Ecology's (Ecology's) Puget Sound Initiative and regional cleanup efforts on Fidalgo Island. The Site is listed in Ecology's Integrated Site Information System (ISIS) under Facility Site Identification No. 20859 and Cleanup Site Identification No. 12482.

Ecology issued Agreed Order No. DE 11346 (Order) pursuant to the authority of the Model Toxics Control Act (MTCA), Revised Code of Washington (RCW) 70.105D.050(1). Under the Order, the Port is required to complete a remedial investigation, per Washington Administrative Code (WAC) 173-340-350 and WAC 173-204-560 to define the nature and extent of previously identified contamination in media of concern at the Site. The Port completed a Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan; GeoEngineers 2017) approved by Ecology and collected information for the RI in 2017 through 2018.

The Order allows for an interim action to be completed pursuant to WAC 173-340-430 and in coordination with Ecology. The Port is planning to complete an interim action to remediate a portion of the Site to facilitate development of the property for commercial purposes. Addressing the environmental issues in the area to be developed in advance of construction of new facilities will avoid adding cost and complexity to the cleanup. Additionally, early cleanup in part of the Site will reduce overall impacts of the known contamination to the environment. The current property layout is presented on Figure 2.

The Interim Action Work Plan is a requirement under the Order for implementing an interim action at the Quiet Cove Site (Interim Action) and describes details of the scope of work and schedule for the proposed cleanup action. The Interim Action Work Plan will fulfill the requirements of the Order and WAC 173-340-430 by providing the following:

- Background information describing the historical property use, environmental and ecological setting, and current conditions;
- Summary of existing environmental data with respect to screening levels to complete a preliminary delineation of the nature and extent of contamination;
- Summary of the interim action objective, cleanup requirements, remedial alternatives considered for this interim remedial action and how it will coordinate with the final cleanup action;
- Identification of the components of the Interim Action;
- Identification of permitting and substantive requirements for the Interim Action;
- Schedule for the Interim Action to be implemented; and
- Identification of reporting requirements after the Interim Action is completed.

2.0 BACKGROUND INFORMATION

2.1. Site Location and Description

The 0.8-acre Quiet Cove property lays between 2nd and 3rd Streets on O Avenue and according to Skagit County records is composed of the three tax parcels. The tax parcel numbers and legal descriptions are summarized in the following table. Tax parcels for the Quiet Cove property and surrounding areas are shown on Figure 2.

Tax Parcel Number	Legal Description
P55354	Lots 1 to 6 of Block 66, Anacortes, Together with the North ½ of Vacated Alley adjacent thereto, ORD#1760, Survey AF#201501210019 (0.4500 acre)
P55358	Lots 16 to 18 of Block 66, Anacortes, Together with the South ½ of Vacated Alley Adjacent thereto, ORD#1760, Survey AF#201501210019 (0.2200 acre)
P55359	Lots 19 to 20 of Block 66, Anacortes, Together with the South ½ of Vacated Alley Adjacent thereto, ORD#1760, Survey AF#201501210019 (0.1500 acre)

Adjacent properties include a Port-owned storage yard (Parcel No. P55355) and a bulk fuel distribution facility operated by Texaco/Reisner (Parcel No. P55357) to the west, Guemes Channel to the northwest and City ROW and streets including 2nd Street, O Avenue and 3rd Street to the north, east and south, respectively.

2.2. Site History

The property was historically used for bulk fuel storage and distribution from approximately 1909 to at least 1977. The final date when fuel operations ceased is unknown. As reported in the February 17, 1910 Anacortes American, Standard Oil erected a dock (in the general vicinity of what is now Curtis Wharf) and bulk fuel plant on the Anacortes waterfront at 2nd Street and O Avenue in November 1909 selling 40,000 gallons of oil a month. Standard Oil operated the bulk fuel facility until the late 1970s at which time the facility was decommissioned, and the aboveground tanks were removed. Skagit County Assessor records indicate that the property was sold to Thomas and Patricia Stowe in 1977. Following the purchase of the property, the Stowes began to operate a storage yard for marine vessels and recreational vehicles, and leased office and warehouse space to various tenants for commercial purposes. In 2013, the property was purchased by the Port.

The approximate location of the historical features at the Site are shown on Figure 3. A copy of the Standard Oil facility drawing dated May 31, 1921 shows the property layout while operating as a bulk fuel storage and distribution facility (Appendix A). Historical aerial and other photographs of the property and surrounding area are presented in Appendix B.

According to the Standard Oil engineering drawing, the facility layout included a 280,000 gallon above ground storage tank (AST), a 158,000 gallon AST, a 56,000 gallon AST, a 43,000 gallon AST, four 20,000 gallon ASTs, a pump house, three stall garage with attached boiler room, warehouse with covered area for barrel storage and an office. Product supply lines within the property connected each of the ASTs to the central pump house. During operation, the facility received fuel delivered from vessels moored to a historical wooden pier through a series of product supply lines which were located underground south of

the bulkhead (Figure 3). North of the bulkhead (Figure 3), product supply lines were hung beneath the historical wooden pier which was later demolished during the late 1990s according to historical aerial photographs (Appendix B). The historical aerial photographs (Appendix B) show that the facility remained largely unchanged throughout its operational history. The facility layout is visible in circa 1920s, 1971 and 1977 aerial photographs (Appendix B). As noted on the engineering drawing (Appendix A), Lots 16 through 20 located south of the main facility (Parcel No. P55358 and P55359) were acquired during the 1960s.

The property west of the Site (P55355) is currently owned by the Port and was the location of a former coal storage shed presumably used to support railroad operations in Anacortes due to its proximity to the historical rail line (Figure 3). The property located to the southwest of the Site is currently used by Texaco/Reisner as a bulk fuel facility. Bulk fuel operations at this location began as early as 1925. Historically, the Texaco/Reisner facility also operated a fuel terminal (referred to as the Reisner Petroleum Terminal) located at the northern end of N Avenue. Based on historical aerial photographs (Appendix B), the Reisner Petroleum Terminal was removed between 1971 and 1977. Currently, fuel to the Texaco/Reisner facility is supplied by truck.

The development and operational history for the Quiet Cove property is presented in the following table.

Timeline	Operational History
1910 to late-1970s	Standard Oil operated a bulk fuel storage and distribution facility at the Quiet Cove property. During the 1960s, Standard Oil acquired Parcel No. P55358 and P55359 according to the historical Engineer's Drawings.
Late-1970s	Bulk fuel storage and distribution operations ceased, and the above ground storage tanks were removed.
Late-1970s to 2013	Thomas and Patricia Stowe operated a storage yard for marine vessels and recreational vehicles, and leased office and warehouse space to various tenants for marine-related sales and services. Parcels P55358 and P55359 were redeveloped between 1977 and 1994 as shown on historical aerial photographs (Appendix B). During this time, northern and southern portions of the property were paved.
2013 to Present	Port of Anacortes has been leasing various portions of the property to the following companies: American Gold Seafoods, Ballast Contracting, LLC, Fisherman's Finest, North Columbia Ironworks, and NW Clean Air Agency. From April – September 2016 the Port of Anacortes temporarily leased a portion of the Quiet Cove property to Kiewit Infrastructure West Co. for storage and loading of armor rock via Curtis Wharf.

2.3. Current and Future Site Use

Since the late 1970s until it was acquired by the Port, the Quiet Cove property had been used for the storage of marine vessels and recreational vehicles. The Port purchased the property in 2013 and existing tenants

have continued to use the property. The existing office/warehouse buildings at the property are occupied by American Gold Seafoods and Ballast Contracting, LLC and North Columbia Ironworks. American Gold Seafoods also uses the building in the central area of the Site for storage of equipment. Northwest Clean Air Agency has a mobile office trailer setup in the northeast corner of the Site. From April through September 2016 a majority of the open space of the property was used for storage of armor rock for loading onto barges at Curtis Wharf.

The property adjacent to the west of the Quiet Cove property (also owned by the Port) is currently leased to Fishermen's Finest for equipment storage. The southwestern adjacent property (owned by Guemes Channel Corporation) continues to operate as a Texaco/Reisner bulk fuel storage and distribution facility generally consistent with the past operations. A beach with public access extends along the shoreline in the vicinity of these properties.

Currently, the Port plans to redevelop the Site. Currently the proposed redevelopment is in the concept planning phase and will be adapted to the specific future tenant or lessee needs. The anticipated future use of the property is expected to be commercial or industrial as evaluated in the Ecology funded Integrated Planning Grant study report (Maul Foster, et al. 2015).

3.0 ENVIRONMENTAL CONDITIONS

This section includes a summary of existing environmental conditions at the Site including previous environmental investigations. Detailed summary of the previous environmental investigation activities and analytical results are presented in the Quiet Cove Data Report (Data Report; GeoEngineers 2019) included in this Interim Action Work Plan as Appendix C.

3.1. Site Description

The Site is relatively flat and gently slopes to the northwest towards the Guemes Channel. The Mean Higher High Water (MHHW) line of the Guemes Channel (shown on Figure 2) generally delineates the marine and upland areas of the Site. The surfaces of the northern portions of the Quiet Cove property and adjacent street are approximately at the same level. The street level gradually climbs up to the south and as a result the southern portion of the property is approximately 5 to 6 feet below the adjacent sidewalk and street level. A retaining wall exists along the southern, eastern and western perimeters of the property to support the elevation transition. Site topography based on a recent survey completed by Sound Development Group (SDG) is shown on Figure 2. The Site and surrounding areas are generally covered with buildings, concrete, gravel or asphalt surfaces. Planting strips are located on 2nd and 3rd Street, and in the O Avenue Rights-of-Way (ROWs). Currently, a combined office/warehouse building measuring approximately 100 feet long by 45 feet wide and a second warehouse building measuring approximately 50 feet long by 35 feet wide are present in the northwest portion of the property. A chain link fence surrounds the property limiting general public access. Vehicle and pedestrian access to the property is through a gated entrance south of 2nd Street. The utilities known to be present within or adjacent to the Site include power, water, sewer, storm drains, telephone and gas based on SDG's survey.

3.2. Previous Environmental Investigations

Previous environmental investigations at the Site for the purposes of MTCA cleanup under the Order include the 2014 Focused Environmental Investigation, 2017 and 2018 Remedial Investigation and 2018

Supplemental Remedial Investigation. Details on field procedures, sampling locations, and results of these investigations are presented in the Data Report attached as Appendix C. The following section give a summary of each of the previous environmental investigation.

3.2.1. Focused Environmental Investigation

The Port performed a Focused Site Investigation in 2014 as part of an Ecology's Integrated Planning Grant (IPG) to evaluate the presence of contamination in soil and groundwater at the Site. The Focused Site Investigation was completed under an Ecology-approved Work Plan. No other environmental studies are known to have been completed at the Site prior to this investigation. The results of investigation completed in 2014 are presented in the Ecology-approved Focused Environmental Site Investigation Data Report (GeoEngineers, 2014) and summarized in Ecology-approved RI/FS Work Plan (GeoEngineers 2017). Soil and groundwater sample locations completed in 2014 as part of this investigation are shown on Figure 4. Exploration logs describing materials encountered, field screening results and sample intervals for the Focused Site Investigation are provided in the Quiet Cove Data Report (Appendix C). The findings from this investigation were reviewed for technical quality relative to the quality assurance (QA) and quality control (QC) objectives presented in the Ecology-approved RI/FS Work Plan and are considered acceptable for use in the future RI Report. Ecology provided approval of the project Work Plan and Focused Environmental Investigation data results.

3.2.2. Remedial Investigation

Following the 2014 Focused Environmental Investigation, the Port entered into an Agreed Order with Ecology for cleanup of the Site. As a requirement of the Agreed Order an RI/FS Work Plan was prepared and approved by Ecology (GeoEngineers, 2017) that describes the plans for investigation of the Site for the purpose of the RI.

The RI activities were completed in 2017 and 2018 and primarily included the following:

- Topographic survey to document existing surface conditions and utilities at the Site.
- Sampling and analysis of soil to evaluate the stratigraphy and nature and extent of contamination.
- Sampling and analysis of groundwater to evaluate water quality parameters and nature and extent of contamination.
- Sampling and analysis of surface and subsurface sediment to evaluate the stratigraphy and nature and extent of contamination.
- Tidal study and hydraulic conductivity testing to evaluate aquifer characteristics including groundwater gradient and flow direction, hydraulic connection between groundwater and adjacent marine surface water and groundwater flow velocities.

A detailed summary of the field activities and analytical results of the RI are presented in the Data Report (Appendix C).

3.2.3. Supplemental Remedial Investigation

Upon completion of the RI field activities the Port requested to complete a Supplemental Remedial Investigation (Supplemental Investigation) in the upland portion of the Site to fill identified data gaps in the Site soil and groundwater characterization. The RI primarily focused on defining the extent and limits of

contamination, but additional information was needed for defining the nature of contaminated soil and groundwater in the most contaminated source area of the Site. The Port and GeoEngineers developed a Work Plan Addendum (Work Plan Addendum; GeoEngineers, 2018), which presented a detailed plan for the Supplemental Investigation. The Work Plan Addendum was developed in coordination with Ecology and was approved by Ecology on October 4, 2018.

The Supplemental Investigation activities included:

- Completion of soil borings for sampling and analysis of selected contaminants.
- Construction of a new monitoring well.
- Installation of pre-pack well points.
- Groundwater measurement of water and/or product levels.
- Groundwater sampling and analysis at the existing and new wells.

A detailed summary of the field activities and analytical results of the Supplemental Investigation are presented in the Data Report (Appendix C).

3.3. Nature and Extent of Contamination

The Quiet Cove Data Report, attached as Appendix C, includes detailed documentation of the investigation completed at the Site.

3.3.1. Geology and Hydrology

This section provides information on the geology and hydrology at the Site based on the previous environmental investigations including the hydrogeology study completed as part of the RI in 2017.

3.3.1.1. Geologic Conditions

The general stratigraphy at the Site is based on observations of material encountered in soil exploration completed as part of the previous investigation of the Site. The stratigraphy at the Site generally consists of fill soil deposits overlying native as described below:

- **Historical Fill Deposits:** Historical fill material at the Site is generally comprised of layers of sand, silty sand and silt with variable gravel content at the depths ranging from about 4 to 17 feet bgs. In the southern part of the Site the fill material is shallow relative to the ground surface (approximately 4 to 6 feet bgs) because the Site is cut into the slope and the south and east property boundaries have retaining walls. Contained in the historical fill deposits are occasional debris including concrete asphalt, brick and wood fragments. Along the shoreline and on the beach, debris was encountered at shallower depths potentially related to the construction of historical dock(s) and the adjacent Curtis Wharf. A layer of dark brown organic soil (peat) is present below the fill layer in north and northern portion of the Site. The organic layer varies in thickness from several inches to 2 feet.
- **Native Deposits:** Native material underlying the fill deposits at the Site include sands overlying glacial deposits. The sand deposits are typically poorly sorted and loose in nature and vary in thickness from 2 to 6 feet. Glacial deposits consist of a medium dense glaciomarine drift with varying amounts of silt, sand, and gravel.

3.3.1.2. Hydrogeologic Conditions

As part of the RI a hydrogeologic study was completed to assess tidal influence on groundwater flow direction and gradient, hydraulic conductivity and groundwater velocity. The study included a 72-hour tidal study and slug testing at six monitoring wells. Details of the procedures and results of the hydrogeologic study are provided in the Quiet Cove Data Report attached as Appendix C. The following provides an overview of the hydrogeologic conditions and results of the hydrogeologic study.

- **Tidal Study:** A tidal study monitored groundwater level fluctuations during a 72-hour period using transducers to evaluate tidal influence on groundwater. The groundwater level data in each monitoring well were evaluated in comparison to measured surface water elevations in Guemes Channel during the tidal study period for comparison of groundwater elevation and tidal trends. The study indicates that in general there is a relatively low degree of tidal influence on Site monitoring wells. Details on the methodology and results of the tidal study are included in the Data Report (Appendix C).
- **Hydraulic Conductivity:** Hydraulic conductivity for the Site aquifer was estimated using results of slug testing at six monitoring wells. Based on the slug test results, hydraulic conductivity of the aquifer ranges between 0.02 and 4.11 feet/day with a mean value of 1.25 feet/day.
- **Groundwater Flow Direction and Gradient:** The mean groundwater flow direction was determined using the mean groundwater elevations found during the tidal study. Based on the results of the tidal study and the mean groundwater elevations, the groundwater flow direction is generally to the north and northwest toward Guemes Channel. Mean hydraulic gradient at the Site was calculated using two monitoring well pairs. In the western portion of the Site, the calculated hydraulic gradient is 0.013 feet per foot (ft/ft). In the eastern portion of the Site, the calculated hydraulic gradient is 0.023 ft/ft.
- **Groundwater Velocity:** Slug test results were also used to calculate groundwater velocity. Through central and western portion of the Site the average linear groundwater velocity is 0.07 feet per day (ft/day) with a flow direction to the northwest. Through the eastern part of the Site the average linear groundwater velocity is 0.09 ft/day with a groundwater flow direction toward the north.

3.3.2. Extent of Chemical Contamination in Site Media

The Quiet Cove Data Report (Appendix C) presents the analytical data results for the previous environmental investigations completed at the Site. Chemical analytical data collected as part of previous investigations were compared to the preliminary screening levels established in the Ecology-approved RI/FS Work Plan. The following sections summarize the extent of contamination in soil, groundwater and sediment at the Site based on analytical data collected. Refer to the Data Report in Appendix C for analytical data tables and figures illustrating the extent of contaminated media at the Site.

3.3.2.1. Soil Conditions

Previous environmental investigations found the following chemicals exceeded preliminary screening levels in soil:

- Total Petroleum Hydrocarbons (TPH) including gasoline-, diesel- and heavy oil-range;
- Volatile Organic Compounds (VOCs) including benzene, ethylbenzene, toluene and xylenes (BETX) and n-Hexane;
- Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs) Toxicity Equivalent Quotient (TEQ);
- Various individual PAH analytes; and

- Metals including cadmium, chromium, lead and mercury.

For the purposes of the Interim Action these contaminants are considered as contaminants of concern (COCs) in soil.

The analytical results provide evidence of petroleum related contaminants in soil (TPH and fuel related VOCs) in the northern half of the Site in the vicinity of the former bulk fuel facility operations and north into 2nd Street and west towards the beach area. Elevated concentrations of metals and PAHs were primarily identified within the fill deposits with depths up to approximately 8 to 12 feet bgs.

Fuel-related VOCs are located primarily within the historical fuel operation facility and are comingled with TPH in soil. The depth of petroleum contamination ranges from approximately 4 to 13 feet bgs within the fill formation in both vadose and saturated soil. Petroleum-related contamination is bounded to the east, south and north by sample locations where exceedances were not detected. To the west the data do not provide clear evidence on whether GEI-39 (at the top of the beach slope) is an isolated contamination or contiguous with the upland source area.

Figure 5 presents the approximate lateral extent of TPH contamination in soil at the Site. As previously stated, analytical data indicate VOC contamination is co-mingled with the TPH-contaminated soil. The approximate lateral extent is estimated to be approximately half the distance between contaminated sample locations and the adjacent clean locations. Areas that are not fully bound are shown with a dashed line. Figures 6 through 8 present cross-sectional views and the vertical extent of petroleum contamination along these sections. The extent in Figure 5 generally defines the source area related to the historical bulk fuel terminal operations based on the data available.

Soil analytical results also indicate evidence of isolated areas of PAH and metals contamination in the northern part of the Site. In general metals and PAHs have a higher frequency of exceedance to the west part of the Site, closer to the shoreline area.

3.3.2.2. Groundwater Conditions

Previous environmental investigations found the following chemicals exceeding preliminary screening levels in groundwater:

- Total Petroleum Hydrocarbons (TPH) including gasoline-, diesel- and heavy oil-range;
- Volatile Organic Compounds (VOCs) including benzene and 1,2-dibromoethane (EDB); and
- Metals including arsenic (total and dissolved) and lead (total only).

For the purposes of the Interim Action these contaminants are considered as contaminants of concern (COCs) in groundwater.

Groundwater analytical results generally indicate that petroleum-related contamination in groundwater exists within the northern area of the Site within the former bulk fuel operation footprint and in wells located downgradient to the north and west. The highest concentration of TPH and fuel-related VOCs in groundwater are near the center of the historical fueling operations, in the vicinity of the historical storage tanks where free product has been measured as approximately 1.5 feet thick in monitoring well MW-11. Petroleum-related contamination is bounded to the north, south and east by existing monitoring wells. Wells

along the shoreline, west of the Site, indicate diesel-range TPH exceedances. The existing groundwater data do not bound petroleum contamination in groundwater along the shoreline to the north and south. Based on the groundwater flow direction the extent of petroleum-related contamination is generally within the source area and downgradient of the source. One groundwater monitoring location (MW-8) is cross-gradient relative to the source area for the Site and was found to have diesel-range TPH (during one RI monitoring event) and benzene (all RI monitoring events) in groundwater above preliminary screening levels and uncertainty exists as to the source of TPH and benzene contamination at this location.

Groundwater did not exceed the preliminary screening levels for PAH or cPAH analytes. Isolated, low concentrations of dissolved arsenic above preliminary screening levels (exceedance ratios of approximately 2 or less) in groundwater were detected at three (3) monitoring well locations. Arsenic-contaminated soil was not identified at the Site.

3.3.2.3. Sediment Conditions

The Interim Action addresses contamination in the upland portion of the Site and sediment is not subject to the Interim Action. Appendix C provides detail on the sediment data collected and the analytical results completed as part of the RI. Further evaluation of the sediment data and potential cleanup actions will be completed as part of the RI/FS process in coordination with Ecology.

4.0 OVERVIEW OF THE INTERIM ACTION

This section provides an overview of the Interim Action including the objective, cleanup requirements, remedial actions considered and coordination with the final cleanup.

4.1. Objective of the Interim Action

The Interim Action will focus on implementing a partial cleanup to address the primary source area in the Site uplands. For the purposes of the Interim Action the source area is defined as the petroleum-contaminated soil in the vicinity of the historical tank locations from which contamination has migrated downgradient as described in Section 3.3.2.1 above. The Port plans to redevelop the Port-owned properties at the Site. The Port proposes to complete an Interim Action because cleanup actions to address the petroleum-contaminated soil within the source area will be significantly more complicated and expensive if development occurs prior to cleanup. The objective of the Interim Action is to remove petroleum hydrocarbon-related contamination from within the Port-owned properties (Quiet Cove property and the adjacent property to the west) that is the source of contamination at the Site to clear environmental encumbrances prior to development.

4.2. Cleanup Requirements

The MTCA cleanup regulations provide that an interim action comply with cleanup standards for a portion of the Site (WAC 173-340-430) for identified COCs, points of compliance, and applicable or relevant and appropriate requirements (ARARs) based on federal and state laws (WAC 173-340-710). This section identifies cleanup standards for the Interim Action including remediation levels, points of compliance and applicable regulatory requirements.

As further detailed in Section 5.0, the Interim Action will achieve cleanup objectives for portions of the Site, while other areas will be addressed by Ecology's decisions in the future RI/FS and Cleanup Action Plan. For

the purposes of the Interim Action cleanup requirements including soil remediation levels, soil points of compliance and ARARs are described in the following sections.

4.2.1. Soil Cleanup Requirements

The following sections provide soil remediation levels and points of compliance for the purposes of the Interim Action.

4.2.1.1. Soil Remediation Levels

For the purposes of the Interim Action soil remediation levels will be used to confirm completion of the Interim Action in portions of the Site. Final soil cleanup levels will be developed in the future as part of the RI/FS Report. As indicated in the objective for the Interim Action, soil will be removed to achieve the remediation levels within the Port-owned property of the Site. Soil remediation levels will be used to confirm the objective of the Interim Action has been met.

For the purposes of this Interim Action, the preliminary screening levels from the Ecology-approved RI/FS Work Plan will be used as remediation levels. These remediation levels are presented in Table 1 for the COCs identified in Section 3.3.2.1. Interim Action activities will be completed to achieve the remediation levels presented in Table 1 within Port-owned property as further detailed in Section 5.0.

4.2.1.2. Soil Points of Compliance

For the Interim Action the standard point of compliance for the soil remediation levels will be throughout the soil column from the surface to 15 feet bgs, in accordance with WAC 173-340-740(6)(d) and WAC 173-340-7490(4)(b). As previously noted, the Interim Action will achieve cleanup of contaminated soil to the point of compliance within the Port-owned properties at the Site.

4.2.2. Groundwater Cleanup Standards

Groundwater cleanup is not the focus of the Interim Action, but improvement in groundwater quality is expected to occur as a result of the source material removal of the Interim Action. Post-construction monitoring will evaluate groundwater quality following the Interim Action cleanup. This section provides guidelines to evaluate the post-construction groundwater monitoring results.

4.2.2.1. Groundwater Screening Levels

The objective of the Interim Action is to remediate the soil on Port-owned property within the Site. Some amount of contaminated soil outside of the Port-owned properties is expected to be left in place following the Interim Action and may be a continuing source to groundwater contamination. However, the removal of source material may decrease groundwater contamination levels. Following the Interim Action, groundwater will be monitored to evaluate the effects of the Interim Action on groundwater quality at the Site.

For the purposes of the Interim Action the post-construction groundwater monitoring results will be compared to groundwater screening levels included in the Ecology-approved-RI/FS Work Plan. Table 2 summarizes these screening levels for the groundwater COCs identified in Section 3.3.2.2. The post-construction groundwater monitoring data will be used for completion of the RI/FS Report where groundwater cleanup levels and a final remedy for groundwater contamination will be developed.

4.2.2.2. Groundwater Points of Compliance

Because groundwater screening levels are based on protection of marine surface water and not protection of groundwater as drinking water, the conditional point of compliance for groundwater is at the

groundwater/surface water interface along the western shoreline adjacent to Guemes Channel. Post-construction monitoring will evaluate the groundwater analytical data in relation to the established point of compliance.

4.2.3. Applicable Regulatory Requirements

In addition to the cleanup standards described in the preceding section, other regulatory requirements must be considered during implementation of the Interim Action (WAC 173-340-710). Because the cleanup action is required by Ecology under the AO, the cleanup action is exempt from the procedural requirements of certain laws and local permits (WAC 173-340-710[9][a]). However, the cleanup action must comply with the substantive requirements of these laws and permits. The applicable regulatory requirements for the Interim Action include the following:

4.2.3.1. Washington State Environmental Policy Act (SEPA)

The Washington State Environmental Policy Act (SEPA) provides a way to identify possible environmental impacts that may result from governmental decisions. Information provided during the SEPA review process helps agency decision-makers, applicants, and the public understand how a project will affect the environment. SEPA is intended to ensure that state and local government officials consider environmental values when making decisions or taking an official action. To meet this requirement, the Port (SEPA lead agency for the project) has completed the SEPA checklist in Appendix D and will complete a SEPA determination prior to implementation of the project.

4.2.3.2. Historic and Cultural Resources

The National Historic Preservation Act (Section 106) and the Federal Archaeological and Historical Preservation Act (16 USCA 496a-1) will be applicable if any materials of archaeological interest are discovered during excavation activities. For compliance with the Archaeological Resources Protection Act, 43 CFR Part 7.

The project historical and cultural resources review concluded that unknown potentially significant archaeological materials may be present in the soil where native beach deposits underly recent fill soil. During development of the Site for commercial and industrial use infilling of the shoreline would likely have destroyed or disturbed cultural deposits in the vicinity of the Site. In the unlikely event of the discovery of archeological materials or human remains, work will be immediately stopped in the area and appropriate personnel will be notified as detailed in Section 5.2.

4.2.3.3. Hazardous Building Material Abatement and Disposal

The Resource Conservation and Recovery Act (RCRA) and the National Emissions Standard for Hazardous Air Pollutants (NESHAP) regulate the abatement and disposal of asbestos-containing materials (ACM). Federal NESHAP 40 CFR Part 61 and the Northwest Clean Air Agency (Section 570 – Asbestos Control Standards) regulate ACM and work will be completed in accordance with these regulations. Removal, handling and disposal of Universal Waste are regulated by Ecology in accordance with WAC 173-303. Universal wastes expected to be encountered during building demolition include fluorescent tubes and ballasts that will be handled and disposed in accordance with WAC 173-303-573 and chlorofluorocarbon (CFC) or hydrochlorofluorocarbon (HCFC) refrigerants that will be handled and disposed in accordance with WAC 173-303-506. Additional hazardous building materials including lead and polychlorinated biphenyls (PCBs) will also be removed, handled and disposed of in accordance with WAC 173-303.

4.2.3.4. Washington State Construction Stormwater General Permit (CSWGP)

Construction site operators are required to be covered by a Construction Stormwater General Permit (CSWGP) if they are engaged in clearing, grading, and excavating activities that disturb one or more acres and discharge stormwater to surface waters of the state. The CSWGP is administered by Ecology under the National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge General Permit for Stormwater Discharges. This permit is not anticipated to be applicable for the Interim Action because the area of disturbance from the Interim Action is less than one acre. Prior to construction the Port will consult with the Northwest Regional Office Water Quality Program as necessary to confirm that a CSWGP is not required.

4.2.3.5. City of Anacortes Permit(s)

The Interim Action construction work is within 200 feet from the shoreline and the work will be required to comply with City of Anacortes Shoreline Master Program substantive requirements. The City will provide a Shoreline Permit Exemption Letter, but the Port will coordinate with the City to comply with the substantive requirements of the shoreline permit.

The Interim Action at Quiet Cove involves excavation, filling and grading work within City streets (O Avenue and N Street) and ROW and therefore, the work falls within the City's permit jurisdiction. The City will require permits as part of their standard procedure to confirm that substantive requirements are met. Applicable documentation (e.g. permit application forms) and plans prepared for Interim Action construction will be submitted to the City for review and coordination will be completed with the City to ensure compliance with the substantive requirements of the appropriate permit(s).

4.3. Remedial Actions Considered

Remedial actions considered to address contaminated soil within the source area of the Site generally include the following:

- In situ treatment such as soil vapor extraction, in situ stabilization, chemical oxidation, etc.
- Capping and containment of contaminated soil; and
- Excavation to remove contaminated soil and off-site disposal.

The contaminated soil identified to be addressed by the Interim Action is located within Port-owned properties on the Site that are planned to be redeveloped. The remedial action selected for the Interim Action needs to address contamination, provide a certainty in the cleanup timeframe while reducing potential for future additional costs and complexities for the final cleanup action and be compatible with future use of the Site.

In situ treatment and capping/containment are potentially effective remedial actions for the Site but the duration for remediation may limit the ability of the Port to use the Site for beneficial uses in the near future. Additionally, the effectiveness of these remedial options is less certain than removal and offsite disposal. Excavation and offsite disposal allow for certainty in the timeframe that is required by the Port to pursue redevelopment plans. Development of the site could prevent contingency actions for in situ treatment or capping/containment. For these reasons removal and offsite disposal was selected as the preferred remedial approach for the Interim Action due to its compatibility with future site use.

4.4. Coordination with Final Cleanup

The Port has completed the RI field activities as documented in the Data Report (Appendix C) and at this time has not completed the RI/FS Report required by the AO.

The AO for the Site allows for an interim remedial action to be completed in coordination with Ecology. The Port is planning to complete the Interim Action to remediate a portion of Site to avoid adding complexity and costs to the final cleanup due to development at the Site. The Interim Action will reduce the potential threat of Site contaminants to human health and the environment and will not preclude reasonable alternatives for the final cleanup action (WAC 173-340-430(3)(b)). The Interim Action is expected to be a permanent solution for a portion of the Site and a final remedial alternative can be selected to supplement the Interim Action and achieve a final remedy for the Site.

The RI/FS for the Site will identify the completion of the Interim Action as part of the Site conditions. The RI/FS will identify appropriate alternatives for the final cleanup of the Site. The final cleanup action will include integration of the Interim Action cleanup area and the resulting reduction of source material.

5.0 INTERIM ACTION COMPONENTS

The Interim Action will remove and dispose of petroleum-contaminated soil within the Port-owned properties in the upland portion of the Site as described in Section 4.1. The components of the Interim Action include:

- Site Preparation;
- Procedures for Inadvertent Discovery of Cultural Resources;
- Utility Management;
- Excavation Shoring (if required);
- Remedial Excavation Limits and Verification Soil Sampling;
- Soil Segregation, Stockpiling and Reuse/Disposal Characterization;
- Management of Contaminated Water;
- Backfill and Compaction;
- Placement of Oxygen-Releasing Material;
- Site Restoration; and
- Institutional Controls.

The following sections provide detail on how these components will be implemented to complete the Interim Action.

5.1. Site Preparation

5.1.1. Utility Locate

As part of the Interim Action mobilization, the contractor will be responsible for contacting Washington State Utilities Underground Location Center (UULC) at 811 (or 1-800-424-5555) as well as private utility locating services in order to locate utilities at/near the Site. A recent (November 2018) pre-construction survey,

completed by Sound Development Group on behalf of the Port, identified existing utilities at/near the Site as shown on Figure 9. Currently known utilities in the vicinity of the Interim Action include overhead power and telephone and underground power, telephone, stormwater, water and gas. The exact location or depth of the underground utilities is not known and will be verified in the field by the contractor. The contractor will also be responsible for identifying the location of utilities that may exist at/near the Property but are not identified in the survey. Assumptions for managing utilities during remedial activities are presented in Section 5.3.

5.1.2. Contractor Staging Areas

The southern portion of the Site, where contamination is not present will be available to the contractor for staging as shown on Figure 10. The contractor may propose a different location for staging for Port's approval. The contractor will be responsible for protecting existing surfaces, including existing monitoring wells, used for the staging areas.

5.1.3. Site Security and Traffic Control

The contractor will be responsible for providing and installing temporary site security measures including fencing, barricades, etc., as necessary for cordoning off the construction work and contractor staging areas from the public during active work and non-work hours. Appropriate gate(s) will be provided along the temporary fence to provide access to construction personnel, vehicles and other construction equipment. Site security measures such as fencing will also be used along the western portion of the Interim Action construction area to restrict public access from the beach.

The limits of excavation are predominantly located within Port-owned properties; however, the northern and potentially the eastern sidewall of the excavation will extend into the City's ROW where existing sidewalk and streets are located. A portion of 2nd Street southern lane and sidewalk is expected to be excavated. The southern sidewalk of 2nd Street will be closed during construction and pedestrian traffic will be rerouted. Second street is primarily used for vehicles and pedestrians accessing Curtis Wharf and City's N Avenue Park. It is assumed that the vehicular traffic movement (in both directions) on 2nd Street can be kept open during the majority of construction activities with the use of appropriate traffic controls (e.g. signs, barricades, etc.). If vehicular traffic movement must be limited to one direction at a time on 2nd Street, the contractor will be required to implement additional traffic controls to ensure public safety.

Depending on contractor's means and method, the eastern sidewall of the excavation along O Avenue may be built utilizing temporary shoring or at a stable side slope. In this scenario, a portion of the western sidewalk, parking lane and bike lane of O Avenue is expected to be removed and/or damaged as part of the excavation. The western sidewalk and bike lane of O Avenue will be temporarily closed for pedestrian and bike traffic, respectively, for the duration of the construction and traffic will be rerouted. The parking lane will be closed for the duration of the construction. The vehicle traffic lanes of O Avenue will not be impacted due to construction and the vehicular traffic movement (in both directions) on O Avenue will be kept open.

A pedestrian path associated with City's N Avenue Park is located on Port's property and adjacent to the northwestern portions of excavation. This pedestrian path consists of gravel surface and will be removed to facilitate excavation, as necessary. Pedestrian traffic will be temporarily rerouted for the duration of construction in coordination with the City's requirements. The pedestrian path will be restored following

construction. The southern portion of the excavation is located within Port property and specific traffic control measures are not expected to be required to complete excavation work in this portion.

City coordination will be completed as part of the design and permitting process to ensure City requirements are met. The contractor will be required to implement traffic control in accordance with the City permits and approvals. In general, traffic controls will include providing necessary signs (e.g. sidewalk closure, rerouting signs, etc.), barricades and flaggers (if necessary) to maintain safe movement of pedestrian, bike and vehicular traffic.

The contractor will be required to prepare a temporary site security and traffic control plan for City's review and approval. The contractor's plan will identify the truck haul route within the City limits that the contractor proposes to use for transport of contaminated material.

5.1.4. Temporary Erosion and Sediment Control (TESC)

Best management practices (BMPs) consistent with Ecology's current Stormwater Management Manual for Western Washington (SWMMWW) and the project permit requirements will be used for erosion and sediment control during construction. A temporary erosion and sediment control (TESC) plan will be prepared as part of the project plans presenting minimum requirements that the contractor will be required to follow. The contractor will be required to revise this plan or prepare a new TESC plan as necessary to identify TESC BMPs that will be implemented during construction.

The proposed temporary erosion and sediment control elements will include the following:

- Prevention of sediment, debris and sediment-laden water from leaving the work area and entering adjacent surface streets, storm drains as well as Puget Sound using silt/filter fabric fences, straw bales, straw wattles, storm drain inlet protection, catch basin silt barriers and/or similar BMPs.
- Implementation of BMPs to divert stormwater such that stormwater from offsite does not enter the excavation area.
- Implementation of BMPs at the construction entrance/exit and internal haul routes to minimize the tracking of soil onto the adjacent surface streets (described in Section 5.1.5).
- Street sweeping and/or street cleaning, as necessary, to remove soil tracked onto the adjacent surface streets.
- Implementation of stockpile BMPs (described in Section 5.1.6).

5.1.5. Construction Entrance/Exit and Internal Haul Routes BMPs

The location of construction entrance/exit will be selected by the contractor depending on their approach to excavation and hauling. The construction entrance/exit is expected to be located adjacent to 2nd Street. Construction entrance/exit and internal equipment operation areas will be stabilized with quarry spalls, crushed rock or other equivalent BMPs. A geotextile fabric may be placed as a separation layer between existing surface and spalls/rocks where appropriate. Construction entrance/exit and haul routes can also be located directly on top of existing gravel or paved surfaces at the Site provided that the existing surface is not known to be contaminated or does not exhibit field screening evidence of contamination, and trucks are not causing soil to be cross-tracked. Wheel wash or tire baths may be required if other BMP's installed

for construction entrance/exit and internal haul routes are not effective in preventing tracking soil onto roads.

5.1.6. Stockpiling BMPs

The southern portion of the Property will be available for temporary stockpiling as shown on Figure 10. The contractor may use this area or propose a different area for temporarily stockpiling excavated material for Port's approval.

Overburden and contaminated material will be generated as a result of remedial excavation activities. Stockpiling of overburden is required for reuse characterization. The contractor will be allowed to stockpile excavated overburden material on existing surfaces (paved or unpaved) at the Property provided that the existing surface is not known to be contaminated or does not exhibit field screening evidence of contamination. Stockpiling of overburden soil will not be allowed on a surface that is contaminated or suspected to be contaminated to prevent cross contamination. The minimum best management practices (BMPs) applicable to overburden material stockpile include perimeter berm and impermeable liner and cover as described below.

The contractor may elect to either directly load contaminated material to haul trucks or temporarily stockpile contaminated material outside the limits of excavation area prior to loading. In the latter case, it is assumed that the temporary stockpiling of material may be required within the limits of excavation area. Such stockpiling of excavated contaminated material may occur on top of existing contaminated material and the contractor will be required to ensure that the water draining out of stockpiled material is not causing cross-contamination of adjacent clean or potentially clean material (e.g. overburden). The minimum BMPs applicable to contaminated material stockpile located outside the limits of excavation area include perimeter berm, impermeable and stabilized base and impermeable cover are described below.

- **Perimeter Barrier:** This BMP is applicable to both overburden material stockpile and contaminated material stockpile located outside the limits of excavation area. The intent of perimeter barrier is to prevent stormwater run-on into the stockpiled material and to contain liquids from stockpiled material within the stockpile area. The barrier will be installed on all sides of the stockpile. Stockpile material will be contained within the barrier in a manner that prevents spillage of material over/outside of the berm. The berm barrier will be constructed of clean imported soil, asphalt, concrete ecology blocks or similar and will be capable of performing its function. Existing site features such as retaining wall can also be used as a barrier.
- **Impermeable Liner:** This BMP is applicable to both overburden material stockpile and contaminated material stockpile located outside the limits of excavation area. An impermeable liner will be placed on existing surfaces following clearing of any debris that might potentially tear or puncture the liner and will extend underneath the entire footprint of the stockpile and over the perimeter barrier. The intent of an liner is to minimize or eliminate (to the extent practicable) direct contact and cross-contamination of underlying existing surface from stockpiled material. Overburden material may be deemed contaminated based on chemical analytical testing as described in Section 5.6 and therefore, this BMP is considered applicable. If the individual section of the liner is not big enough to cover the entire stockpile, then multiple sections will be used. Adjacent sections of the liner will be overlapped with overlying section located uphill. The liner will be constructed of impermeable high-density polyethylene (HDPE) sheeting (thickness of 20-millimeter or greater) or similar and will be capable of performing its function. A torn liner will be repaired or replaced upon identification of the breach.

- **Stabilized Impermeable Base:** This BMP is applicable to both overburden material stockpile and contaminated material stockpile located outside the limits of excavation area on unpaved surfaces. A stabilized impermeable base will be constructed on existing unpaved surfaces following preparatory activities that may be necessary to prepare stable subgrade (e.g. clearing of debris, grading/compaction of existing surface and will extend underneath the entire footprint of the stockpile and berm. The intent of the stabilized impermeable base is to prevent direct contact and cross-contamination of underlying existing surface from stockpiled material, provide a stable working surface that is not compromised of its function due to normal wear and tear from construction activities and is sloped such that the liquids draining from stockpiled material are channeled to a point (e.g. sump) where the liquids can be collected, as necessary.
- **Impermeable Cover:** This BMP is applicable to both overburden material stockpile and contaminated material stockpile located outside the limits of excavation area. This BMP is also applicable to contaminated material stockpile located within the limits of excavation area when the stockpile must remain in place for extended periods of time. An impermeable cover will be required to eliminate or minimize wind dispersion and direct contact of precipitation with stockpiled material. The complete extent of the stockpile will be covered during off-work hours and the portions of stockpile that is not in use during work hours will also be covered. The covers will extend over the berm (to ensure that the precipitation is diverted outside the stockpile area) and will be anchored using sandbags or similar to prevent them from being removed by wind. If the individual section of the cover is not big enough to cover the entire stockpile, then multiple sections will be used similar to the approach described for liner. The cover will be constructed of impermeable high-density polyethylene (HDPE) sheeting (thickness of 6-millimeter or greater) or similar. Any torn covers will be repaired or replaced upon identification of the breach.

5.1.7. Demolition and Management of Demolition Debris

Demolition activities primarily involve removal of two existing building structures, retaining wall and paved surfaces to facilitate removal of contaminated material within the planned excavation footprint.

5.1.7.1. Building Demolition

Two warehouse-type buildings located within the Site will be demolished to the extent needed to access the underlying contaminated soil. One of the buildings is approximately 100 feet long by 40 feet wide and the other is approximately 45 feet long by 30 feet wide. The buildings are identified on Figure 9. Prior to demolition the Port will consult with Department of Archaeology and Historic Preservation (DAHP) as part of the City demolition permitting process to determine any cultural significance of the buildings to be demolished.

A hazardous building material survey has been completed to characterize building material prior to construction as presented in Appendix E. Building materials characterized as hazardous will be demolished, managed separately from the rest of the materials and transported offsite to a Resource Conservation and Recovery Act (RCRA) Subtitle C landfill for disposal. Non-hazardous building material will be demolished and transported offsite to a recycling facility or a permitted disposal facility if recycling is not feasible. The underground foundation of the building will be removed as necessary to complete the excavation. Foundation material and paved surfaces of the building will be managed in accordance with the procedures mentioned below in Section 5.1.7.3.

5.1.7.2. Retaining Wall and Paved Surface Demolition

As shown on Figure 9 and 10, eastern, southern and western perimeters of the Quiet Cove property contain a retaining wall. The type of retaining wall is not known but it appears to be of reinforced concrete. The portion of the retaining wall within excavation limits will be demolished to facilitate removal of contaminated material and/or installation of temporary excavation shoring. The demolition debris from the retaining wall will be managed in accordance with the procedures mentioned below in Section 5.1.7.3.

As previously discussed, the southern sidewalk and lane of 2nd Street and potentially western sidewalk, parking and bike lane of O Avenue will be impacted due to construction. Concrete and/or asphalt paved surfaces of these sidewalks and street will be demolished as necessary to facilitate excavation of underlying contaminated material. The existing surface of 2nd Street (north of the Property) is unpaved and consists of gravel/dirt and therefore, demolition activities are not expected to be necessary to access underlying contaminated material under this street. The existing surfaces within the Interim Action footprint are predominantly paved with concrete and/or asphalt. The paved surfaces located within the excavation limit will be demolished to access underlying contaminated material. The demolition debris of paved surfaces will be managed in accordance with the procedures mentioned below in Section 5.1.7.3.

5.1.7.3. Management Procedures for Demolition Debris in Contact with Contaminated Soil

Demolition debris from building foundations, retaining wall and paved surfaces will be segregated from adjacent/underlying soil to the extent practicable, scraped clean using excavator bucket or hand tools (e.g. shovel) and subsequently field screened for signs of contamination (staining and petroleum hydrocarbon sheen or odor). Demolition debris exhibiting signs of contamination will be managed similar to contaminated soil and will be transported and disposed at an offsite permitted disposal facility. Demolition debris with no field screening evidence of contamination will be transported offsite to a recycling facility or a permitted disposal facility if recycling is not feasible.

5.1.8. Monitoring Well Protection/Decommissioning

Eleven groundwater monitoring wells including MW-1 through MW-8 and MW-10 through MW-12 are currently located at/near the Site as shown on Figure 10. Monitoring wells located within the excavation limits and equipment operation area will be decommissioned prior to performing excavation activities. Five monitoring wells including MW-2, MW-11, MW-12, SD-02 and SD-08 are located within or immediately adjacent to the limits of excavation and therefore are planned to be decommissioned. The other existing monitoring wells will be protected in place to the extent possible.

Excavation activities are not planned to disturb the other monitoring wells at the Site including MW-3, MW-4, and MW-6 through MW-8, and these five wells will be protected in place during construction activities. Decommissioning activities will be completed by a Washington State licensed driller in accordance with Ecology requirements (WAC 173-160-460).

5.1.9. Dust and Noise Control

Site grading and excavation work has the potential to generate airborne dust. Engineering controls will be used during construction (e.g., wetting or covering exposed soil), as necessary, to meet Northwest Clean Air Agency substantive restrictions on the off-site transport of airborne particulates. If wetting is employed, care will be taken to apply the appropriate amount of water to prevent dust only. Visual monitoring will take place and water application will cease if over-saturation is noted (i.e. puddling, surface runoff). In addition, street sweeping will be performed, as necessary to comply with City street use permit requirements.

Construction noise will be generated by a variety of construction equipment, including truck engines, back-up alarms, generators, other small engines, and earthmoving equipment. Work associated with the Interim Action will be performed during hours allowed by the City of Anacortes municipal code. If required, a variance on the allowable work hours will be coordinated with the City of Anacortes.

5.2. Procedures for the Inadvertent Discovery of Cultural Resources

As discussed in Section 4.2, there is potential for encountering archaeological materials during excavation where native beach deposits are encountered. The Interim Action primarily addressed contaminated fill material, but portions of the excavation may encounter the fill-native interface. During construction, field inspectors that are generally aware of the potential types of cultural artifacts that could be encountered will be utilized to oversee the excavation activities. Where the excavation reaches the fill-native interface layer an archeological monitor will be onsite to observe excavation activities as required. If potential archaeological resources are identified by the field inspector during construction, work will be stopped immediately, and the Port notified. In the event of a suspected discovery, the Port will retain a professional archeologist to evaluate the potential discovery and determine its cultural significance. If it is determined that the discovery is not culturally significant, work activities will resume. In the unanticipated event of a potential archeological discovery, the following steps shall be taken:

1. **Stop Work and Protect the Discovery Site.** If any agency employee, contractor, or subcontractor believes that he or she has uncovered any cultural resources, all work within a minimum of 50 feet of the discovery ("discovery site") will be stopped to provide for its total security, protection and integrity. The discovery site shall be secured, and vehicles, equipment, and unauthorized personnel will not be permitted to traverse the discovery site. Work may continue in other areas of the project.
2. **Notify the Port.** The individual making the discovery will immediately contact GeoEngineers who will then notify the Project Manager for the Port (contact information presented in the table below).
3. **Notify the Project Archaeologist.** Immediately following the work stoppage and notification to the Port, the Project Archaeologist shall be contacted by the Port.
4. **Identify the Find.** The Project Archaeologist, in coordination with the Port is responsible for ensuring that appropriate steps have been taken to protect the discovery site. The Project Archaeologist shall be qualified as a professional archaeologist under the Secretary of Interior's Professional Qualification Standards (as outlined in 36 CFR Part 61). As such, the Project Archaeologist shall be qualified to examine the find to determine if it is of cultural significance. If it is determined not to be of cultural significance, work may proceed at the discovery site with no further delay.
5. **Notify Additional Parties.** If the discovery is determined by the Project Archaeologist to be a cultural resource, the Port or their designee will provide notification to Ecology, DAHP, the Samish Indian Nation, Swinomish Indian Tribal Community and the Lummi Nation. Confidentiality of the find will be maintained by Project leads and their contractors. In the event human remains are identified, law enforcement will be notified.
6. **Obtain Consent to Proceed with Construction.** Construction work will not recommence at the discovery site until treatment has been completed and the Tribes, DAHP, and/or jurisdictional agencies, as appropriate, have provided written or verbal consent to proceed.

Contact information for key personnel for the inadvertent discovery of cultural resources is summarized in the following table.

CONTACT LIST FOR THE INADVERTENT DISCOVERY OF CULTURAL RESOURCES

Contact Name	Organization	Title	Contact Number
John Herzog (Primary Contact)	GeoEngineers, Inc.	Project Manager	(o) 206.728.2674 (c) 206.406.6431
Brian Tracy (Alternate Contact)	GeoEngineers, Inc.	Project Engineer	(o) 206.239.3250 (c) 206.679.1643
Brad Tesch	Port of Anacortes	Project Manager	(o) 360.299.1830
Brett Lenz	Columbia Geotechnical Associates	Project Archaeologist	(o) 206.855.9020
Arianne Fernandez	Ecology	Site Manager	(o) 360.407.7209
Rob Whitlam	DAHP	State Archaeologist	(o) 360.586.3080 (c) 360.890.2615
Jackie Ferry	Samish Tribe	Cultural Resources	(o) 360.293.6404
Lena Tso	Lummi Tribe	Lummi Tribal Historic Preservation Office	(o) 360.384.2259
Larry Campbell	Swinomish Tribe	Tribal Historical Preservation Officer	(o) 360.466.7352

5.3. Utility Management

Utilities will either be demolished and removed, temporarily rerouted if necessary and restored, or protected in-place to facilitate remedial excavation activities. The contractor will be responsible for coordinating and notifying respective utility providers in advance of demolition and remedial excavation. In addition, the contractor will be responsible for obtaining necessary inspections for the restored utilities. The approximate locations of utilities, currently known to exist within/near the Interim Action construction area based on a survey completed by Sound Development Group dated May 2019, are shown on Figure 9. These utilities include power, water, sewer, storm drains and catch basins, telephone and gas. The utilities will be managed as follows during excavation:

- Unknown buried abandoned pipes (e.g., asbestos wrapped product lines) or other utilities related to the former Standard Oil fueling operations may exist within the excavation area. If encountered these abandoned utilities will be removed and disposed of in accordance with appropriate disposal regulations.
- If the utility is in an abandoned state, then such utility will be permanently removed to facilitate excavation, unless the owner of the utility (e.g. City) requests otherwise.
- Functional utility located within the Port properties will be removed or protected in place (if possible) to facilitate excavation. If removed, such utility will be reinstalled following construction or remain permanently removed depending on future Property use.
- Functional utility located outside the Port properties will be removed or protected in place (if possible) to facilitate excavation. If removed, the functional utility will be restored in kind following construction.

If a utility not identified in the pre-construction survey or contractor's utility locate is uncovered during excavation, the contractor will be required to notify the Port immediately of such occurrence. Appropriate notifications will be made to the utility owner, if necessary, and the utility will be managed as per the procedures mentioned above. Any accidental damage to such utilities will be repaired.

5.4. Excavation Shoring

The contractor may elect to use a shoring system to complete excavation or shoring may be required in certain areas in order to protect adjacent surfaces or structures. The primary area where shoring may be required or provide benefit for overall construction is along the eastern excavation sidewall to protect adjacent sidewalk and minimize construction impacts to O Avenue. If shoring is used on site, the contractor will be responsible for hiring a Washington State professional geotechnical engineer to collect subsurface geotechnical information necessary for design of a shoring system and a Washington State professional structural engineer to design the shoring system. The design of a shoring system may be subject to review and approval – if required by the City.

5.5. Remedial Excavation Limits and Verification Soil Sampling

The objective of remedial excavation is to remove petroleum hydrocarbon contaminated material located within the Port-owned properties in the upland area of the Site to allow for these areas to be redeveloped prior to implementation of a final remedy for the Site. In general, known contamination located outside Port-owned properties and in groundwater on Port-owned properties will be left in place and subject to monitoring and additional remedial actions, as required.

The estimated limits of contamination and remedial excavation are shown in plan view on Figure 11 and cross-sections are presented on Figures 12 and 13. The excavation limits are comprised of the excavation base and five sidewalls - northwestern, northern, eastern, southern and southwestern, as shown on Figure 11. A total of approximately 8,500 cubic yards of material are estimated to be removed from the excavation based on the limits shown in the figures.

5.5.1. Final Excavation Limits

The northwestern, northern and eastern sidewalls are considered to be the final Interim Action limits at the parcel boundary and additional excavation beyond the shown limits will not be completed to remove additional contaminated soil that may exist. At these limits field screening (headspace organic vapor screening, water sheen screening, and visual observation) and verification soil sampling will be completed to document contaminant conditions that will be left in place. Field screening and verification soil sampling procedures are described in the Compliance Monitoring and Quality Assurance Project Plan (CMP/QAPP; Appendix F). The following list describes the process used in developing the final limits for northwestern, northern and eastern sidewalls:

- The northern sidewall of the excavation will be completed at a stable side slope (1 Horizontal: 1 Vertical [1H:1V] or less) with the toe located at the parcel boundary. The northern sidewall is located such that contamination will be removed to the maximum extent practicable within the Port-owned property.
- The eastern sidewall of the excavation is assumed to be completed either at a stable side slope (1H:1V or less) with the toe located at the property boundary or vertical slope using shoring methods depending on contractor's excavation approach. Shoring, if used, will be located at the property boundary. Similar

to the northern sidewall, the eastern sidewall will be located such that contamination can be removed to the maximum extent practicable within the property boundary.

- The northwestern portion of the excavation area contains a portion of City's N Avenue Park and associated pedestrian pathway and shoreline vegetation. It is assumed that the existing fence line in the northwestern portion (Figure 11) marks the boundary for the City's park. The northwestern sidewall of the excavation will be completed at a stable side slope (1H:1V or less) with the toe located at the fence line. The northwestern sidewall is located such that contamination can be removed to the maximum extent practicable within the portion of Port-owned property that is not used as City park and to protect riparian vegetation, shrubs and trees located waterward of the pedestrian pathway and adjacent to the Guemes Channel.

5.5.2. Preliminary Excavation Limits

The excavation base, southern sidewall, southwestern sidewall and northwestern sidewall as shown on Figure 11 are considered preliminary based on existing chemical analytical data (Data Report; Appendix C). Excavation limits for the base and these sidewalls will be modified as necessary to remove contaminated soil on Port-owned properties to achieve remediation levels established for the Interim Action.

The preliminary depths to the excavation base range from 7 to 14 feet below ground surface (bgs) as shown on Figure 11. The final depths to excavation base may vary based on results of field screening (headspace organic vapor screening, water sheen screening, and visual observation) and verification soil sampling.

Similarly, the final excavation limits in the southern and southwestern direction may extend beyond the preliminary limits shown on Figure 11 based on results of field screening and verification soil sampling. Based on existing analytical data (Appendix C) the southern and southwestern limits of the excavation are not anticipated to extend beyond the property boundaries.

The following list describes procedures for field screening and verification soil sampling in determining final excavation limits for the base, southern and southwestern sidewalls. As mentioned above, field screening and verification soil sampling procedures (including frequency at which samples will be collected) are described in the CMP/QAPP (Appendix F).

- Field screening will be performed by GeoEngineers' field personnel at the preliminary excavation limits (shown on figures) to evaluate evidence of contamination and help determine when to collect verification samples. If field screening results indicate evidence of contamination, then additional excavation will be performed until excavation limits are reached where field screening does not yield evidence of contamination. Field screening will continue as additional excavation progresses to minimize removal of non-contaminated material located beyond the limits of contamination.
- Verification soil samples will be collected at the excavation limits where field screening does not yield evidence of contamination and submitted for chemical analysis as detailed in the CMP/QAPP. Remedial excavation activities will be continued until the results of verification soil samples are below Interim Action remediation levels presented on Table 1 and/or the property boundaries (or the northwestern fence line) have been reached. In which case, verification soil samples will be collected and analyzed to document contaminated soil that is left in place at the excavation limit.

5.6. Soil Segregation, Stockpiling and Reuse/Disposal Characterization

Based on existing data, a total of approximately 1,500 and 7,000 cubic yards of overburden and contaminated material, respectively are estimated to be generated from excavation limits. Overburden material is expected to be generated from approximately upper 2 to 4 feet of the excavation. Contaminated material will be generated from the remainder of the excavation. GeoEngineers field personnel will observe the excavation activities and perform field screening to assist the contractor in segregating overburden and contaminated material. Overburden material will be managed separately from contaminated material in a manner that prevents cross-contamination. The contractor and GeoEngineers field personnel will evaluate suitability of overburden material for backfill purposes. If overburden material contains unsuitable backfill material (e.g. organics, peat, soft clay, quicksand, etc.) that would prevent overburden material from achieving backfill compaction requirements (to be developed as part of design), then such overburden material will be managed similar to contaminated material and transported offsite for disposal. If overburden material is deemed suitable for backfilling purposes, then it will be stockpiled on site as per the stockpiling requirements identified in Section 5.1.6 pending reuse characterization. Sampling and analysis to be performed on overburden stockpile and reuse/disposal characterization are summarized below.

Disposal characterization for contaminated material will be completed using existing chemical analytical data (Data Report; Appendix C). The existing chemical analytical data along with the completed disposal-facility waste profile forms will be submitted to permitted solid waste disposal landfills to obtain preliminary authorizations. Based on existing data, it is assumed that the contaminated material will be characterized as non-hazardous/non-dangerous waste and require disposal at solid waste landfills that are permitted to accept such waste. Preliminary disposal authorizations will be obtained from up to two RCRA Subtitle D landfills (i.e. landfills that are permitted to accept non-hazardous/non-dangerous waste) and made available to the contractor to obtain final authorizations. Alternatively, the contractor may propose to use landfills of their choice that are Ecology-approved and permitted to accept contaminated waste generated from the Site. GeoEngineers will coordinate with contractor proposed landfills and/or Ecology's Hazardous Waste and Toxics Reduction Program, as necessary, to assist in obtaining disposal authorization. Since waste profiles for contaminated material will be developed prior to construction stockpiling of contaminated material is not expected to be necessary for disposal characterization purposes.

5.6.1. Overburden Stockpile Sampling and Analysis

Overburden soil will be stockpiled and characterized before being used as backfill at the Site. Soil sampling and analysis will be required to adequately characterize overburden material prior to reuse as backfill material. The quantity of soil samples to be collected for stockpile characterization will be in accordance with Ecology's guidance on the typical number of samples needed to adequately characterize stockpiled soil as summarized in the table below.

Typical Number of Samples Needed to Adequately Characterize Stockpiled Soil ¹	
Cubic Yards of Soil	Number of Samples for Chemical Analysis
0-100	3
101-500	5
501-1000	7

1001-2000	10
>2000	10+1 for each additional 500 cubic yards

¹ Source: Ecology's Guidance for Remediation of Petroleum Contaminated Sites (Ecology 2016)

The locations of stockpile samples will be evenly distributed horizontally over the extent of the stockpile such that reasonable representation of the entire stockpile is achieved. For example, if a stockpile is 300 cubic yards where 5 samples are to be collected, stockpile sample locations will be distributed evenly over the footprint of the stockpile such that each sample represents roughly 60 cubic yards. Each stockpile sample collected for analysis will be a three-point composite. These three points will also be evenly distributed horizontally within the portion of the stockpile they represent. The depth at which soil will be sampled from these points will be distributed vertically such that a reasonable representation of the stockpile is obtained. For example, for a 5-foot high stockpile, the depth of sampling at these three points may be distributed at 0.5 feet, 1.5 feet and 3 feet below the surface of the stockpile, if necessary. The depth of sampling will be 0.5 feet below the surface of the stockpile, at a minimum.

Decontaminated hand tools such as hand-auger, shovel or similar will be used for collecting samples at deeper sampling depths, as necessary. Soil compositing procedures for collection of non-volatile analyses will include collecting equal amounts of soil from each of the three sampling points and placing the soil in a fresh (unused) zip-top plastic bag or a decontaminated stainless-steel container. These samples for non-volatile analyses will be thoroughly mixed to a homogeneous consistency prior to placing it into laboratory provided containers. For volatile analyses including gasoline-range total petroleum hydrocarbons (by NWTPH-Gx) and other volatile organic compounds (by EPA 8260) discrete samples will be collected in accordance with EPA 5035A sampling methods. The three sampling points for the composite sample will be field screened (i.e. sheen, headspace vapor, odor) and the location with greatest evidence of contamination will be sampled for volatile analyses. The requirements applicable for sampling and analysis presented in CMP/QAPP will be followed. Duplicate soil samples will not be collected for waste characterization samples (i.e. stockpile samples). As identified in CMP/QAPP, duplicable samples are considered applicable only for samples collected as part of compliance monitoring, which includes verification soil samples and post-construction confirmational groundwater samples but not waste characterization samples. Chemical analysis will be performed at an Ecology accredited laboratory. Chemical analysis will be performed on a 2-day turn-around time to support decision making concerning stockpile material reuse/disposal. Overburden stockpile samples will be analyzed for site contaminants and any other analytes requested by disposal facility, if necessary. As a minimum the following analysis will be performed:

- Gasoline-range petroleum hydrocarbons by Ecology Method NWTPH-G;
- Diesel- and heavy oil-range petroleum hydrocarbons by Ecology Method NWTPH-Dx;
- PAHs by EPA Method 8270SIM;
- Volatile Organic Compounds (VOCs) including benzene, ethylbenzene, toluene and xylenes (BETX), n-hexane, Methyl tert-butyl ether (MTBE), Ethylene Dibromide (EDB) and Ethylene Dichloride (EDC) by EPA Method 8260; and
- Metals (arsenic, cadmium, chromium, lead and mercury) by EPA Method 6000/7000 series.

If the results are less than the remediation levels presented in Table 1 then overburden material will be used for backfilling. Consistent with Tables 12.1 and 12.2 in Ecology's Guidance for Remediation of

Petroleum Contaminated Sites (Ecology, 2016) overburden will be placed based on stockpile analytical results as follows:

- Soils with no detectable levels will be used to backfill any parts of the excavation.
- Soils with detections below remediation levels will be available for backfill above the water table.
- Soils above remediation levels will be transported and disposed of offsite.

Backfilling activities and requirements are described in Section 5.9. If the results are greater than the remediation levels (Table 1) then overburden material will be managed as contaminated material and require off-site transport and disposal at an Ecology-approved permitted disposal facility. The results of stockpile sampling will be submitted to an Ecology-approved permitted landfill proposed by the contractor, if necessary, along with completed waste profile forms to obtain disposal authorization.

5.7. Management of Groundwater

Groundwater is expected to be encountered during excavation activities (Data Report; Appendix C). Groundwater and any other water (e.g. stormwater, water used for decontamination, etc.) that comes in contact with material/equipment on Site and has potential to be contaminated will be managed in accordance with applicable laws and regulations. In addition to implementing TESC BMPs (Section 5.1.4), the contractor will be required to perform excavation in a manner that minimizes or prevents to the extent practicable the generation of contaminated water. To the extent possible the excavation will be completed during the dry season. If necessary, excavation will be performed during low-tide hours of the day so that tidal influence will be minimized during active excavation work. Excavation may also be completed in smaller portions where each portion is excavated, sampled and backfilled prior to commencing excavation activities on adjacent sections so that areas where water can accumulate are minimized. Under this approach, necessary BMPs will be implemented to prevent cross-contamination of newly backfilled sections. The contractor may be required to dewater portions of the excavation to achieve the objectives of the Interim Action.

The contractor will be required to manage water that collects within excavation limits such that (1) clean or potentially clean limits (chemical analytical results below cleanup levels and field screening does not indicate evidence of contamination) are not contaminated due to contact with free product, sheen or other contamination present in water; and (2) Port's field representative is able to observe, field screen, and collect verification soil samples from excavation limits.

Free product or sheen that does not get removed with contaminated soil and results in accumulating on the surface of standing water within excavation will also be managed properly by the contractor. Containment BMPs such as booms will be used to minimize contact of the floating free product and sheen within excavation limits that are clean or potentially clean. If necessary, the contractor will be required to remove and collect free product that poses a threat of cross-contamination. Collected free product will be stored and managed in accordance with applicable laws and regulation and will be transported off-site for either recycling or disposal at an Ecology-approved facility.

Additionally, the contractor will be required to manage free liquids generated from excavated material such that the material is suitable for transportation and meets the requirements of the disposal facility. If free liquids are drained within excavation limits prior to transport, the contractor will be required to ensure that draining water is flowing back into the excavation and not causing cross-contamination of adjacent areas. If free liquids are drained within stockpiling area, then the contractor will be required to divert draining water towards collection points (e.g. sumps or similar) within stockpile area where the water can be

collected and managed. Trucks used to transfer excavated material between excavation and stockpile areas will be equipped with proper doors and seals such that spillage of free liquid or material does not occur during transfer. Alternatively, the contractor may choose to mix dry contaminated excavated or treat the excavated material with an absorbent (e.g. diatomaceous earth or similar) to address free liquids; however, such additives will require Ecology approval and the contractor may need to compensate the Port for the increase in disposal weight resulting from the addition of an absorbent.

Water collected, stored and/or treated during excavation activities will be disposed of in accordance with applicable laws and regulations. The contractor will be responsible for designing and implementing water collection, storage and treatment system (as necessary) and implementing excavation water management in accordance with general requirements as previously detailed in this section. The contractor may elect to either transport collected/stored water for disposal to an off-site permitted disposal facility or discharge to City's sanitary sewer. Prior to disposal/discharge, the contractor will be required to treat the water (if necessary) to meet the disposal facility/City's acceptance criteria. The contractor will be responsible for collecting representative samples of the collected water for disposal characterization purposes and coordinating with the disposal facility or the City, as applicable, for obtaining necessary permits and approvals. Discharge into the City's sanitary sewer will require a temporary sewer discharge permit and City approval.

5.8. Transport and Disposal of Excavated Soil

Excavated contaminated soil and overburden soil unsuitable for backfilling will be transported off-site. Contaminated materials will be disposed at an Ecology-approved permitted disposal facility. The contractor will be required to ensure that material loaded for off-site disposal meets paint filter criteria in accordance with all applicable transportation laws and regulations and the requirements of the receiving disposal facility. Material with free liquid will not be allowed for off-site transportation. The contractor will be required to setup a designated area for transferring excavated or stockpiled material onto trucks/containers used for transporting material off-site. These designated area(s) will be constructed of stabilized surface that can contain accidental spills that may occur during transfer of material, capable of preventing cross-contamination of underlying/adjacent areas and resisting damage due to heavy truck traffic. Trucks/containers used for transporting excavated material will be equipped with seals and doors to prevent spillage of material during transportation in accordance with applicable regulatory requirements.

Transportation of excavated material will be completed by waste haulers in accordance with applicable state and federal solid waste handling and transportation regulations. Transportation contractor(s) will be capable of providing documentation that demonstrates that they are properly licensed and are in compliance with applicable U.S. Department of Transportation regulations, as well as a copy of their contingency and spill control plans describing the measures to be implemented in the event of spills or discharges during material handling and transporting. The contractor will be required to provide records of disposal (weight tickets, certificate of disposal) from the disposal facility to confirm the weight of the excavated material.

5.9. Backfill and Compaction

Upon completion of the remedial excavation, the excavation will be backfilled in accordance with the following approach:

- Geotextile fabric will be placed at the excavation limits prior to backfilling for use as a visual marker in areas where contamination is left in place.
- The contractor will provide the Port with verification that imported backfill materials have been tested and certified to be free of contaminants in accordance with backfill testing requirements that will be developed as part of the design.
- The excavation will be backfilled with imported, clean material (gravel borrow or similar) in lifts and each lift will be compacted in accordance with the requirements of the Washington Department of Transportation (WSDOT) Standard Specifications to be further detailed in design. Field density testing will be conducted to confirm adequate compaction is achieved.
- Oxygen-releasing material will be placed as part of backfilling activities as discussed in Section 5.10.

5.10. Placement of Oxygen-Releasing Material

Oxygen-releasing material (ORM) will be imported and placed in between backfill lifts adjacent to the areas where petroleum-related contamination will be left in place. The purpose of ORM will be to enhance aerobic biodegradation of the contamination remaining outside the excavation by supplying oxygen and promoting bacterial growth in the subsurface and thereby, enhancing degradation of residual petroleum compounds in soil and/or groundwater. ORM releases oxygen when it comes in contact with groundwater and will be placed within the saturated/smear zone adjacent to contaminated soil that is left in place. Based on analytical data collected contaminated material is expected to be left in place along the eastern, northern and northwestern sidewalls of the excavation. Typically, a single application of ORM can support aerobic biodegradation for up to approximately 12 months. The ORM will be non-toxic and soluble in groundwater that passively releases oxygen to the aquifer over time. As part of the design, further evaluation will be completed for ORM placement interval and dosage rate that will not have long-term negative effects on subsurface conditions. Placement of ORM will be completed in a safe manner in accordance with handling procedures.

5.11. Site Restoration

This section outlines the planned restoration following soil excavation and backfilling activities.

5.11.1. Utilities

Restoration of utilities that will be demolished/removed as described in Section 5.3.

5.11.2. Surface Restoration

Ground surfaces in the excavation area that are within the Port-owned properties will be restored with compacted gravel surfacing. Areas outside of Port-owned property that are disturbed or demolished as a result of the construction activities will be restored in kind. Landscaping and paved surfaces including streets, sidewalks, curbs and curb ramps located on City's ROW including 2nd Street and O Avenue will be restored in accordance with City requirements. The pedestrian pathway and landscaping of City's N Avenue Park will be restored in accordance with City's requirements. The retaining wall located along the eastern, southern and western perimeter of the Quiet Cove property will be replaced by a temporary earthen slope or block/rock wall (e.g. ecology blocks) to allow restoration of the retaining wall to be completed in coordination with redevelopment of the Site. The contractor will be required to perform survey(s) to document the as-built conditions of surface restoration.

5.11.3. Groundwater Monitoring Wells

Groundwater monitoring well MW-2 is planned to be decommissioned prior to excavation and reconstructed as part of restoration activities. Additionally, if wells MW-1, MW-5 and MW-10 are required to be decommissioned due to remedial excavation construction activities, then these wells will also be reconstructed as part of restoration activities. Monitoring wells will be constructed in accordance with the procedures and requirements of the Ecology-approved RI/FS Work Plan (GeoEngineers 2017). These monitoring wells will be reconstructed to facilitate post-construction groundwater monitoring activities detailed in the CMP/QAPP (Appendix F). Four monitoring wells that are planned to be decommissioned prior to excavation including MW-11, MW-12, SD-02 and SD-08 are not planned to be reconstructed as these well locations are not planned to be used for post-construction groundwater monitoring activities.

6.0 COMPLIANCE MONITORING

Compliance monitoring will be implemented in accordance with WAC 173-340-410 that presents compliance monitoring requirements of Ecology. The three types of compliance monitoring to be performed include:

- Protection monitoring to confirm that human health and the environment are adequately protected during the construction phase of the Interim Action.
- Performance monitoring to confirm that the Interim Action has attained remediation levels, where applicable.
- Confirmational monitoring to confirm the long-term effectiveness of the Interim Action.

The protection monitoring plan for the Interim Action will be addressed in a Health and Safety Plan (HASP; Appendix G). Performance monitoring includes verification soil sampling that will be performed at the limits of excavation and confirmational monitoring includes post-construction groundwater monitoring. Performance and confirmational monitoring are detailed in the CMP/QAPP (Appendix F) and describes the duration and frequency of the compliance monitoring program.

7.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

This section describes general QA/QC procedures to be implemented during the interim cleanup action, including contractor quality control, construction monitoring and field documentation, and analytical QA/QC.

7.1. Contractor Quality Control

The contractor will prepare a plan describing each of the primary elements of work, quality control procedures that will be utilized, and project management structure. The contractor's plan will be subject to review and approval by the Port to ensure that the construction is completed in accordance with the IAWP and contract requirements (to be developed).

The contractor will maintain QC records for the duration of the construction. These records will include evidence that the required inspections or tests have been performed, including the type and number of

inspections or tests involved; results of inspections or tests; nature of defects, deviations, causes for rejection, proposed corrective action, and corrective actions taken.

In addition to the contractor's QC activities, the Port and/or Port representatives will perform independent oversight of the contractor's activities.

7.2. Construction Monitoring and Field Documentation

Construction monitoring will be performed by the Port and its representatives. A comprehensive record of field activities will be maintained. Field documentation for this project will include field reports, and chain-of-custody forms for samples submitted for analytical testing. The field documentation will record construction, sampling, and monitoring activities, as well as decisions, corrective actions, and/or modifications to the project plans and procedures discussed in this report. Construction monitoring and field documentation procedures are described in the CMP/QAPP (Appendix F).

7.3. Analytical QA/QC

Analytical QA/QC is described in the CMP/QAPP (Appendix F). The CMP/QAPP describes verification soil and post-construction groundwater sampling, analysis, and QC procedures that will be implemented to produce chemical and field data that are representative, valid, and accurate for use in evaluating the effectiveness of the cleanup action.

7.4. Health and Safety

Cleanup-related construction activities will be performed in accordance with the requirements of the Washington Industrial Safety and Health Act (RCW 49.17) and the Federal Occupational Safety and Health Act (29 CFR 1910, 1926). These regulations include requirements that workers are to be protected from exposure to contaminants.

A project-specific Health and Safety Plan (HASP) describing actions that will be taken to protect the health and safety of GeoEngineers personnel (the Port's environmental construction oversight consultant) is presented as Appendix G. The contractor will be required to prepare and submit a separate HASP for use by contractor personnel. Personnel engaged in work that involves hazardous material excavation and handling will comply with MTCA safety and health provisions in WAC 173-340-810 and will be HAZWOPER, OSHA, and WISHA certified as required.

8.0 SCHEDULE

Pending public review of this Interim Action Work Plan and Ecology approvals, Interim Action-related construction work is scheduled to begin in the summer of 2020. The construction duration is estimated to occur over a period of three to four months. A detailed project schedule will be established at the time of contractor selection.

9.0 REPORTING

Upon completion of Interim Action construction work, an Interim Action Completion Report (IACR) that describes the construction activities will be prepared and submitted to Ecology for review and approval. The IACR will be prepared for Ecology's review. Additionally, the results of the Interim Action, as described

in the final IACR, will be incorporated into the RI/FS Report for the Site. A separate groundwater monitoring report will be prepared to document results of post-construction groundwater monitoring that will be completed after the Interim Action construction as described in the CMP/QAPP. The groundwater monitoring report will be prepared following completion of the groundwater monitoring activities described in the CMP/QAPP.

10.0 REFERENCES

GeoEngineers, 2014. Focused Environmental Site Investigation Data Report, Quiet Cove Property, Anacortes, Washington, GEI No. 5147-024-01, dated October 20, 2014

GeoEngineers, 2017. FINAL Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan); Quiet Cove Property; Anacortes, WA; Ecology Agreed Order No. DE 11346. GEI No. 5147-024-03, dated January 25, 2017.

GeoEngineers, 2018. Work Plan Addendum for Supplemental Upland Area Soil and Groundwater Investigation at the Quiet Cove Site, Anacortes, Washington (Work Plan Addendum). GEI No. 5147-024-06, dated October 1, 2018.

GeoEngineers, 2019. Data Report; Quiet Cove Site; Anacortes, Washington; Ecology Agreed Order No. DE 11346 for Washington State Department of Ecology on Behalf of Port of Anacortes. Dated May 31, 2019.

Maul Foster & Alongi, Inc.; GeoEngineers; and BST Associates (Maul Foster, et al), 2015. Quiet Cove and Curtis Wharf Cleanup and Redevelopment Strategy. Prepared for: Port of Anacortes. Prepared by: Maul Foster & Alongi, Inc.; GeoEngineers, Inc.; and BST Associates. March 9, 2015.

Washington State Department of Ecology (Ecology). 2016. Guidance for Remediation of Petroleum Contaminated Sites; Toxics Cleanup Program; Publication No. 10-09-057. Revised June 2016.

11.0 LIMITATIONS

We have prepared this report for the Quiet Cove Site located at 202 O Avenue in Anacortes, Washington for use by the Port of Anacortes. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

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Table 1
Interim Action Soil Remediation Levels
Quiet Cove Property
Anacortes, Washington

Analyte	Criteria for Protection of Human Health ¹			Criteria for Protection of Groundwater					Modifying Factor		Soil Remediation Level (Adjusted for Natural Background and PQL)	
	MTCA Method A Cleanup Level for Unrestricted Land Use	MTCA Method B Cleanup Level for Direct Contact (Standard Formula Value)		Equilibrium Partition Coefficients ²			Soil Concentration Protective of Preliminary Groundwater Cleanup Level ³		Natural Background ⁴	Practical Quantitation Limit (PQL) ⁵		
		Carc.	Non-Carc.	K _{oc} (org.)	K _d (metals)	H	Vadose Zone	Saturated Zone			Vadose Zone	Saturated Zone
Metals (mg/kg)												
Arsenic	–	0.67	24	–	29	–	2.92	0.15	20	5	20	20
Cadmium	–	–	80	–	6.7	–	1.21	0.061	1	0.20	1.2	1
Chromium (total)	–	–	120,000	–	1,000	–	1000	50.01	48	0.50	1,000	50
Lead	250	–	–	–	10,000	–	420	21	24	2	250	24
Mercury	2	–	–	–	52	4.70E-01	0.026	0.0013	0.07	0.05	0.07	0.07
Petroleum Hydrocarbons (mg/kg)												
Gasoline-Range	30/100 ⁶	–	–	–	–	–	–	–	–	5	30/100 ⁶	30/100 ⁶
Diesel-Range	2,000	–	–	–	–	–	–	–	–	5	2,000	2,000
Heavy Oil-Range	2,000	–	–	–	–	–	–	–	–	10	2,000	2,000
BETX Compounds (mg/kg)												
Benzene	–	18.18	320	62	–	2.28E-01	0.0135	0.00084	–	0.05	0.05	0.05
Ethylbenzene	–	–	8,000	204	–	3.23E-01	1.12	0.064	–	0.05	1.12	0.06
Toluene	–	–	6,400	140	–	2.72E-01	3.78	0.22	–	0.05	3.78	0.22
Xylenes	–	–	16,000	233	–	2.79E-01	2.83	0.16	–	0.05	2.83	0.16
Petroleum-Related Volatile Organic Compounds (VOCs; mg/kg)												
1,2-Dichloroethane (EDC)	–	10.99	480	38	–	4.01E-02	0.0203	0.00136	–	0.001	0.02	0.001
1,2-Dibromoethane (EDB)	–	0.5	720	66	–	2.66E-02	0.0015	0.000099	–	0.001	0.002	0.001
Methyl t-Butyl Ether (MTBE)	–	555.6	–	11	–	1.80E-02	2.592	0.182	–	0.001	2.59	0.18
n-Hexane	–	–	4800	1,482	–	6.50E-01	0.27	0.014	–	0.001	0.27	0.01
Non-carcinogenic Polycyclic Aromatic Hydrocarbons (PAHs; mg/kg)												
1-Methylnaphthalene	–	34.48	5600	2,528	–	2.10E-02	–	–	–	0.0067	34.48	34.48
2-Methylnaphthalene	–	–	320	2,478	–	2.12E-02	0.77	0.040	–	0.0067	0.77	0.04
Acenaphthene	–	–	4,800	4,898	–	7.52E-03	0.32	0.02	–	0.0067	0.32	0.02
Acenaphthylene	–	–	–	5,027	–	–	–	0.068	–	0.0067	–	0.068
Anthracene	–	–	24,000	23,493	–	2.67E-03	4	0.2	–	0.0067	4.41	0.2
Benzo[g,h,i]perylene	–	–	–	1,951,000	–	–	–	1.95	–	0.0067	–	1.95
Fluoranthene	–	–	3,200	49,096	–	6.60E-04	3.20	0.16	–	0.0067	3.2	0.16
Fluorene	–	–	3,200	7,707	–	2.61E-03	0.46	0.02	–	0.0067	0.5	0.02
Naphthalene	–	–	1,600	1,191	–	1.98E-02	0.25	0.013	–	0.0067	0.25	0.01
Phenanthrene	–	–	–	16,690	–	–	–	0.10	–	0.0067	–	0.101
Pyrene	–	–	2,400	67,992	–	4.51E-04	20.01	1.00	–	0.0067	20	1

Analyte	Criteria for Protection of Human Health ¹			Criteria for Protection of Groundwater					Modifying Factor		Soil Remediation Level (Adjusted for Natural Background and PQL)	
	MTCA Method A Cleanup Level for Unrestricted Land Use	MTCA Method B Cleanup Level for Direct Contact (Standard Formula Value)		Equilibrium Partition Coefficients ²			Soil Concentration Protective of Preliminary Groundwater Cleanup Level ³		Natural Background ⁴	Practical Quantitation Limit (PQL) ⁵		
		Carc.	Non-Carc.	K _{oc} (org.)	K _d (metals)	H	Vadose Zone	Saturated Zone			Vadose Zone	Saturated Zone
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs; mg/kg)												
Benzo[a]anthracene	–	1.37	–	357,537	–	1.37E-04	0.07	0.0036	–	0.0067	0.07	0.007
Benzo[a]pyrene	–	0.14	–	968,774	–	4.63E-05	0.19	0.010	–	0.0067	0.14	0.010
Benzo[b]fluoranthene	–	1.37	–	1,230,000	–	4.55E-03	0.25	0.012	–	0.0067	0.25	0.012
Benzo[k]fluoranthene	–	13.7	–	1,230,000	–	3.40E-05	0.32	0.016	–	0.0067	0.32	0.016
Chrysene	–	137	–	398,000	–	3.88E-03	0.25	0.0124	–	0.0067	0.25	0.0124
Dibenz[a,h]anthracene	–	0.14	–	1,789,101	–	6.03E-07	0.36	0.018	–	0.0067	0.14	0.018
Indeno[1,2,3-c,d]pyrene	–	1.37	–	3,470,000	–	6.56E-05	0.69	0.035	–	0.0067	0.69	0.035
cPAHs TEQ	–	–	–	968,774	–	4.63E-05	0.22	0.011	–	0.0067	0.22	0.011

Notes:

¹ MTCA Method A soil cleanup levels are shown for those chemicals for which Method B values are not available (e.g., petroleum hydrocarbons and lead). MTCA Method A value for total PCBs is also included to show chemical-specific cleanup level mandated in the Federal Toxic Substance Control Act (TSCA).

² Values for Kd and/or Koc and/or Henry's Law Constant not available from Cleanup Levels and Risk Calculation (CLARC) database were referenced from Estimation Program Interface (EPI) EPI Suite v4.11 (<http://www.epa.gov/oppt/exposure/pubs/episuite.html>) or Oak Ridge National Laboratory (ORNL) Risk Assessment Information System (RAIS).

³ Soil concentrations protective of groundwater calculated per WAC 173-340-740(3)(b)(iii)(A) using Equations 747-1 and 747-2 referencing groundwater screening levels presented in Table 2. Method A Cleanup Values are used for petroleum hydrocarbon soil concentrations protective of groundwater.

⁴ Metals background values (Puget Sound Region 90th percentile values) are from *Natural Background Soil Metals Concentrations in Washington State* (Ecology Publication #94-115, 1994), with the exception of arsenic which is referenced from MTCA Table 745-1 (WAC 173-340-900).

⁵ Lowest available PQL value from Analytical Resources Inc. (ARI) of Tukwila, Washington.

⁶ Screening level for gasoline-range petroleum hydrocarbons is 30 mg/kg if benzene is present and 100 mg/kg if not present.

EPA = Environmental Protection Agency

k_d = Distribution coefficient

k_{oc} = Soil organic carbon-water partitioning coefficient (L/kg)

L/kg = Liter per kilogram

mg/kg = Milligrams per kilogram

MTCA = Washington State Model Toxics Control Act

PQL = Practical quantitation limit

– = No screening criteria available.

TEQ = Toxic equivalent concentration (toxicity equivalency factor (TEF) values are presented in Table 5).

Calculated concentrations protective of groundwater as marine surface water assume unsaturated soil, and are calculated based on groundwater screening levels before adjustment for background and PQLs.

Table 2

Interim Action Groundwater Screening Levels

Quiet Cove Property

Anacortes, Washington

Analyte	Criteria for Protection of Aquatic Organisms and Human Health									Groundwater Screening Level Protective of Sediment ⁵	MTCA Method B Groundwater Screening Level for Protection of Vapor Intrusion		Modifying Factor		Groundwater Screening Level (Adjusted for Natural Background and PQL)
	Marine Surface Water Quality Criteria ¹		National Toxics Rule ²		Clean Water Act ³		MTCA Method B Surface Water Cleanup Level ⁴	Natural Background ⁶	Practical Quantitation Limit (PQL) ⁷						
			Protection of Marine Aquatic Life		AWQC for Protection of Human Health	Protection of Marine Aquatic Life					Carc.	Non-Carc.			
	Acute	Chronic	Acute	Chronic		Acute	Chronic	Acute	Chronic						
Metals (µg/L)															
Arsenic	69	36	69	36	0.14	69	36	0.14	0.098	43.1	--	--	5	0.5	5
Cadmium	42	9.3	42	9.3	--	40	8.8	--	40.5	114.5	--	--	--	0.1	8.8
Chromium ⁸ (total)	1,100	50	1,100	50	--	1,100	50	--	243,056	389.9	--	--	--	1	50
Lead	210	8.1	210	8.1	--	210	8.1	--	--	2.1	--	--	--	0.1	2.1
Mercury	1.8	0.025	2.1	0.025	0.15	1.8	0.94	0.3	--	3.8	--	0.89	--	0.02	0.025
Petroleum Hydrocarbons (µg/L)															
Gasoline-Range	--	--	--	--	--	--	--	--	800/1000 ^{9,10}	--	--	--	--	100	800/1000 ⁹
Diesel-Range	--	--	--	--	--	--	--	--	500 ⁹	--	--	--	--	100	500
Heavy Oil-Range	--	--	--	--	--	--	--	--	500 ⁹	--	--	--	--	200	500
BETX Compounds (µg/L)															
Benzene	--	--	--	--	71	71	71	58	22.66	--	2.4	102.7	--	0.2	2.4
Ethylbenzene	--	--	--	--	29,000	29000	29000	130	6,823	--	--	2,783	--	0.2	130
Toluene	--	--	--	--	200,000	200000	200000	520	18,855	--	--	15,584	--	0.2	520
Xylenes	--	--	--	--	--	--	--	--	--	--	--	310	--	0.2	310
Fuel-Related Volatile Organic Compounds (VOCs; µg/L)															
1,2-Dichloroethane (EDC)	--	--	--	99	99	99	99	650	59.35	--	4.20	139.8	--	0.2	4.20
1,2-Dibromoethane (EDB)	--	--	--	--	--	--	--	--	--	--	0.28	276.8	--	0.2	0.3
Methyl t-Butyl Ether (MTBE)	--	--	--	--	--	--	--	--	--	--	610.0	87,003	--	0.5	610
n-Hexane	--	--	--	--	--	--	--	--	--	--	--	7.8000	--	0.2	7.8

Notes:

¹ Water quality criteria for protection of aquatic life from WAC 173-201A-240 (Water Quality Standards for Surface Waters of the State of Washington).

² Ambient water quality criteria (AWQC) for protection of human health from 40 CFR Part 131d (National Toxics Rule).

³ National Recommended Water Quality Criteria (<http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm>; accessed March 2016).

⁴ The values presented are the lowest of the MTCA Method B carcinogenic and non-carcinogenic criteria for surface water. The carcinogenic and non-carcinogenic criteria for surface water are adjusted for cases when a state or federal surface water standard is available, but is not considered to be "sufficiently protective" under MTCA (that is, the standard is based on a hazard quotient greater than 1 or a cancer risk greater than 1 x 10-5). For these cases, WAC 173-340-720(7)(b) and -730(5)(b) allows the standard to be adjusted downward to a hazard quotient of 1 or a cancer risk of 1 x 10-5.

⁵ For ionizing organics, C_w (µg/L) = (C_{sed} (mg/kg OC) / K_{oc} (L/kg OC)) x 1000 µg/mg; for non-ionizing organics, C_w (mg/L) = (C_{sed} (mg/kg) / K_d (L/kg)*foc) x 1000 µg/kg (assumes foc of 2%) and for metals, C_w (mg/L) = (C_{sed} (mg/kg) / K_d (L/kg)) x 1000 µg/kg.

⁶ Metals background values (Puget Sound Region 90th percentile values) are from *Natural Background Soil Metals Concentrations in Washington State* (Ecology Publication #94-115, 1994), with the exception of arsenic which is referenced from MTCA Table 745-1 (WAC 173-340-900).

⁷ Lowest available PQL value from Analytical Resources Inc. (ARI) of Tukwila, Washington.

⁸ Trivalent chromium (chromium III) is assumed where no value is available for total chromium.

⁹ MTCA Method A groundwater cleanup level; MTCA Method B surface water cleanup level is not available for total petroleum hydrocarbons.

¹⁰ The screening level for gasoline-range petroleum hydrocarbons is 800 µg/L if benzene is present and 1,000 µg/L if not present.

MTCA = Washington State Model Toxics Control Act

ng/L = Nanogram per liter

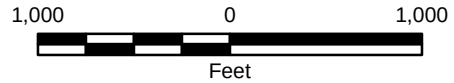
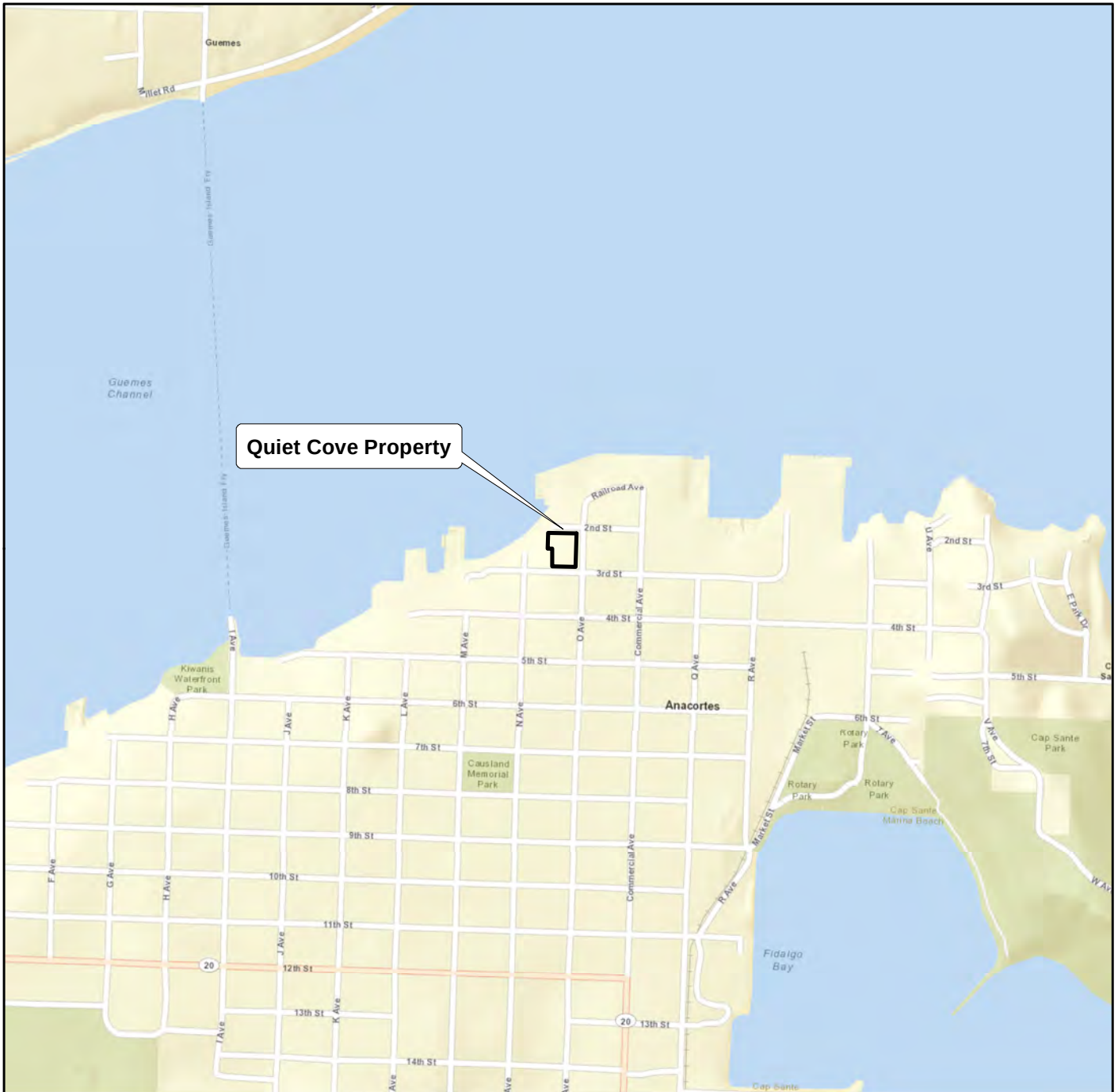
µg/L = Microgram per liter

PQL = Practical quantitation limit

Analyte	Criteria for Protection of Aquatic Organisms and Human Health									Groundwater Screening Level Protective of Sediment ⁵	MTCA Method B Groundwater Screening Level for Protection of Vapor Intrusion		Modifying Factor		Groundwater Screening Level (Adjusted for Natural Background and PQL)
	Marine Surface Water Quality Criteria ¹		National Toxics Rule ²		Clean Water Act ³			MTCA Method B Surface Water Cleanup Level ⁴	Natural Background ⁶				Practical Quantitation Limit (PQL) ⁷		
			Protection of Marine Aquatic Life		AWQC for Protection of Human Health	Protection of Marine Aquatic Life					AWQC for Protection of Human Health				
	Acute	Chronic	Acute	Chronic		Acute	Chronic					Chronic			

-- = No screening criteria available.

TEQ = Toxic equivalent concentration (toxicity equivalency factor (TEF) values are presented in Table 5).



Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
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Data Sources: ESRI Data & Maps, Street Data 2013.

Transverse Mercator, Zone 10 N North, North American Datum 1983
North arrow oriented to grid north

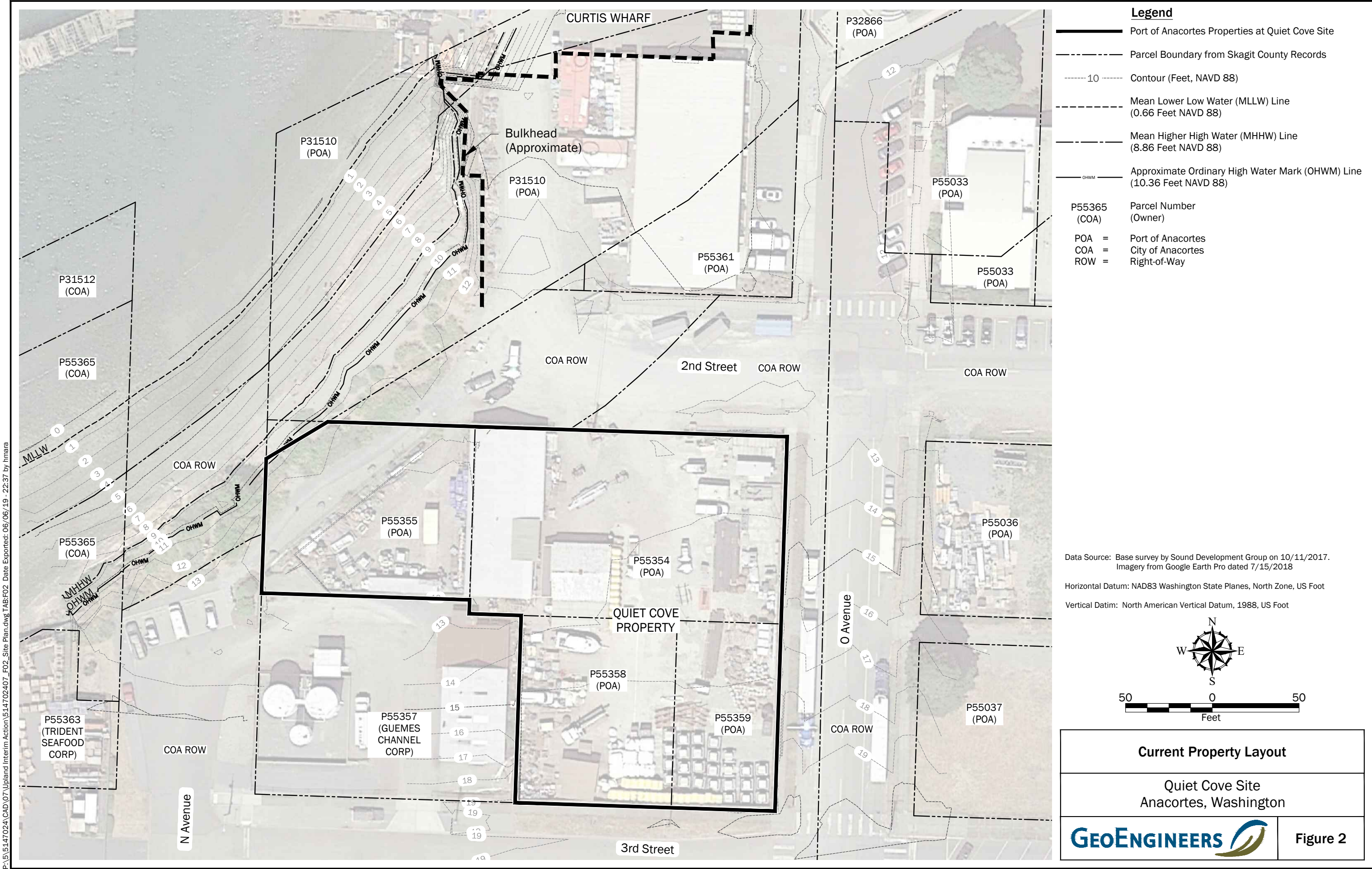
Vicinity Map

Quiet Cove Property
Anacortes, Washington

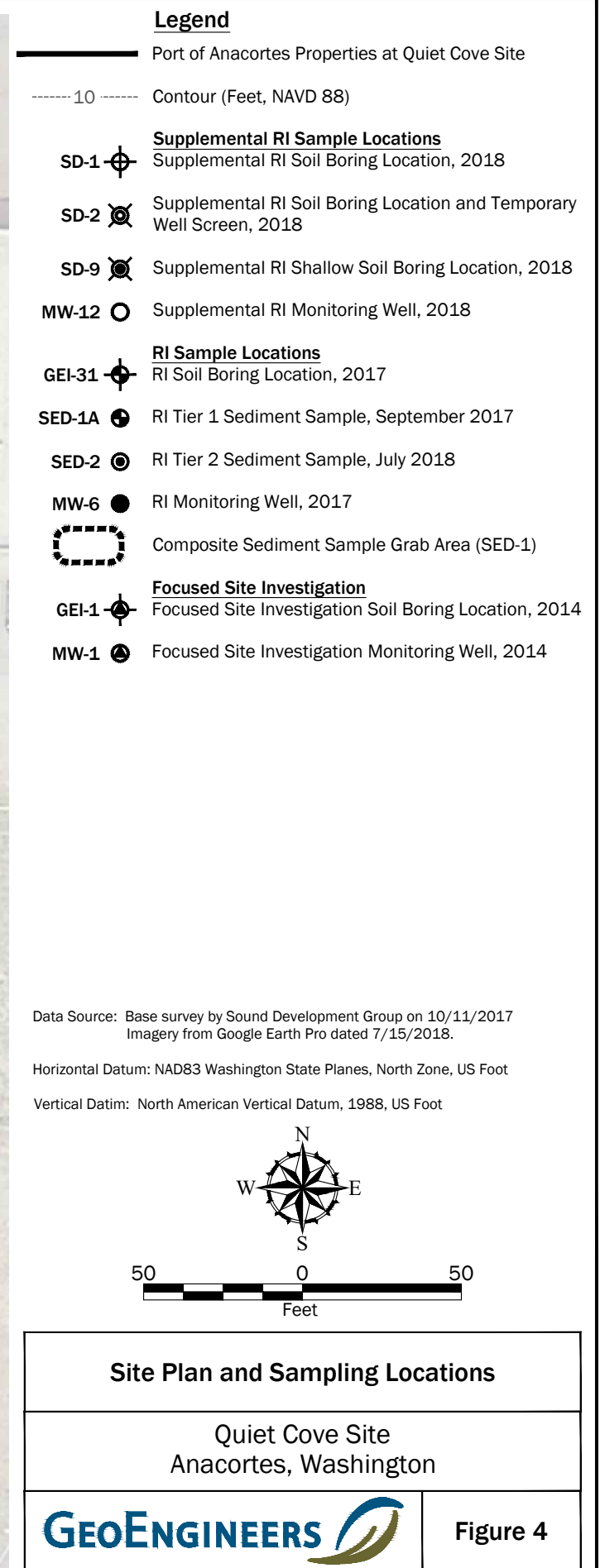
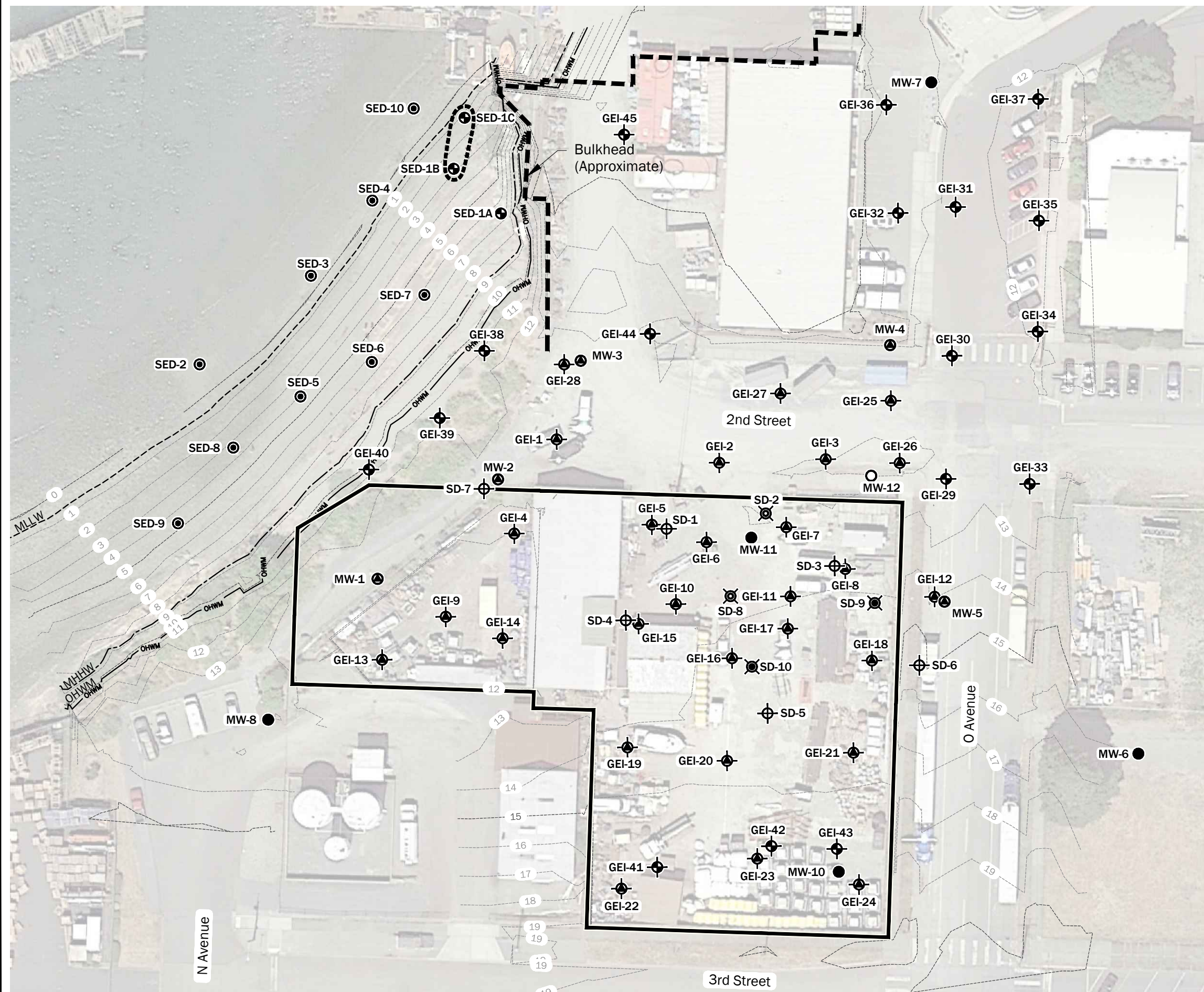


Figure 1

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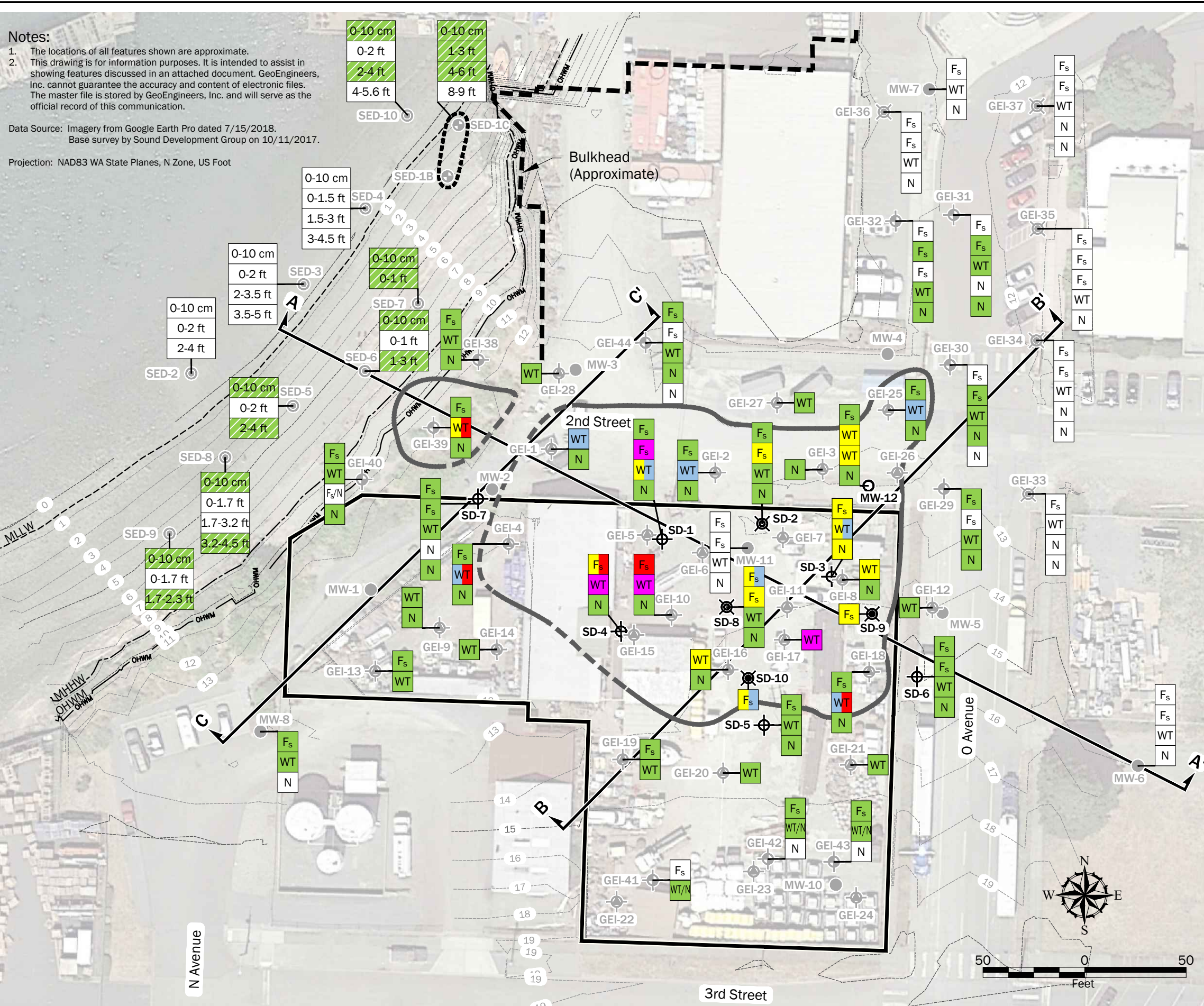
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Notes:
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Data Source: Imagery from Google Earth Pro dated 7/15/2018.
Base survey by Sound Development Group on 10/11/2017.

Projection: NAD83 WA State Planes, N Zone, US Foot



Legend

Port of Anacortes Properties at Quiet Cove Site

Supplemental Data Sample Locations

- SD-1: Supplemental Data Soil Boring Location
- SD-2: Supplemental Data Soil Boring Location and Temporary Well Screen
- SD-9: Supplemental Data Shallow Soil Boring Location
- MW-12: Supplemental Data Monitoring Well

Previous Sample Locations

- GEI-31: RI Soil Boring Location, 2017
- SED-1A: Tier 1 Sediment Sample, September 2017
- GEI-1: Integrated Planning Grant Soil Boring Location, 2014
- MW-10: Monitoring Well

Composite Sediment Sample Grab Area (SED-1)

Contour (Feet, NAVD 88)

Approximate Extent of Contaminated Soil (Defined by Existing Data)

Approximate Extent of Contaminated Soil (Inferred from Existing Data)

Cross-Section Location

Soil Sample Result

Exceedance of Preliminary Screening Level for:

- Gasoline-Range TPH
- Diesel-Range TPH
- Heavy-Oil-Range TPH
- Gas, Diesel and Heavy-Oil TPH
- Gas+Diesel TPH
- Gas+Heavy-Oil TPH
- Diesel+Heavy Oil TPH
- No Exceedance for TPH
- Sample Not Analyzed, Archived

Soil Site Stratigraphy

- F_s: Surface Fill
- WT: Water Table
- N: Native

Sediment Sample Results

- 0-10 cm
- 1-3 ft
- 4-6 ft
- 8-9 ft
- SED-1 Sample Interval Depth (bml)
- No Exceedance
- Human Health Exceedance
- Benthic and Human Health Exceedance
- Sample Not Analyzed, Archived

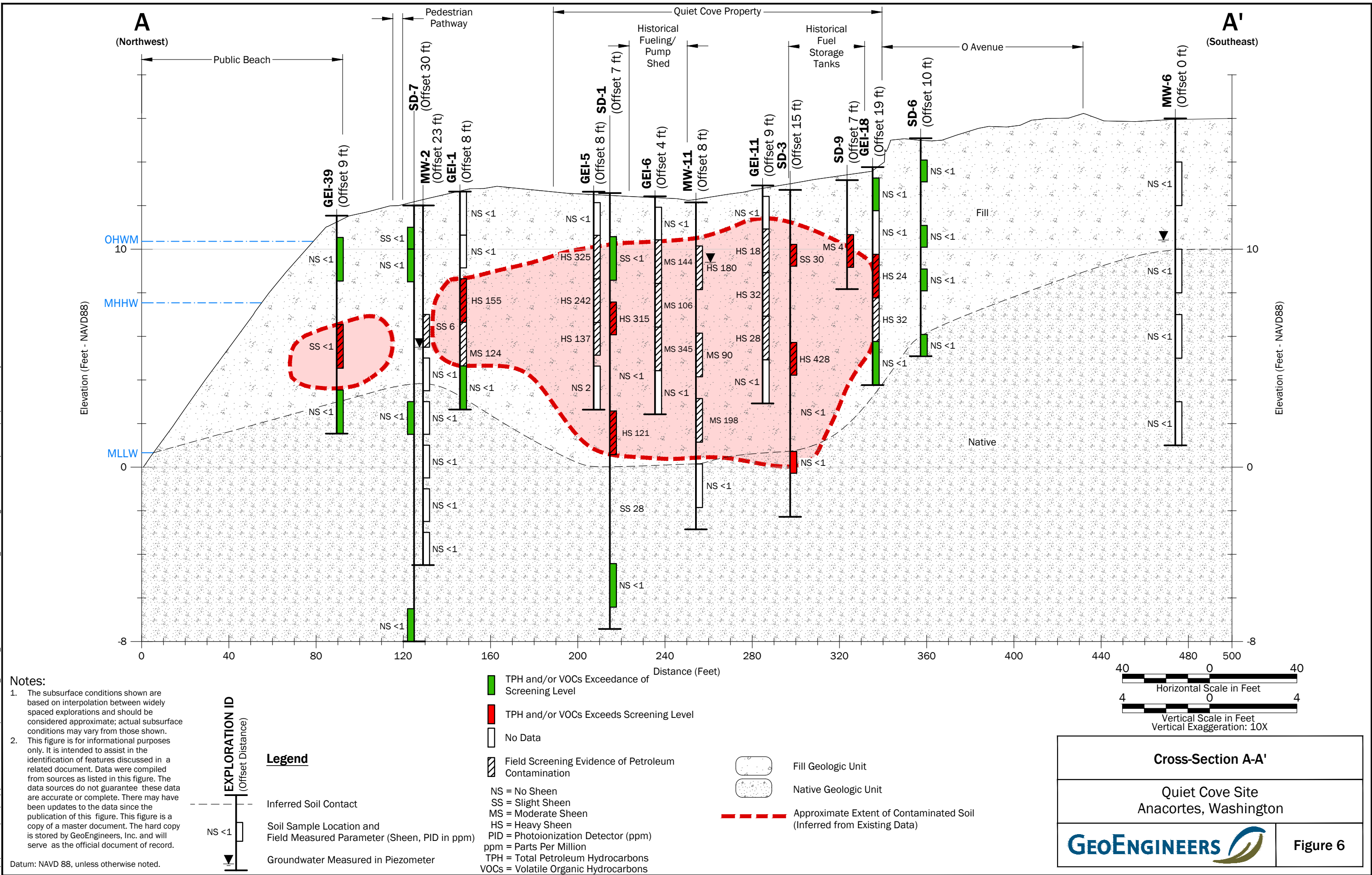
Approximate Extent of Petroleum Contamination in Soil

Quiet Cove Site
Anacortes, Washington

GEOENGINEERS

Figure 5

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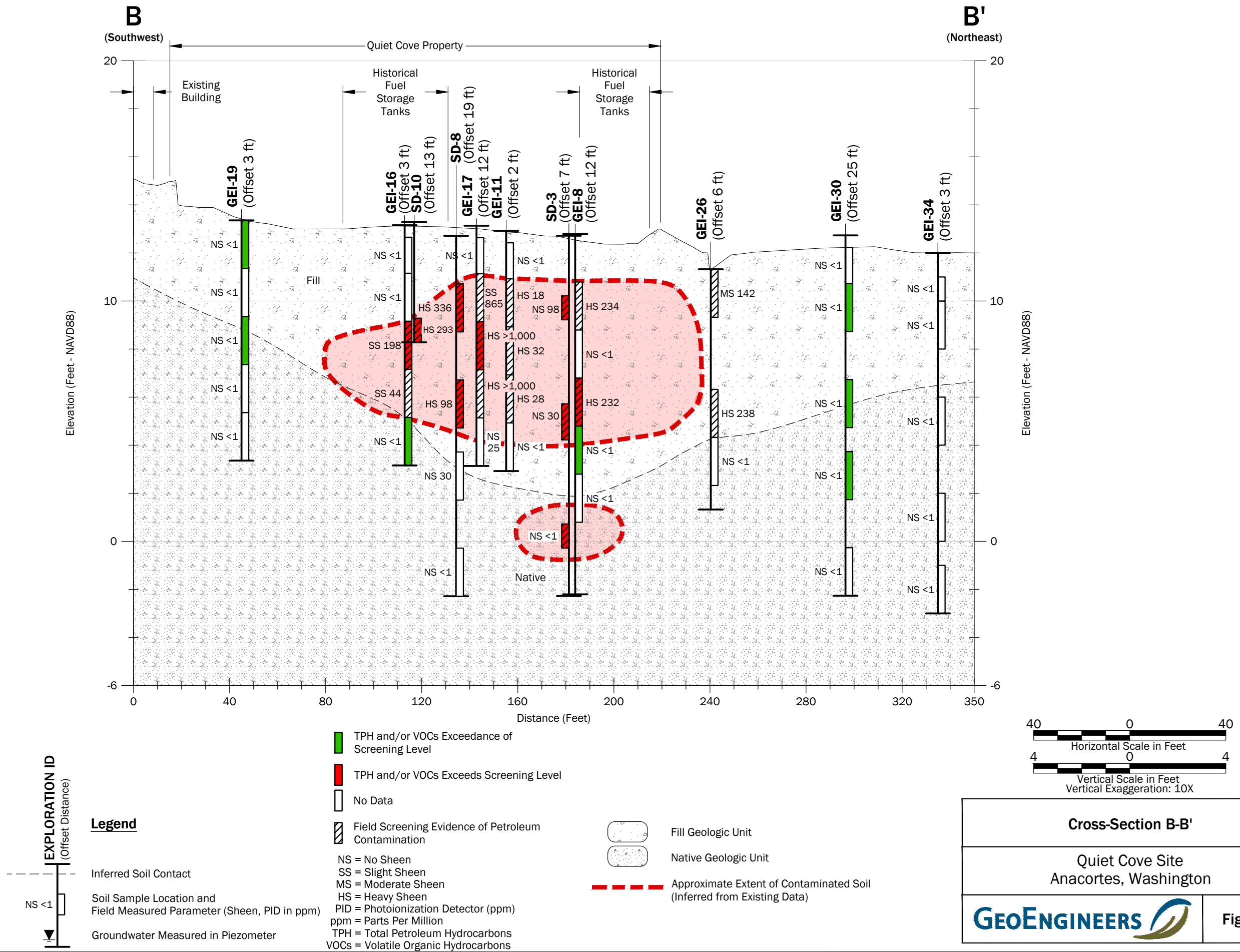


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Notes:

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
2. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Datum: NAVD 88, unless otherwise noted.



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Notes:

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
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Datum: NAVD 88, unless otherwise noted.



Legend

Inferred Soil Contact

Soil Sample Location and
Field Measured Parameter (Sheen, PID in ppm)

Groundwater Measured in Piezometer

- TPH and/or VOCs Exceedance of Screening Level
- TPH and/or VOCs Exceeds Screening Level
- No Data
- Field Screening Evidence of Petroleum Contamination
- NS = No Sheen
- SS = Slight Sheen
- MS = Moderate Sheen
- HS = Heavy Sheen
- PID = Photoionization Detector (ppm)
- ppm = Parts Per Million
- TPH = Total Petroleum Hydrocarbons
- VOCs = Volatile Organic Hydrocarbons



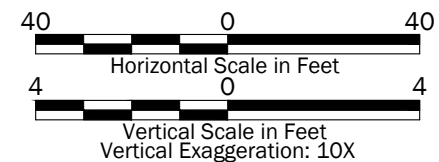
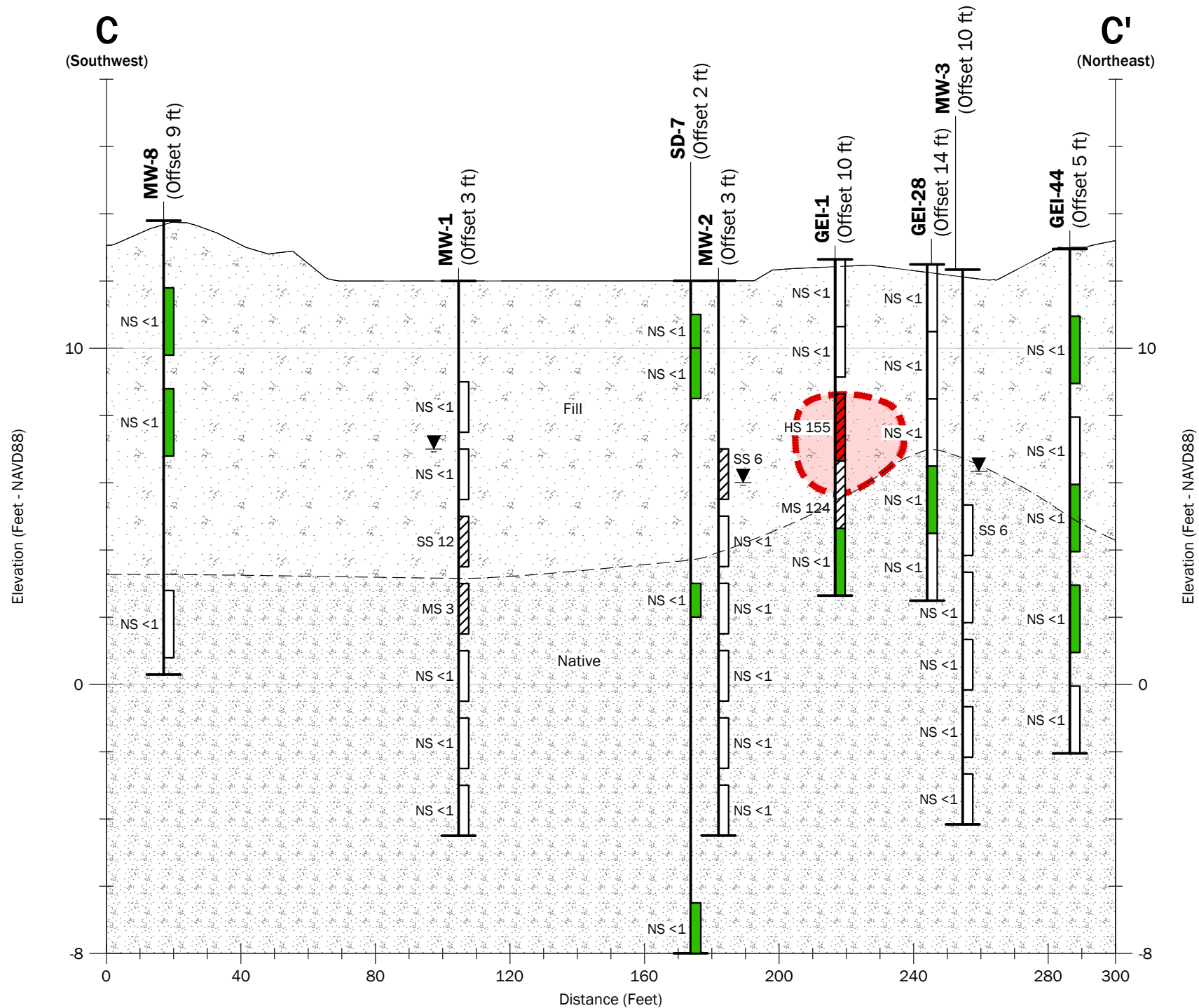
Fill Geologic Unit



Native Geologic Unit



Approximate Extent of Contaminated Soil
(Inferred from Existing Data)



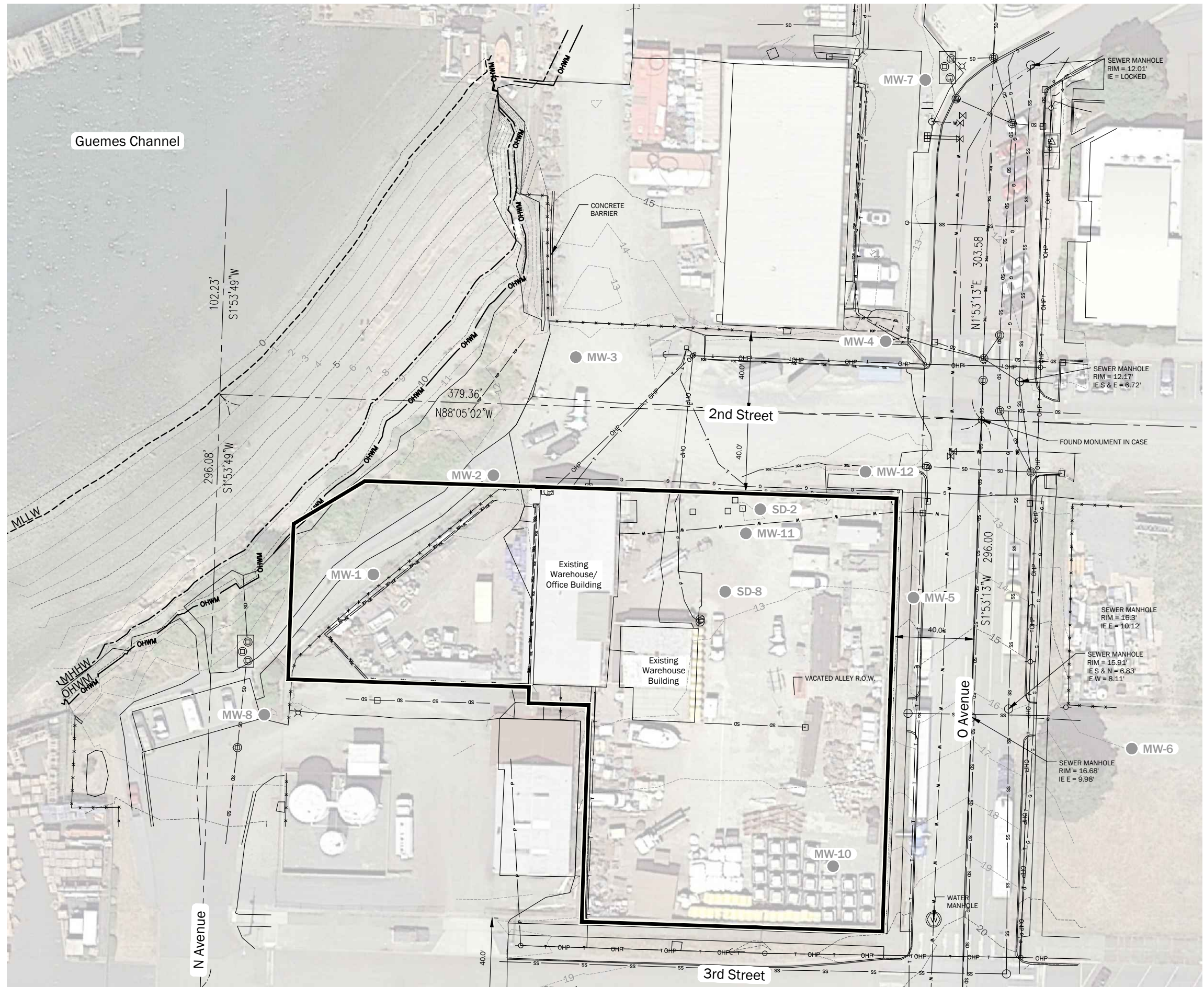
Cross-Section C-C'

Quiet Cove Site
Anacortes, Washington



Figure 8

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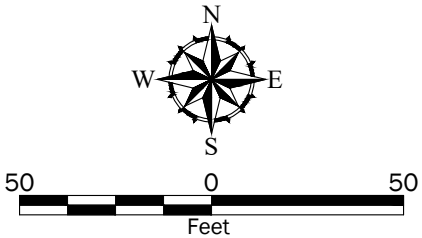
Legend

- Port of Anacortes Properties at Quiet Cove Site
- MW-11 ● Existing Monitoring Well
- Existing Right of Way Line
- Asbuilt Road Centerline
- Existing Road Centerline
- Existing Property Line
- Existing Property Corner
- SD --- Existing Storm Drain
- ⊕ Existing Type 2 CB
- Existing Type 1 CB
- SS --- Existing Sanitary Sewer
- Existing Sanitary Manhole
- W --- Existing Waterline
- ⊗ Existing Water Valve
- ⊕ Existing Fire Hydrant
- G --- Existing Gas Line
- P --- Existing Powerline
- OHP --- Existing Overhead Power
- T --- Existing Telephone
- Existing Fenceline
- Existing Edge of Asphalt
- Existing Curb & Gutter
- 29 --- Existing Contour
- ◇ Pile [typ.]

Data Source: Base on survey file by Sound Development Group dated 05/07/2019.
Imagery from Google Earth Pro dated 7/15/2018.

Horizontal Datum: NAD83 Washington State Planes, North Zone, US Foot

Vertical Datum: North American Vertical Datum, 1988, US Foot



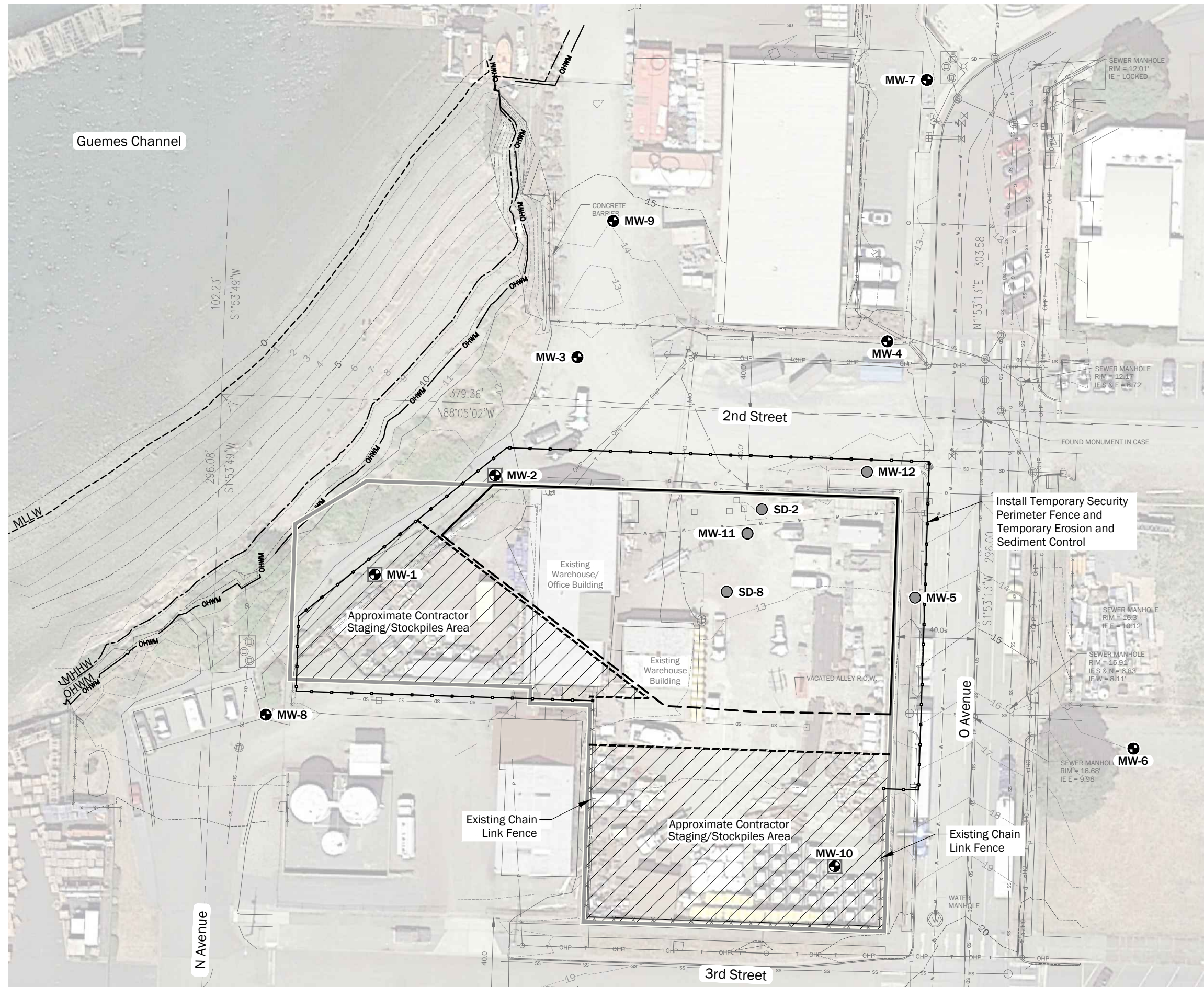
Existing Site Conditions

Quiet Cove Site
Anacortes, Washington



Figure 9

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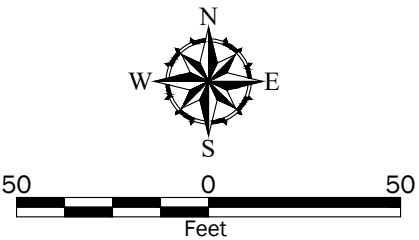
Legend

- Port of Anacortes Properties at Quiet Cove Site
- MW-1 Existing Monitoring Well to be Protected
- MW-2 Existing Monitoring Well to be Protected to the Extent Possible
- MW-12 Existing Monitoring Well to be Decommissioned if within Excavation Area
- Approximate Contractor Staging/Stockpile Area
- Temporary Security Fence
- Estimated Limits of Excavation Sidewall
- Final Limits of Excavation Sidewall

Data Source: Base on survey file by Sound Development Group dated 05/07/2019.
Imagery from Google Earth Pro dated 7/15/2018.

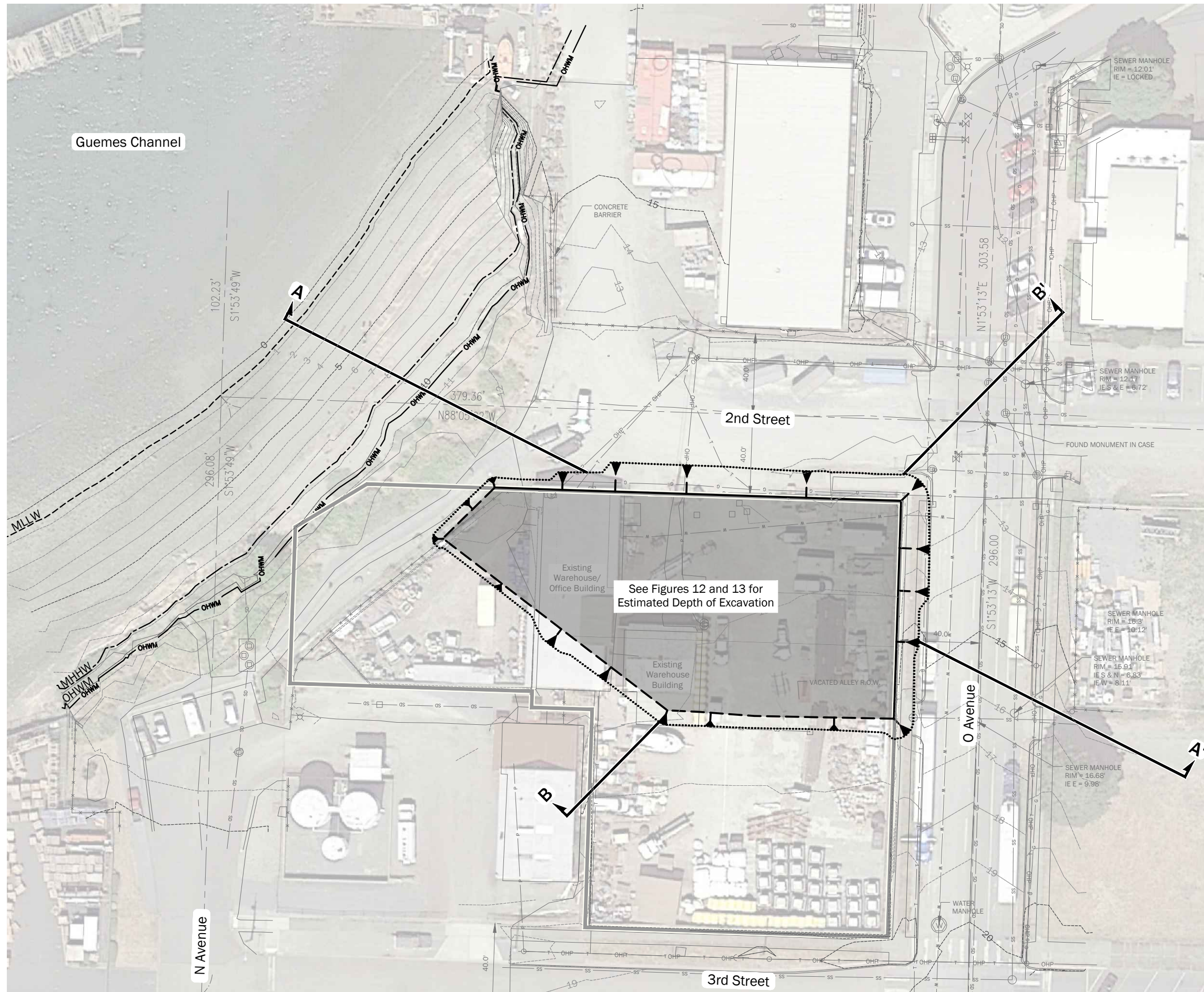
Horizontal Datum: NAD83 Washington State Planes, North Zone, US Foot

Vertical Datum: North American Vertical Datum, 1988, US Foot



Temporary Site Controls and Contractor Staging Plan	
Quiet Cove Property Anacortes, Washington	
GEOENGINEERS	Figure 10

P:\5147024\CAD\07 Upland Interim Action\514702407_F11 Remedial Excavation Plan.dwg TAB:F11 Date Exported: 06/06/19 - 22:45 by hmara



Legend

- Port of Anacortes Properties at Quiet Cove Site
- Estimated Excavation Base¹
- Estimated Limits of Excavation Sidewall²
- Final Limits of Excavation Sidewall
- Sloped Excavation Sidewall³
- A A' Cross Section Location

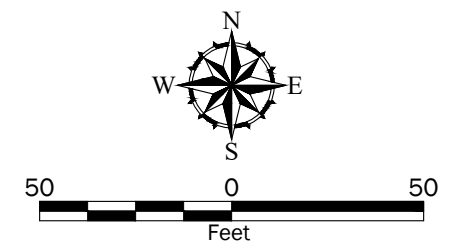
Notes:

- Preliminary depths to excavation base are shown in figures 12 and 13. Final depths will be determined by verification soil sampling analysis.
- Final limits of excavation sidewall will be determined by verification soil sampling analysis.
- Sloped excavation sidewalls are shown at 1H:1V. The contractor will be responsible for determining stable side slopes to complete excavation.

Data Source: Base on survey file by Sound Development Group dated 05/07/2019.
Imagery from Google Earth Pro dated 7/15/2018.

Horizontal Datum: NAD83 Washington State Planes, North Zone, US Foot

Vertical Datum: North American Vertical Datum, 1988, US Foot



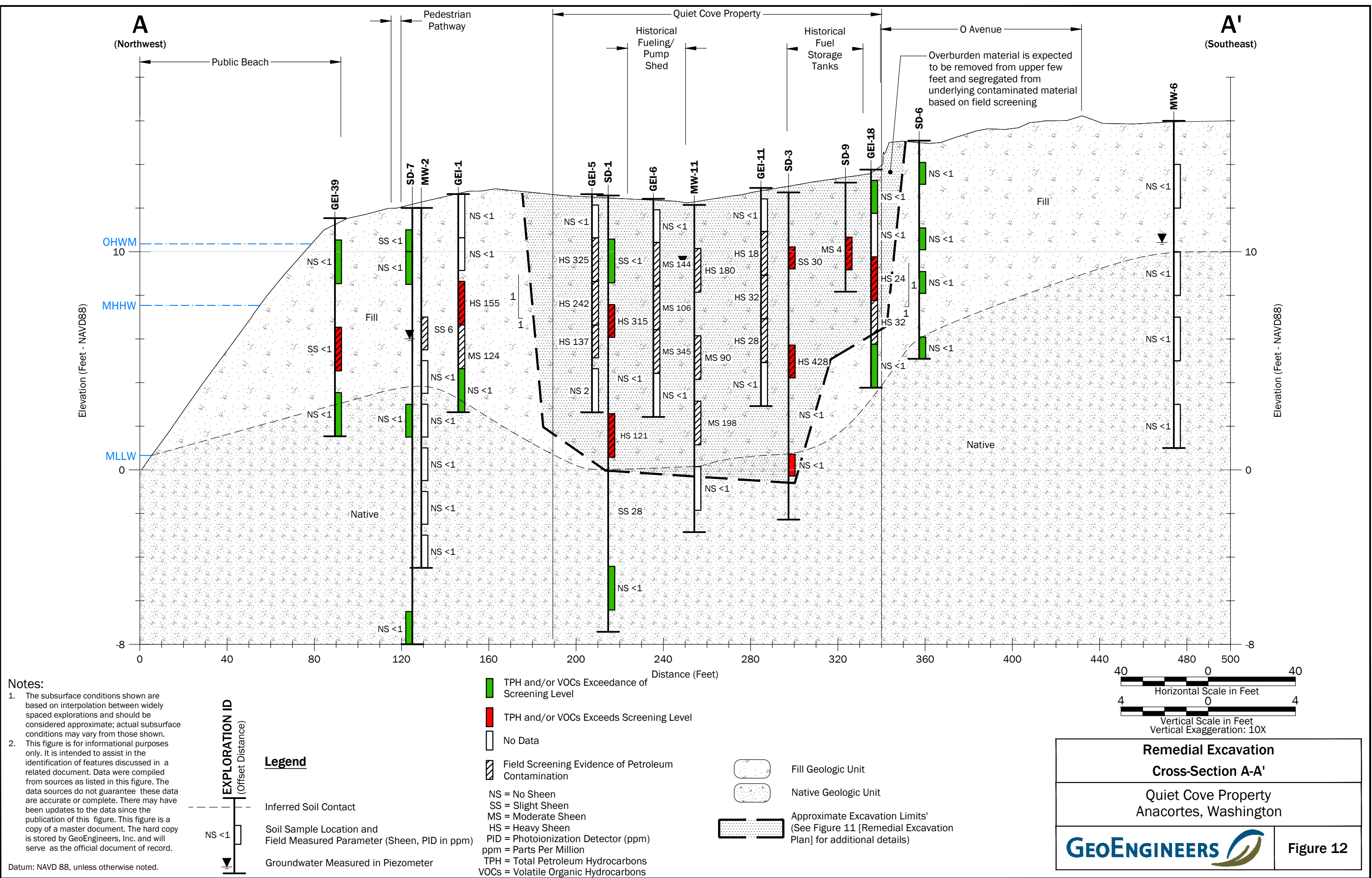
Remedial Excavation Plan

Quiet Cove Property
Anacortes, Washington

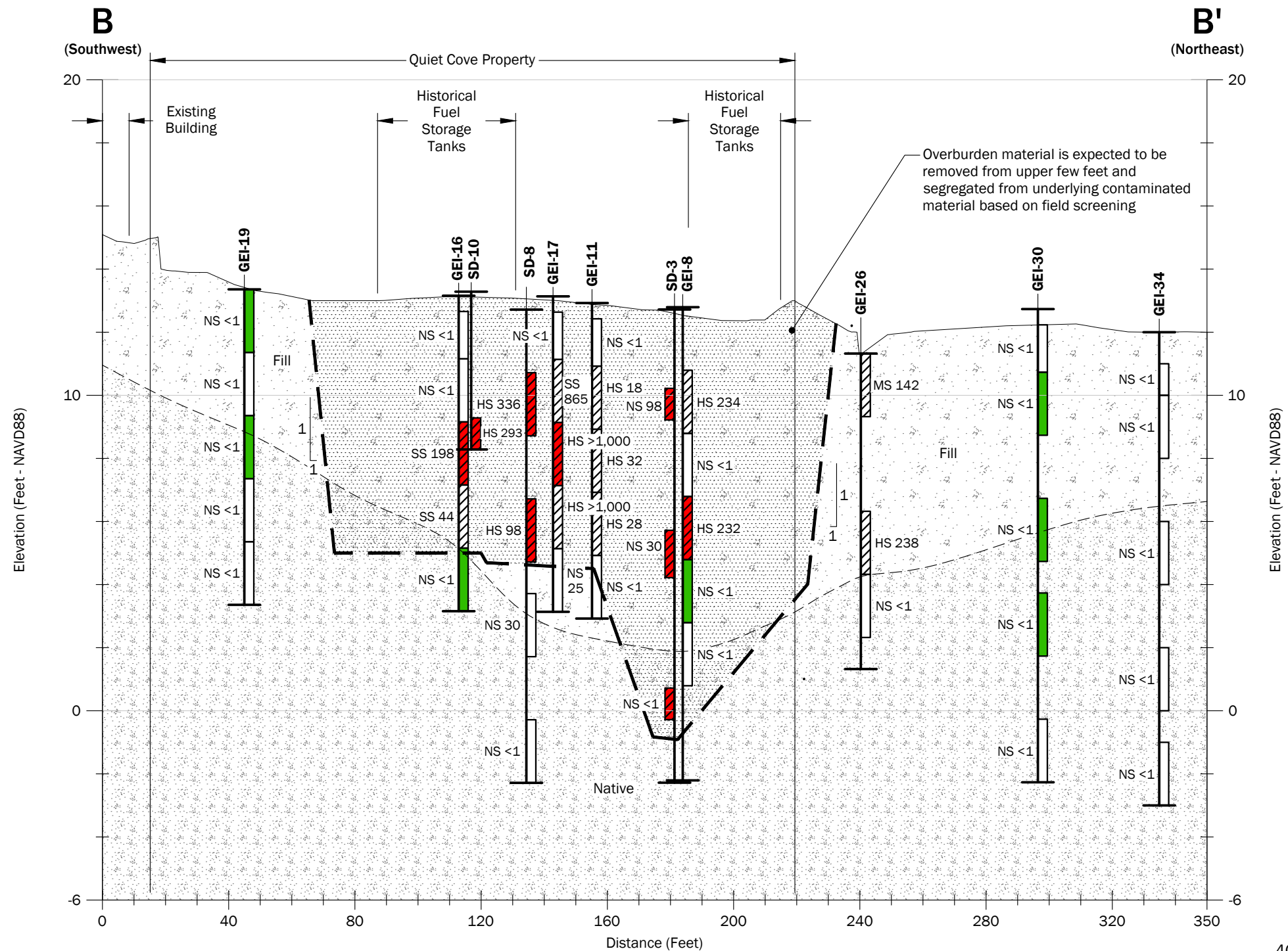


Figure 11

P:\5147024\CAD\07\Upland Interim Action\514702407_F12-13_Extent of TPH Contamination_Sections.dwg TAB:AA Date Exported: 06/06/19 - 22:46 by hmara



\\geoengineers.com\WAN\Projects\5147024\CAD\07 Upland Interim Action\514702407_F12-13_Extent of TPH Contamination_Sections.dwg TAB:BB Date Exported: 05/24/19 - 14:15 by mwwoods



Notes:

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
2. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Datum: NAVD 88, unless otherwise noted.

EXPLORATION ID
(Offset Distance)

Legend

Inferred Soil Contact

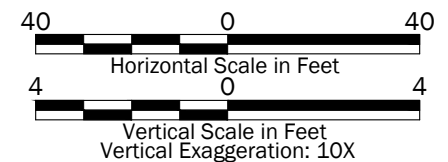
Soil Sample Location and
Field Measured Parameter (Sheen, PID in ppm)

Groundwater Measured in Piezometer

TPH and/or VOCs Exceedance of
Screening Level
TPH and/or VOCs Exceeds Screening Level
No Data
Field Screening Evidence of Petroleum
Contamination
NS = No Sheen
SS = Slight Sheen
MS = Moderate Sheen
HS = Heavy Sheen
PID = Photoionization Detector (ppm)
ppm = Parts Per Million
TPH = Total Petroleum Hydrocarbons
VOCs = Volatile Organic Hydrocarbons

Fill Geologic Unit
Native Geologic Unit

Approximate Excavation Limits'
(See Figure 11 [Remedial Excavation
Plan] for additional details)



Remedial Excavation Cross-Section B-B'

Quiet Cove Property
Anacortes, Washington

GEOENGINEERS

Figure 13

APPENDIX F

Compliance Monitoring and Quality Assurance Project Plan

**Compliance Monitoring and Quality
Assurance Project Plan (CMP/QAPP)**

Quiet Cove Site
Anacortes, Washington
Ecology Agreed Order No. DE 11346

for

**Washington State Department of Ecology
on Behalf of Port of Anacortes**

August 19, 2019



GEOENGINEERS 
Earth Science + Technology

**Compliance Monitoring and Quality
Assurance Project Plan (CMP/QAPP)**

Quiet Cove Site
Anacortes, Washington
Ecology Agreed Order No. DE 11346

for

**Washington State Department of Ecology
on Behalf of Port of Anacortes**

August 19, 2019



**Compliance Monitoring and Quality
Assurance Project Plan (CMP/QAPP)**

**Quiet Cove Site
Anacortes, Washington
Ecology Agreed Order No. DE 11346**

File No. 5147-024-07

August 19, 2019

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym/ Abbreviation	Description
ARI	Analytical Resources, Inc.
ASTM	ASTM International
bgs	below ground surface
COC	chain-of-custody
cPAH	carcinogenic polycyclic aromatic hydrocarbons
DQO	data quality objective
Ecology	Washington State Department of Ecology
EDD	electronic data deliverable
EIM	Environmental Information Management system
EPA	United States Environmental Protection Agency
FS	feasibility study
GeoEngineers	GeoEngineers, Inc.
GPS	global positioning system
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
KM	Kaplan-Meier
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
MDL	method detection limit
mg/kg	milligrams per kilogram
MLLW	mean lower low water
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
MTCA	Model Toxics Control Act
NAD	North American Datum
NTU	nephelometric turbidity unit
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon

PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PID	photoionization detector
Port	Port of Anacortes
PPE	personal protective equipment
ppm	part per million
%D	percent difference
%R	percent recovery
PQL	practical quantitation limit
QA	quality assurance
QC	quality control
RI	remedial investigation
RL	reporting limit
RPD	relative percent difference
Site	Quiet Cove Site
SOP	standard operating procedure
SVOC	semi-volatile organic compound
TEF	toxicity equivalency factor
TEQ	toxicity equivalent (refers to concentration basis)
TRL	target reporting limit
VOC	volatile organic compound
VPC	volatile petroleum compound
WAC	Washington Administrative Code

1.0 INTRODUCTION

This Compliance Monitoring and Quality Assurance Project Plan (CMP/QAPP) is prepared as an appendix to the Interim Action Work Plan (IAWP) for the Quiet Cove Site (Site). The Site is situated along the southeast shoreline of Guemes Channel at 202 O Avenue (at the intersection of 2nd Street and O Avenue) in Anacortes, Washington. The Interim Action is being implemented by the Port of Anacortes (Port) under the regulatory oversight by Department of Ecology (Ecology) and includes remedial excavation and permitted off-site disposal of Site contamination present within the properties owned by the Port. A summary of site conditions including background, history and nature/extent of contamination, and detailed description of planned Interim Action activities are presented in the IAWP. This plan describes compliance monitoring activities and presents quality assurance (QA) and quality control (QC) requirements applicable to Interim Action activities.

The CMP portions of this document were prepared in accordance with Washington Administrative Code (WAC) 173-340-410 (compliance monitoring requirements of Ecology) to describe the protection, performance and confirmation monitoring that will be completed for the Interim Action.

The QAPP portions of this document were prepared following the Ecology's Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies (Ecology, 2004), United States Environmental Protection Agency (EPA) Requirements for Quality Assurance Project Plans (EPA 2001), Guidance for Quality Assurance Project Plans (EPA, 2002), and EPA's National Functional Guidelines for Inorganic and Organic Superfund Methods Data Review (EPA 2017a and 2017b). This CMP/QAPP presents the objectives, procedures, organization, functions, activities, and specific quality assurance/quality control (QA/QC) activities designed to achieve the data quality objectives (DQOs) established for the project. Environmental measurements will be taken to produce data that are scientifically valid, of known and acceptable quality, and meet established objectives. QA/QC procedures will be implemented so that the precision, accuracy, representativeness, completeness, and comparability (PARCC) of the data generated meet the specified DQOs to the maximum extent possible.

2.0 COMPLIANCE MONITORING

2.1. Protection Monitoring

Protection monitoring will be completed to confirm that human health and the environment are adequately protected during Interim Action construction.

2.1.1. Worker Health and Safety

Interim Action construction activities will be performed in accordance with the requirements of the Washington Industrial Safety and Health Act (RCW 49.17) and the Federal Occupational Safety and Health Act (29 CFR 1910, 1926). These regulations include requirements that workers are to be protected from exposure to contaminants. A site-specific Health and Safety Plan (HASP) is included as an appendix to the IAWP and addresses protection monitoring requirement for GeoEngineers' personnel. The Port's construction contractor (contractor) will be required to prepare and submit a separate HASP for use by the contractor's personnel.

2.1.2. Environmental Protection

Environmental protection measures consisting of Best Management Practices (BMPs) for stormwater, sediment, drainage, and erosion control; dust and noise control; spill prevention and pollution control; and all other controls needed to protect environmental quality will be implemented. Environmental protection measures including installation, inspection and maintenance necessary for stormwater management, control of surface water runoff, and temporary erosion and sediment control measures will be described by the Contractor prior to commencing construction activities. The minimum standards for environmental protection measures that will be implemented are described in the IAWP. If the Port or Ecology determines that the contractor's environmental protection measures are inadequate to meet the intent of applicable regulations, the contractor will be required to implement additional stormwater runoff, erosion control, or spill prevention and control measures to address the deficiencies.

2.2. Performance Monitoring

Performance monitoring will be conducted to verify that the Interim Action achieves soil remediation levels and/or to document contaminant concentrations that will be left in place. As described in the IAWP, the Interim Action is being implemented to remove the source of Site contamination and cleanup Port owned properties, and therefore any contamination observed at the property boundaries will be left in place and documented so that it can be addressed as part of the final cleanup action for the Site. Performance monitoring activities will include verification soil sampling and analysis as described below.

2.2.1. Verification Soil Sampling and Analysis

Soil verification samples will be collected by GeoEngineers field personnel from the base and/or sidewalls of the remedial excavation as described in the IAWP. Soil samples from the base of the excavation will be collected at a frequency of one sample per 400 square feet. If the area of the base is less than 400 square feet, a minimum of one base sample will be obtained. Sidewall samples will be collected at a frequency of one sample per 20 linear feet of sidewall along the perimeter of the excavation. Sidewall samples will be collected at a depth where field screening evidence of contamination is the highest. If the sidewall does not have field screening evidence of contamination, the sidewall will be collected immediately above the water table (saturated zone). Field personnel will take photos of the sidewall and base soil sample locations to document visual field screening conditions. One duplicate soil sample will be collected per every 20 parent soil samples collected from excavation limits for QA/QC purposes.

Soil samples will be collected by GeoEngineers' field personnel using a clean pair of nitrile gloves and placed in clean laboratory provided containers for chemical analysis. Reusable sampling equipment (if used) will be decontaminated prior to sample collection at each location. Each sample container will be securely capped, labeled, and placed in a cooler with ice immediately upon collection. Samples for volatile analyses (NWT PH-Gx and EPA Method 8260) will be collected as discrete samples at a minimum of 6 inches below the surface of the base or sidewall in accordance with EPA 5035A sampling methods. Samples for non-volatile analysis will be collected from a minimum of 6 inches below the surface and homogenized in a stainless-steel bowl. The field representative will visually classify the soils in accordance with ASTM International (ASTM) Method D 2488 (Standard Practice for Description and Identification of Soils [Visual Manual Procedure]) and record soil descriptions and other relevant field screening details (e.g., staining, debris, odors, etc.) in the field log. Field screening, decontamination, sample container, labeling, and handling procedures are described in Section 5.

Chemical analysis will be performed at an Ecology accredited laboratory—Analytical Resources, Inc. (ARI) of Tukwila, Washington. Chain-of-custody forms will be used to document the transfer of samples during transport and submittal of samples to the laboratory. The following analysis will be performed on each verification soil samples:

- Gasoline-range petroleum hydrocarbons by Ecology Method NWTPH-Gx;
- Diesel- and heavy oil-range petroleum hydrocarbons by Ecology Method NWTPH-Dx;
- Volatile Organic Compounds (VOCs) including benzene, ethylbenzene, toluene and xylenes (BETX), n-hexane, Methyl tert-butyl ether (MTBE), Ethylene Dibromide (EDB) and Ethylene Dichloride (EDC) by EPA Method 8260;
- Polycyclic Aromatic Hydrocarbons (PAHs) by EPA Method 8270D/SIM; and
- Metals including arsenic, cadmium, chromium, lead and mercury by EPA Method 6000/7000 series.

Table 1 summarizes the analytical methods, sample size, containers, preservation and holding times for above mentioned laboratory analysis. Sufficient volume will be collected for each sample to perform each of the listed analysis. Verification soil samples collected to document contaminant conditions that will be left in place will be analyzed at a standard (7 to 10 days) turn-around-time (TAT). Verification soil samples collected to verify compliance with remediation levels will be analyzed at expedited TAT (2 days) to support decision making in the field concerning any additional excavation that may be required to achieve remediation levels. The result of verification soil samples will be compared to soil remediation levels presented in the IAWP. Data validation will be completed as described in Section 6. The results will be submitted to Ecology's Environmental Information Management (EIM) database following data validation.

2.3. Confirmational (Post-Construction) Monitoring

Confirmational monitoring will be performed after Interim Action remedial excavation and restoration activities completed to evaluate changes in groundwater conditions as a result of the removal of source material/contamination from within Port owned properties. Groundwater monitoring will be performed on a quarterly basis for of four consecutive quarters following the Interim Action. Additional monitoring may be performed following the completion of four quarters based on the results and requirements of Ecology. Groundwater monitoring results will be used in conjunction with other existing data (Data Report; an appendix of IAWP) as part of the Remedial Investigation/Feasibility Study (RI/FS) to evaluate the final cleanup plan for the Site.

Groundwater monitoring activities will be completed at wells located along the shoreline and/or downgradient of the Interim Action area. Currently, it is expected that up to 7 existing/newly installed monitoring wells including MW-1 through MW-4, MW-8, MW-9 and MW-13 will be monitored. The exact number and location of the wells that will be monitored will be determined in consultation with Ecology following the completion of remedial excavation. IAWP identifies existing wells that are planned to be decommissioned and reinstalled and new monitoring wells that are planned to be installed as part of the Interim Action. Groundwater monitoring will include water level measurements and groundwater sampling and analysis as described below.

2.3.1. Water Level Measurements

Water level measurements will be obtained at each monitoring well prior to purging and sample collection. All water levels will be measured using an electronic water level indicator and will be recorded to the nearest 0.01 foot. Measurements will be taken from the top of the well casing.

2.3.2. Groundwater Sampling and Analysis

Groundwater samples will be obtained by GeoEngineers field personnel using low-flow/low-turbidity sampling techniques to minimize the suspension of sediment in the samples. The wells will be purged and groundwater samples will be obtained from the wells using a peristaltic or submersible pump and disposable polyethylene tubing. Groundwater will be purged from the wells at a rate of approximately 0.5 liters per minute. A water quality measuring system (YSI Pro or similar) with a flow-through cell will be used to monitor the following water quality parameters during purging. Water quality parameter monitored will include:

- Electrical conductivity (EC);
- Dissolved oxygen (DO);
- Acidity (pH);
- Salinity;
- Total dissolved solids (TDS);
- Turbidity;
- Oxidation-reduction potential (ORP); and
- Temperature.

Samples will be collected from the wells after these parameters vary by less than 10 percent on three consecutive measurements. The stabilized field measurements will be documented in the field log. Following well purging, the flow-through cell will be disconnected and groundwater samples will be collected in laboratory-prepared containers. Both field-filtered and unfiltered samples for metals analysis will be collected. Reusable sampling equipment (if used) will be decontaminated prior to sample collection at each location. One duplicate soil sample will be collected per monitoring event for QA/QC purposes. Each sample container will be securely capped, labeled, and placed in a cooler with ice immediately upon collection. Decontamination, sample container, labeling, and handling procedures are described in Section 5.

Chemical analysis will be performed at an Ecology accredited laboratory – ARI. Chain-of-custody forms will be used to document the transfer of samples during transport and submittal of samples to the laboratory. The following analysis will be performed on each groundwater sample:

- Gasoline-range petroleum hydrocarbons by Ecology Method NWTPH-Gx;
- Diesel- and heavy oil-range petroleum hydrocarbons by Ecology Method NWTPH-Dx;
- Volatile Organic Compounds (VOCs) including benzene, ethylbenzene, toluene and xylenes (BETX), n-hexane, Methyl tert-butyl ether (MTBE), Ethylene Dibromide (EDB) and Ethylene Dichloride (EDC) by EPA Method 8260;

- Metals including arsenic, cadmium, chromium, lead and mercury by EPA Method 6000/7000 series;
- Total alkalinity by SM 2420 B-97;
- Ferrous iron by SM 3500-Fe B-97;
- Nitrate and sulfate by EPA 300.0;
- Dissolved manganese by EPA 6020A; and
- Dissolved methane by EPA RSK-175.

Table 2 summarizes the analytical methods, sample size, containers, preservation and holding times for laboratory analysis. Sufficient water will be collected from each well to perform each of the listed analysis. Groundwater samples will be analyzed on a standard (7-10 days) TAT. The result of groundwater analysis will be compared to groundwater screening levels presented in the IAWP. Data validation will be completed as described in Section 6. The results will be submitted to Ecology's Environmental Information Management (EIM) database following data validation. If additional compliance groundwater monitoring becomes necessary based on the results of the four initial monitoring events, then the sampling frequency and list of groundwater analysis for additional round of monitoring will be determined based on discussions between the Port and Ecology.

3.0 PROJECT MANAGEMENT AND ORGANIZATION

The project management and organization elements for the Interim Action including the key personnel, roles and responsibilities of the participants and special training/certification are presented in the following sections.

3.1. Project Organization and Responsibilities

Key individuals and positions providing QA and QC are summarized in the following table. A description of the responsibilities, lines of authority and communication for the key individuals and positions providing QA and QC is presented below.

Project Role	Name and Organization	Contact Information
Project Coordinator	Brad Tesch Port of Anacortes	360.299.1830 brad.tesch@portofanacortes.com 100 Commercial Ave. Anacortes, WA 98221
Technical Project Manager	John Herzog GeoEngineers	206.406.6431 jherzog@geoengineers.com 2101 4 th Avenue, Suite 950 Seattle, Washington 98121
Task Manager	Brian Tracy GeoEngineers	206.239.3250 btracy@geoengineers.com 2101 4 th Avenue, Suite 950 Seattle, Washington 98121

Project Role	Name and Organization	Contact Information
Field Coordinator/Field Personnel	Nathan Solomon GeoEngineers	206.518.5141 nsolomon@geoengineers.com 2101 4 th Avenue, Suite 950 Seattle, Washington 98121
Health and Safety Manger	Mary Lou Sullivan GeoEngineers	253.722.2425 msullivan@geoengineers.com 1101 Fawcett Avenue, Suite 200 Tacoma, Washington 98402
Data Quality Assurance Leader	Mark Lybeer GeoEngineers	206.278.2674 mlybeer@geoengineers.com 2101 4 th Avenue, Suite 950 Seattle, Washington 98121
Laboratory Project Manager	Amanda Volgardsen Analytical Resources Inc.	206.695.6220 amanda.volgardsen@arilabs.com 333 9 th Avenue North Seattle, WA 98109

3.1.1. Port of Anacortes Project Coordinator

The Port's project coordinator duties consist of implementing the project approach and tasks, overseeing the project team members during performance of project tasks.

3.1.2. Technical Project Manager

The technical project manager is responsible for fulfilling contractual and administrative control of the project. The technical project manager's duties include defining the project approach and tasks, selecting project team members and establishing budgets and schedules.

The technical project manager's duties also include implementing the project approach and tasks, overseeing project team members during performance of project tasks, adhering to and communicating the status of budgets and schedules to the Port project manager, providing technical oversight, and providing overall production and review of project deliverables.

3.1.3. Task Manager

The task manager is responsible for the daily management of project tasks including providing technical direction to the field staff, produces task specific documents and supporting documents, develops schedules and allocates resources for field tasks, coordinates data collection activities to be consistent with information requirements, supervises the compilation of field data and laboratory analytical results, assures that data are correctly and completely reported, implements and oversees field sampling in accordance with project plan and supervises field personnel. Additionally, the task manger coordinates work with on-site subcontractors, verifies that appropriate sampling, testing, and measurement procedures are followed, coordinates the transfer of field data, sample tracking forms, and log books to the technical project manager for data reduction and validation, and participates in QA corrective actions as required.

3.1.4. Field Coordinator

The field coordinator will lead the field sampling effort for the project, serving as the direct point of contact between the task manager, analytical laboratory and subcontractors; and ensures that the appropriate sampling containers, COC forms and field sampling gear including PPE are available. The field coordinator ensures that data collection activities are consistent with information requirements and to assure that field information is correctly and completely reported for the entire duration of the project. The field coordinator will also coordinate appropriate sampling, testing, and measurement procedures and schedule sample delivery/shipment with the analytical laboratory. The field coordinator will transfer field data and sample tracking forms to the project file and data reduction and validation and participate in QA corrective actions as required.

3.1.5. Field Personnel

Field personnel have the primary responsibility for duties involving field data collection and documentation. Technical/field staff are responsible for:

- Understanding and following the IAWP, CMP/QAPP and HASP.
- Checking all equipment and supplies in advance of field operations.
- Ensuring that samples are properly collected, preserved, labeled, packaged, and shipped.
- Ensuring that all field data are carefully recorded in accordance with the IAWP and supporting documents.
- Following COC procedures and SOPs when they are required.

3.1.6. Health and Safety Manager

The health and safety manager will oversee implementation of health and safety programs and verify that work on the project proceeds in accordance with the site-specific HASP.

3.1.7. Quality Assurance Leader

The quality assurance leader will provide oversight required for the completion of sample analyses for the project and verify, in conjunction with the laboratory manager, that the analytical work is proceeding in accordance with internal laboratory standard practices and the QA/QC guidelines for the project. This person will also oversee completion of data validation activities completed for this project. The quality assurance leader maintains independence from the individual(s) generating the data.

3.1.8. Laboratory Project Manager

The laboratory project manager will fulfill the analytical requirements of this project including being responsible for sample analyses using appropriate analytical laboratory methods. The specific procedures to be used for COC transfer, internal calibrations, laboratory analyses, reporting, preventive instrument maintenance, and corrective action will follow standard protocols.

3.2. Special Training Requirements/Certification

The Superfund Amendments and Reauthorization Act of 1986 required the Secretary of Labor to issue regulations providing health and safety standards and guidelines for workers engaged in hazardous waste

operations. Occupational Safety and Health Administration (OSHA) regulations (29 CFR 1910.120) require training to provide employees with the knowledge and skills necessary to enable them to perform their jobs safely and with minimum risk to their personal health. All sampling personnel will have completed the 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and 8-hour refresher courses, as necessary, to meet OSHA regulations.

4.0 DATA QUALITY OBJECTIVES

The primary Data Quality Objectives (DQO) for this Interim Action is to collect environmental sampling data of known, acceptable, and documentable quality. The specific objectives established for the project are:

- Implement the procedures outlined herein for field sampling, sample custody, equipment operation and calibration, laboratory analysis, and data reporting to ensure consistency and thoroughness of data generated.
- Achieve the level of QA/QC required to produce scientifically valid analytical data of known and documented quality. This will be accomplished by establishing criteria for data precision, accuracy, representativeness, completeness, and comparability, and by evaluating project data against these criteria.

4.1. Chemical Quality Objectives

The sampling design, field procedures, useable laboratory procedures, and QC procedures established for this project were developed to provide defensible data. Specific factors that may affect data usability include quantitative factors (precision, bias, accuracy, completeness, and reporting limits) and qualitative factors such as representativeness and comparability. The specific DQOs associated with these data quality factors are discussed below. Method-specific DQOs for chemical laboratory analyses are presented in Table 3.

4.1.1. Analytical Detection Limits

Analytical methods have quantitative limitations at a given statistical level of confidence that are often expressed as the method detection limit (MDL). Although results reported near the MDL provide insight for contaminant conditions, quality assurance dictates that analytical methods achieve a consistently reliable level of detection known as the practical quantitation limit (PQL), which is typically demonstrated with the lowest point of a linear calibration. The contract laboratory will provide numerical results for all analytes and report them as detected above the PQL or undetected at the PQL.

The PQLs provided by the Ecology-certified laboratory contract laboratory (ARI) are presented in Table 4 for both soil and groundwater. The PQLs presented in Table 4 are considered target reporting limits (TRLs) because several factors may influence final reporting limits. First, moisture and other physical conditions of samples affect detection limits. Second, analytical procedures may require sample dilutions or other practices to quantify a particular analyte at concentrations above the range of the instrument. The effect is that other analytes could be reported as undetected but at a value higher than a specified TRL. Data users must be aware that high non-detect values, although correctly reported, can bias statistical summaries and careful interpretation is required to correctly characterize subsurface conditions. If PQLs are above the established PQLs in Table 4 there may be a need to re-sample depending on the nature of the PQL adjustment.

4.1.2. Precision

Precision is the measure of mutual agreement among replicate or duplicate measurements of an analyte from the same sample and applies to field duplicates (i.e., split samples), replicate analyses, and duplicate spiked environmental samples (matrix spike duplicates). The closer the measured values are to each other, the more precise the measurement process. Precision error may affect data usefulness. Good precision is indicative of relative consistency and comparability between different samples. Precision will be expressed as the relative percent difference (RPD) for spike sample and field duplicate comparisons of various matrices. The RPD is calculated as:

$$\text{Where: } RPD(\%) = \frac{|D_1 - D_2|}{(D_1 + D_2)/2} \times 100,$$

D_1 = Concentration of analyte in primary sample.
 D_2 = Concentration of analyte in duplicate sample.

The calculation applies to split samples, replicate analyses, duplicate spiked environmental samples (matrix spike duplicates), and laboratory control duplicates. The RPD will be calculated for samples and compared to the applicable criteria. Precision can also be expressed as the percent difference (%D) between replicate analyses. Project RPD goals for all analyses are presented in Table 3, unless the primary and duplicate sample results are less than 5 times the method reporting limit (MRL), in which case RPD goals will not apply for data quality assessment purposes.

4.1.3. Accuracy

Accuracy is a measure of bias in the analytical process. The closer the measurement value is to the true value, the greater the accuracy. Accuracy is typically evaluated by adding a known spike concentration of a target or surrogate compound to a sample prior to analysis. The detected concentration or percent recovery (%R) of the spiked compound reported in the sample provides a quantitative measure of analytical accuracy. Since most environmental data collected represent single points spatially and temporally rather than an average of values, accuracy is generally more important than precision in assessing the data. In general, if %R values are low, non-detect results may be reported for compounds of interest when in fact these compounds are present (i.e., false negative results), and results for detected compounds may be biased low. The reverse is true when %R values are high. In this case, non-detect values are considered accurate, whereas detected values may be higher than true values.

For this project, accuracy will be expressed as the %R of a known surrogate spike, matrix spike, or laboratory control sample (blank spike), concentration:

$$\text{Recovery (\%R)} = \frac{\text{Spiked Result} - \text{Unspiked Result}}{\text{Known Spike Concentration}} \times 100$$

Accuracy (%R) criteria for surrogate spikes, matrix spikes, and laboratory control samples (blank spikes) are presented in Table 3.

4.1.4. Representativeness, Completeness, and Comparability

Representativeness expresses the degree to which data accurately and precisely represent the actual site conditions. Representativeness of the data will be evaluated by:

- Comparing actual sampling procedures to those specified in this document.
- Reviewing analytical results for field duplicates to determine the variability in the analytical results.
- Invalidating non-representative data or identifying data to be classified as questionable or qualitative in nature. Only representative data will be used in subsequent data reduction, validation, and reporting activities.

Completeness establishes whether a sufficient amount of valid measurements were obtained to meet project objectives. The number of samples and results expected establishes the comparative basis for completeness. The completeness goal is 90 percent useable data for the samples/analyses planned. If the completeness goal is not achieved, an evaluation will be performed to determine if the data are adequate to meet study objectives.

Comparability expresses the confidence with which one set of data can be compared to another. Although numeric goals do not exist for comparability, a statement on comparability will be prepared to assess overall usefulness of data sets generated during the project, following the evaluation of precision and accuracy.

4.1.5. Holding Times

Holding times are defined as the time between sample collection and extraction, sample collection and analysis, or sample extraction and analysis. Recommended holding times are presented in Tables 1 and 2 for soil and groundwater, respectively. If the analysis of an archived sample is required but the sample exceeds the respective holding time, either discard the sample and collect a new representative sample for analysis and/or consult with Ecology to determine if the sample may still be used.

4.1.6. Quality Control Blank Samples

According to the National Functional Guidelines for Organic Data Review (EPA 2017b), “The purpose of laboratory (or field) blank analysis is to assess the existence and magnitude of contamination resulting from laboratory (or field) activities. The criteria for evaluation of blanks apply to any blank associated with the samples (e.g., method blanks, instrument blanks, trip blanks, and equipment blanks).” Trip blanks are placed with samples during shipment; method blanks are created during sample preparation and follow samples throughout the analysis process.

Analytical results for QC blanks will be interpreted in general accordance with EPA’s National Functional Guidelines for Inorganic (EPA 2017a) and Organic Data (EPA 2017b) Review and professional judgment. QC blank samples are discussed further in Section 5.8.2.

5.0 DATA GENERATION AND ACQUISITION

The data generation and acquisition elements for the CMP/QAPP (as detailed below) address aspects of the project design and implementation including the appropriate methods for measurement and analysis, data collection or generation, data handling, and how QC activities are employed and properly documented.

Sampling methods including field documentation, sampling, and decontamination procedures are also discussed below.

5.1. Surveying

Surveying at the site will be performed referencing vertical datum - North American Vertical Datum of 1988 (NAVD 88) and horizontal datum - North American Datum of 1983 (NAD 83). Mean Lower Low Water (MLLW) for the Site is 0.66 feet above NAVD 88 (i.e. MLLW = NAVD 88 + 0.66). The contractor will perform excavation and post-construction as-built survey to document excavation limits and post-construction site conditions including locations of newly installed monitoring wells.

5.2. Field Screening Procedures

The potential presence of contamination in soil samples will be evaluated using field screening techniques. Field screening results will be recorded on the field logs and the results will be used as a general guideline to delineate areas of possible contamination. In addition, screening results will be used as a basis for selecting soil samples for chemical analysis. The following screening methods will be used: 1) visual screening; 2) water sheen screening; and 3) headspace vapor screening.

5.2.1.1. Visual Screening

The soil will be observed for unusual color and stains and/or odor indicative of possible contamination. Field personnel will take photos throughout excavation activities to document visual conditions throughout excavation activities.

5.2.1.2. Water Sheen Screening

This is a qualitative field screening method that can help identify the presence or absence of petroleum hydrocarbons. A portion of the soil sample will be placed in a pan containing distilled water. The water surface will be observed for signs of sheen. The following sheen classifications will be used:

Classification	Identifier	Description
No Sheen	(NS)	No visible sheen on the water surface
Slight Sheen	(SS)	Light, colorless, dull sheen; spread is irregular, no rapid; sheen dissipates rapidly
Moderate Sheen	(MS)	Light to heavy sheen; may have some color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on the water surface
Heavy Sheen	(HS)	Heavy sheen with color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on the water surface

5.2.1.3. Headspace Vapor Screening

This is a semi-quantitative field screening method that can help identify the presence or absence of volatile organic compounds (VOCs) in soil samples. A portion of the soil sample will be placed in a resealable plastic bag. The bag will then be sealed capturing air in the bag. The bag is then shaken gently to expose the soil to the air trapped in the bag. The bag will remain closed for approximately 5 minutes at ambient temperature before the headspace vapors are measured. Vapors present within the sample bag's headspace will be measured by inserting the probe of a photoionization detector (PID) through a small opening in the bag, taking care not to clog the probe with soil. The maximum PID reading (in parts per million [ppm]) and the ambient air temperature will be recorded on the field log for each sample. The PID

will be calibrated to 100 ppm isobutylene each day prior to soil sampling. No soil sample used for headspace screening will be submitted to the laboratory for chemical analysis.

5.3. Decontamination Procedures

Soil samples will be collected using excavation equipment (i.e., backhoe or excavator), hand tools including stainless steel spoons and/or directly from the excavation limits using clean pair of nitrile gloves. Groundwater samples will be collected from monitoring wells using submersible or peristaltic pumps and low-flow sampling procedures.

Reusable sampling equipment that comes in contact with soil or groundwater will be decontaminated before each use. Decontamination procedures for this equipment will consist of the following:

1. Washing with a brush and non-phosphate detergent solution (e.g., Liqui-Nox and distilled water);
2. Rinsing with distilled water; and
3. Wrapping or covering the decontaminated equipment with aluminum foil. Field personnel will limit cross-contamination by changing gloves between sampling locations.

Drilling equipment (auger, soil sampler, direct-push barrel) that comes into contact with soil will be decontaminated before each use. Decontamination procedures for this equipment will consist of the following:

1. Washing with pressurized hot water;
2. Wash with brush and non-phosphate detergent solution; and
3. Rinse with potable water.

Wash water used to decontaminate equipment will be collected and stored on-site in 55-gallon drums.

5.4. Sample Containers, Labeling, Handling and Custody

5.4.1. Sample Containers and Labeling

The Field Coordinator will establish field protocol to manage field sample collection, handling and documentation. Soil and groundwater samples will be placed in appropriate laboratory-prepared containers. Sample containers and preservatives are listed in Tables 1 and 2 for soil and groundwater, respectively.

Sample containers will be labeled with the following information at the time of sample collection:

- Project name and number
- Type of sample preservative used (where applicable)
- Sample name, which will include a reference to date and sampling depth (if applicable)
- Date and time of collection

The sample collection activities will be noted in the field log books. The Field Coordinator will monitor consistency between sample containers/labels, field log books and COC forms.

5.4.2. Sample Storage

Samples will be placed in a cooler with ice after they are collected. The objective of the cold storage will be to attain a sample temperature of 2 to 6 degrees Celsius. Holding times (Tables 1 and 2 for soil and groundwater, respectively) will be observed during sample storage.

5.4.3. Sample Shipment

Samples will be transported and delivered to the analytical laboratory in the sample coolers. The samples will either be transported by field personnel, laboratory personnel or by courier service. The Field Coordinator will ensure that the cooler has been properly secured using clear plastic tape and custody seals.

5.4.4. Chain-of-Custody Records

Field personnel are responsible for the security of samples from the time the samples are collected until the samples have been received by the courier service or laboratory personnel. A COC form will be completed for each group of samples being shipped to the laboratory. Information to be included on the COC form includes:

- Project name and number;
- Sample identification numbers;
- Date and time of sampling;
- Sample matrix (soil and groundwater), preservative, and number of containers for each sample;
- Analyses to be performed;
- Names of sampling personnel;
- Project manager name and contact information including phone number; and
- Shipping information including shipping container number, if applicable.

The original COC form will be signed by a member of the field team. Field personnel will retain copies and place the original and remaining copies in a plastic bag. The plastic bag containing the COC form will be placed in the cooler before sealing the cooler for transport to the laboratory.

5.4.5. Laboratory Custody Procedures

The laboratory will follow their standard operating procedures (SOPs) to document sample handling from time of receipt (sample log-in) to reporting. Documentation will include, at a minimum, the analyst's name or initials, time and date.

5.5. Disposal of Investigation-Derived Materials

5.5.1. Soil and Water Generated during Well Installation/Monitoring

Soil cuttings from borings completed during the post-construction groundwater monitoring well installation, development and purge water removed from the monitoring wells, and decontamination water will be placed in labeled and sealed 55-gallon drums. The drums will be temporarily stored on Site at a secure

location pending receipt of analytical results and off-site disposal at a permitted facility. Each drum will be labeled with the following information:

- Material/media (i.e., soil, water, etc.) contained in the drum;
- Source of the material in the drum (i.e., investigation locations and depths where appropriate);
- Date material was generated; and
- Name and telephone number of GeoEngineers contact person.

5.5.2. Disposition of Incidental Waste

Incidental waste generated during sampling activities includes items such as gloves, plastic sheeting, sample tubing, paper towels and similar expended and discarded field supplies. These materials are considered *de minimis* and will be disposed of in a local trash receptacle or county disposal facility.

5.6. Field Documentation

The field staff will be responsible for documenting field activities including sampling in an all-weather (e.g. “Rite-in-the-Rain”) field notebook and/or on field logs, and by producing a draft technical field report at the end of each day of sampling. The field staff will also be responsible for implementing field QA/QC procedures in accordance with the methods outlined in this document and general good practice sampling protocols. These procedures include recording and documenting relevant and appropriate information regarding project activities, sampling methods and data collected during performance of field activities at each sample location.

The following general guidelines should be followed in documenting fieldwork:

- Documentation will be maintained in a dedicated field notebook and on field forms, as applicable.
- Notebook documentation will be completed in waterproof ink or permanent marker and written errors will be crossed out with a single line.

Field notebooks will include records of pertinent activities completed on site including sampling. Field notebooks will be bound books with sequentially numbered pages. The books will remain in the custody of the Field Coordinator/Personnel until project completion, after which, the books will be kept in the project files. The field notebook and forms will be maintained on a real-time basis and will include, where applicable and appropriate, the following information:

- Date, time of specific activities and weather conditions.
- Names of all personnel on the site, including visitors.
- Specific details regarding sampling activities, including sampling locations, type of sampling, depth, and sample numbers.
- Specific problems and resolutions.
- Identification numbers of monitoring instruments used that day.
- Chain-of-custody details, including sample identification numbers.

A draft field report will be prepared upon completion of field activities each day. Field data that was recorded in the notebooks and field forms will be used to complete the field report. The field report will be used to document construction, sampling, and monitoring activities, sampling and Site personnel, and weather conditions, as well as decisions, corrective actions, and/or modifications to the project plans and procedures discussed in this report. Draft field reports will be reviewed by the Technical Project Manager on a daily basis. The draft field report will be finalized following review by the Task Manager and/or Technical Project Manager on a weekly basis and kept in the project files.

5.7. Analytical Methods

Samples and QC samples shall be analyzed following the analytical methods listed in Tables 1 and 2 for soil and groundwater, respectively, using laboratory instruments prescribed in the methods. The analytical methods must meet the technical acceptance criteria specified by the method prior to the analysis of environmental samples. Samples that are not analyzed initially (i.e., placed on “hold”) will be stored at the laboratory for at least 6 months, and will be disposed of by the laboratory following this period. Samples to be analyzed initially will be analyzed within proper holding times, which are listed in Tables 1 and 2 for soil and groundwater, respectively.

The laboratory is required to comply with their current written standard operating procedures. All laboratory personnel will be responsible for reporting problems that may compromise the quality of the data to the laboratory project manager. A narrative describing the anomaly, the steps taken to identify and correct it and the treatment of the relevant sample batch (i.e., recalculation, reanalysis, re-extraction) will be submitted with the data package.

5.8. Quality Control

Quality control activities that will be implemented for each sampling, analysis or measurement technique are summarized in Table 3. Formulas for calculating QC statistics are provided in Section 4.1.

The laboratory will maintain and implement documented QA/QC procedures. The laboratory QA/QC program will provide the following:

- Procedures that must be followed for certifying the precision and accuracy of the analytical data generated by the laboratory.
- Documentation of each phase of sample handling, data acquisition, data transfer, report preparation, and report review.
- Accurate and secure storage and retrieval of samples and data.
- Detailed instructions for performing analyses and other activities affecting the quality of analytical data generated by the laboratory.
- Appropriate management-level review and approval of procedures, revisions to procedures, and control of procedures in such a way so that laboratory personnel that require specific procedures have access to them.

5.8.1. Field Quality Control

Field QC samples serve as a control and check mechanism to monitor the consistency of sampling methods and the potential influence of off-Site factors on project samples. Examples of off-Site factors include airborne VOCs and contaminants that may be present in potable water used during drilling activities.

5.8.1.1. Field Duplicates

In addition to replicate analyses performed in the laboratory, field duplicates also serve as measures for precision. Field duplicates measure the precision and consistency of laboratory analytical procedures and methods, as well as the consistency of the sampling techniques used by field personnel. Under ideal field conditions, field duplicates are created by thoroughly mixing a volume of the sample matrix, placing aliquots of the mixed sample in separate containers, and identifying one of the aliquots as the primary sample and the other as the duplicate sample. The frequency at which field duplicate samples will be collected is identified under Section 2.0.

5.8.1.2. Trip Blanks

Trip blanks consist of samples of reagent water that accompany samples to be analyzed for VOCs during sample storage in coolers and transport to the laboratory. They are used to assess potential contamination of samples during collection and transport due to the presence of VOCs in ambient air. Trip blanks will be analyzed on a one per cooler basis containing soil and/or groundwater sample for VOC analysis.

5.8.2. Laboratory Quality Control

Laboratory QC procedures will be evaluated through a formal data quality assessment process. The analytical laboratory will follow standard analytical method procedures that include specified QC monitoring requirements. These requirements will vary by method, but generally include:

- Method blanks
- Internal standards
- Instrument calibrations
- Matrix spike/matrix spike duplicates (MS/MSD)
- Laboratory control samples/laboratory control sample duplicates (LCS/LCSD)
- Laboratory replicates or duplicates
- Surrogate spikes

5.8.2.1. Laboratory Blanks

Laboratory procedures utilize several types of blanks, but the most commonly used blanks for QC monitoring are method blanks. Method blanks are laboratory QC samples that consist of either a soil-like material having undergone a contaminant destruction process, or reagent (contaminant-free) water. Method blanks are extracted and analyzed with each batch of environmental samples undergoing analysis. Method blanks are particularly useful during volatiles analysis since VOCs can be transported in the laboratory through the vapor phase. If a substance is detected in a method blank, then one (or more) of the following occurred:

- Sample containers, measurement equipment, and/or analytical instruments were not properly cleaned and contained contaminants.

- Reagents used in the process were contaminated with a substance(s) of interest.
- Volatile substances in ambient laboratory air with high solubility or affinities toward the sample matrix contaminated the samples during preparation or analysis.

It is difficult to determine which of the above scenarios took place if blank contamination occurs. However, it is assumed that the conditions that affected the blanks also likely affected the project samples. If target analytes are detected in method blanks, data validation guidelines assist in determining which substances in project samples are considered “real,” and which ones are attributable to the analytical process. Furthermore, the guidelines state, “...there may be instances where little or no contamination was present in the associated blank, but qualification of the sample is deemed necessary. Contamination introduced through dilution water is one example”.

5.8.2.2. Calibrations

Several types of instrument calibrations are used, depending on the analytical method, to assess the linearity of the calibration curve and assure that the sample results reflect accurate and precise measurements. The main calibrations used are initial calibrations, daily calibrations, and continuing calibration verification.

5.8.2.3. Matrix Spike/Matrix Spike Duplicates (MS/MSD)

MS/MSD samples are used to assess influences or interferences caused by the physical or chemical properties of the sample itself. For example, extreme pH can affect the results for SVOCs. Or, the presence of a particular compound may interfere with accurate quantitation of another analyte. MS/MSD data is reviewed in combination with other QC monitoring data to determine matrix effects. In some cases, matrix effects cannot be determined due to dilution and/or high levels of related substances in the sample. A matrix spike is evaluated by spiking a project sample with a known amount of one or more of the target analytes, ideally at a concentration that is 5 to 10 times higher than the sample result. A percent recovery is then calculated by subtracting the un-spiked sample result from the spiked sample result, dividing by the known concentration of the spike, and multiplying by 100.

MS/MSD samples will be analyzed at a frequency of one MS/MSD per sample set or batch. The samples for the MS/MSD analyses should be collected from a boring or sampling location that is believed to have only low-level contamination. The MS/MSD sample location will be chosen to be as similar in geologic and contaminated conditions as possible to other samples collected in the batch based on field screening. A sample from an area of low-level contamination is needed because the objective of MS/MSD analyses is to determine the presence of matrix interferences, which can best be achieved with low levels of contaminants. Additional sample volume will be collected for the MS/MSD analyses as required by the laboratory. MS/MSD sample material will be collected

5.8.2.4. Laboratory Control Sample/ Laboratory Control Sample Duplicates (LCS/LCSD)

Also known as blank spikes, LCSs are similar to MS samples in that a known amount of one or more of the target analytes are spiked into a prepared sample medium, and a percent recovery of the spiked substances is calculated. The primary difference between LCS and MS samples is that the LCS uses a contaminant-free sample medium. For example, reagent water is typically used for LCS water analyses. The purpose of an LCS is to help assess the overall accuracy and precision of the analytical process including sample preparation, instrument performance, and analyst performance.

5.8.2.5. Laboratory Replicates/Duplicates

Laboratories utilize MS/MSDs, LCS/LCSDs, and/or replicates to assess precision. Replicates are a second analysis of a field-collected environmental sample. Replicates can be split at varying stages of the sample preparation and analysis process; they most commonly consist of a second analysis on the extracted media.

5.8.2.6. Surrogate Spikes

Surrogate spikes are used to verify proper extraction procedures and the accuracy of the analytical instrument. Surrogates are substances with characteristics similar to the target analytes. A known concentration of surrogate is added to the project sample and passed through the instrument, and percent recovery is calculated. Each surrogate used has acceptance limits (i.e., an acceptable range) for percent recovery. If a surrogate recovery is low, sample results may be biased low and depending on the recovery value, a possibility of false negatives may exist. Conversely, when recoveries are above the specified acceptance limits, a possibility of false positives exist, although non-detect results are considered accurate.

5.9. Instrument/Equipment Testing, Inspection, and Maintenance

5.9.1. Field Instrumentation

If field instruments are used, calibration and calibration checks will be performed to facilitate accurate and reliable field measurements. The calibration of the instruments will be checked and adjusted as necessary in general accordance with manufacturers' recommendations. Methods and frequency of calibration checks and instrument maintenance will be based on the type of instrument, stability characteristics, required accuracy, intended use, and environmental conditions.

5.9.2. Laboratory Instrumentation

For chemical analytical testing, calibration procedures will be performed in general accordance with the analytical methods used and the laboratory's Standard Operating Procedures (SOPs). Calibration documentation will be retained at the laboratory for a period of 6 months.

5.10. Laboratory Data Reporting and Deliverables

Laboratories will report data in formatted hardcopy and electronic form to the technical project manager, task manager and QA leader. Upon completion of analyses, the laboratory will prepare electronic deliverables for data packages in accordance with the specifications in the agreed-upon *Special Conditions for Lab Analysis* document. The laboratory will provide electronic data deliverables (EDDs) within 2 business days after GeoEngineers' receipt of printed-copy analytical results, including the appropriate QC documentation. GeoEngineers will establish EDD requirements with the contract laboratory.

Analytical laboratory measurements will be recorded in standard formats that display, at a minimum, the client/field sample identification, the laboratory sample identification, reporting units, analytical methods, analytes tested, analytical results, extraction and analysis dates, quantitation limits, and data qualifiers. Each sample delivery group will be accompanied by sample receipt forms and a case narrative identifying data quality issues.

6.0 DATA REDUCTION AND ASSESSMENT PROCEDURES

The process for generating and checking data, as well as the process for producing reports for field and analytical laboratory data, are summarized in the following sections.

6.1. Data Reduction

Data reduction involves the conversion or transcription of field and analytical data to a useable format. The laboratory personnel will reduce the analytical data for review by the QA leader, task manager and technical project manager. This will involve both hard-copy forms and EDDs. Both forms of data will be compared with each other to verify that the data are reliable and error-free.

6.2. Review of Field Documentation and Laboratory Receipt Information

Documentation of field sampling data will be reviewed periodically for conformance with project QC requirements described in this document. At a minimum, field documentation will be checked for proper documentation of the following:

- Sample collection information (date, time, location, matrices, etc.);
- Field instruments used and calibration data;
- Sample collection protocol;
- Sample containers, preservation and volume;
- Field QC samples collected at the frequency specified;
- Chain-of-custody protocols; and
- Sample shipment information.

Sample receipt forms provided by the laboratory will be reviewed for QC exceptions. The final laboratory data package will describe (in the case narrative) the effects that any identified QC exceptions have on data quality. The laboratory will review transcribed sample collection and receipt information for correctness prior to delivering the final data package.

6.3. Data Verification/Validation

Project decisions, conclusions, and recommendations will be based upon verified (validated) data. The purpose of data verification is to ensure that data used for subsequent evaluations and calculations are scientifically valid, of known and documented quality, and legally defensible. Field data verification will be used to eliminate data not collected or documented in accordance with the protocols specified in the IAWP and this document. Laboratory data verification will be used to eliminate data not obtained using prescribed laboratory procedures.

The QA leader will validate data collected during the supplemental investigation to ensure that the data are valid and usable. At a minimum, a Stage 2B validation will be performed on the Interim Action data in general conformance with EPA functional guidelines for data validation (EPA 2004; and EPA 2008). At a minimum, the following items will be reviewed to verify the data as applicable:

- Documentation that a final review of the data was completed by the laboratory QA coordinator;
- Documentation of analytical and QC methodology;
- Documentation of sample preservation and transport;
- Sample receipt forms and case narratives; and
- The following QC parameters:

- Holding times and sample preservation
- Method blanks
- MS/MSDs
- LCS/LCSDs
- Surrogate spikes
- Duplicates/replicates

When sample analytical data are received from the analytical laboratory, they will undergo a QC review by the QA leader. The accuracy and precision achieved will be compared to the laboratory's analytical control limits. Example control limits are presented in Table 3. Calculations of RPDs will follow standard statistical conventions and formulas as presented in in this document. Additional specifications and professional judgment by the QA leader may be incorporated when appropriate data from specific matrices and field samples are available.

A data quality assessment will be prepared to document the overall quality of the data relative to the DQOs. The major components of the data quality assessment are as follows:

- **Data Validation Summary:** Summarizes the data validation results for all sample delivery groups by analytical method. The summary identifies any systematic problems, data generation trends, general conditions of the data, and reasons for any data qualification.
- **QC Sample Evaluation:** Evaluates the results of QC sample analyses, and presents conclusions based on these results regarding the validity of the project data.
- **Assessment of DQOs:** An assessment of the quality of data measured and generated in terms of accuracy, precision, and completeness relative to objectives established for the project.
- **Summary of Data Usability:** Summarizes the usability of data, based on the assessment performed in the three preceding steps.

The data quality assessment will help to achieve an acceptable level of confidence in the decisions that are to be made based upon the project data. The project analytical data will be submitted to Ecology's Environmental Information Management (EIM) system within 60 days after the data quality assessment is completed.

6.4. Calculating Chemical Sums

The following guidelines will be used to calculate chemical sums:

- Total benzofluoranthenes represents the sum of detected concentrations of the b, j, and k isomers of benzofluoranthenes (WAC 173-204-562(2)(k)). In some cases, the testing laboratory may report the total benzofluoranthenes concentration rather than concentrations of individual compounds since they may not be able to resolve all three isomers.
- Total cPAHs will be calculated using the toxicity equivalent (TEQ) approach in accordance with WAC 173-340-708(8)(e). Total cPAH TEQs will be calculated using toxicity equivalency factor (TEF) values referenced from Model Toxics Control Act (MTCA) Table 708.2 (WAC 173-340-900). For non-detect results, one-half the PQL will be used in the TEQ calculations.

For the summation of chemical totals, any “U” qualified data, which may be data reported at the PQL, the MDL, or the reporting limit (RL), represent non-detects. For the calculations, no distinction is made between these different types of detection limits, and any “U” qualified data are treated as “non-detects”. The following guidelines will be used for reporting and summing non-detects for benzo(a)fluoranthene:

- When all chemicals in a group are non-detect, only the single highest individual chemical quantitation limit in a group will be reported and appropriately qualified.
- If some concentrations were detected and others are not, only the detected concentrations are included in the sum.

Estimated values between the method detection limit and the laboratory reporting limit (i.e. “J” qualified results) will be included in the summation at face value and the sum will also be qualified as estimated with a “J” qualifier. Results that are qualified as estimates with “J” qualifiers through data validation, will also be handled in the same manner.

For calculating total cPAH TEQ, the sum will be calculated using a substitution at one-half the detection limit (i.e., $n=1/2$). However, using this alternative may result in generated sums that are estimates with unknown bias and precision. Therefore, these estimates will be bounded by reporting sums using a substitution of the detection limit at $n=0$ and $n=1$.

7.0 LIMITATIONS

We have prepared this Compliance Monitoring and Quality Assurance Project Plan (CMP/QAPP) for use by the Port of Anacortes during the Interim Action at the Quiet Cove Site located at 202 O Avenue in Anacortes, Washington. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

8.0 REFERENCES

- U.S. Environmental Protection Agency (EPA) 2001, “EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5” EPA-240/B-01/003, Office of Environmental Information, Washington, DC, dated March 2001.
- U.S. EPA 2002, “Guidance for Quality Assurance Project Plans, EPA QA/G-5,” EPA-240/R-02/009, Office of Environmental Information, Washington, DC, dated December 2002.
- U.S. EPA 2017a, “National Functional Guidelines for Inorganic Superfund Methods Data Review.” OLEM 9355.0-135, EPA 540-R-2017-001, Office of Superfund Remediation and Technology Innovation (OSRTI), Washington, DC, dated January 2017.

U.S. EPA 2017b “National Functional Guidelines for Organic Superfund Methods Data Review.” OLEM 9355.0-136, EPA 540-R-2017-002, Office of Superfund Remediation and Technology Innovation (OSRTI), Washington, DC, dated January 2017.

Washington State Department of Ecology (Ecology), 2004, “Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies,” dated July 2004 and revised December 2016.

Table 1
Soil Sample Test Methods, Sample Size, Containers, Preservation and Holding Times
Quiet Cove Site
Anacortes, Washington

Laboratory Analysis	Analytical Method	Minimum Sample Size	Sample Container	Sample Preservation	Holding Time ¹
Gasoline-Range Hydrocarbons	NWTPH-Gx	5 g	Two 40mL glass vial (VOA)	Cool ≤6 °C, 5mL MeOH	14 days to extraction/analysis
Diesel- and Oil-Range Hydrocarbons	NWTPH-Dx	100 g	8-oz amber glass WM with Teflon-lined lid	Cool ≤6 °C	14 days to extraction/analysis
VOCs (BTEX, n-Hexane, MTBE, EDB and EDC)	EPA 8260	5 g	Three 40mL glass vial (VOA)	Cool ≤6 °C Two VOAs - Sodium Bisulfate One VOA - Methanol	14 days to extraction/analysis
PAHs	EPA 8270/SIM	100 g	8-oz glass WM with Teflon-lined lid	Cool ≤6 °C	14 days to extraction, 40 days from extraction to analysis
Metals (As, Cd, Cr, Pb and Hg)	EPA 6010/6020/ 7470/7471	100 g	4-oz glass WM with Teflon-lined lid	Cool ≤6 °C	180 days/28 days for Mercury

Notes:

¹ Holding times are based on elapsed time from date of collection.

NWTPH = Northwest total petroleum hydrocarbons

Gx = gasoline-range extended

Dx = diesel-range extended

EPA = Environmental Protection Agency

VOC = volatile organic compound

BTEX = Benzene, Toluene, Ethylbenzene, Xylenes

MTBE = Methyl tert-butyl ether

EDB = Ethylene Dibromide

EDC = Ethylene Dichloride

PAHs = Polycyclic Aromatic Hydrocarbons

SIM = selected ion mode

g = gram

mL = milliliter

oz. = ounce

WM = wide mouth

Table 2
Groundwater Sample Test Methods, Sample Size, Containers, Preservation and Holding Times
Quiet Cove Site
Anacortes, Washington

Laboratory Analysis	Analytical Method	Minimum Sample Size	Sample Container	Sample Preservation	Holding Time ¹
Gasoline-Range Hydrocarbons	NWTPH-Gx	40 mL	Two 40mL glass vial (VOA)	Cool ≤6 C, HCl to pH < 2	14 days to extraction/analysis
Diesel- and Oil-Range Hydrocarbons	NWTPH-Dx	500 mL	Two 500 mL amber glass with Teflon-lined lid	Cool ≤6 C	7 days to extraction 40 days from extraction to analysis
VOCs (BTEX, n-Hexane, MTBE, EDB and EDC)	EPA 8260	40 mL	Three 40mL glass vial (VOA)	Cool ≤6 C, HCl to pH < 2	14 days to extraction/analysis
PAHs	EPA 8270/SIM	500 mL	Two 500mL amber glass with Teflon-lined lid	Cool ≤6 °C	7 days to extraction, 40 days from extraction to analysis
Metals (As, Cd, Cr, Pb and Hg)	EPA 6010/6020/200.8 7470/7471	100mL mL	500mL HDPE bottle	Cool ≤6 C, HNO ₃ - pH<2 (Dissolved metals preserved after filtration)	180 days/28 days for Mercury
Total Alkalinity	SM 2420	250 mL	One 500 mL HDPE bottle	Cool ≤6 C, No Headspace	14 days to extraction/analysis
Ferrous Iron	SM 3500-Fe	250 mL	One 250 mL amber glass with Teflon-lined lid	Cool ≤6 °C HCl preserved	24-hrs to extraction/analysis
Sulfate/Nitrate	EPA 300.0	50 mL	One 500 mL HDPE	Cool ≤6 °C No Headspace	28 days to extraction/analysis SO ₄ , 48 hours to extraction/analysis NO ₃
Dissolved Manganese	EPA 6020A	100 mL	One 500 mL HDPE	Cool ≤6 °C HNO ₃ preservative if field filtered, unpreserved if not field filtered	6 months to extraction/analysis
Dissolved Methane	EPA RSK-175	40 mL	Two 40mL glass vial (VOA)	Cool ≤6 °C	14 days to extraction/analysis

Notes:

¹ Holding times are based on elapsed time from date of collection.

NWTPH = Northwest total petroleum hydrocarbons

Gx = gasoline-range extended

Dx = diesel-range extended

PAHs = Polycyclic Aromatic Hydrocarbons

SIM = selected ion mode

EPA = Environmental Protection Agency
VOC = volatile organic compound
BTEX = Benzene, Toluene, Ethylbenzene, Xylenes
MTBE = Methyl tert-butyl ether
EDB = Ethylene Dibromide
EDC = Ethylene Dichloride

L = liter
mL = milliliter
HCl = hydrochloric acid
HDPE = high density polyethylene
HNO₃ = nitric acid

Table 3
Measurement Quality Objectives
Quiet Cove Site
Anacortes, Washington

Laboratory Analysis	Laboratory Control Sample (LCS) %R Limits ^{1,2}		Matrix Spike (MS) %R Limits ^{1,2}		Surrogate Standard (SS) %R Limits ^{1,2,3}		MS Duplicate Samples or Lab Duplicate RPD Limits ⁴ (%)		Field Duplicate Samples RPD Limits ⁴ (%)	
	Soil	Water	Soil	Water	Soil	Water (Default liq-liq Extraction)	Soil	Water	Soil	Water
Gasoline-Range Hydrocarbons	70-121	72-128	28-162	72-128	74-152	72-133	≤30	≤30	≤30	≤30
Diesel- and Heavy Oil-Range Hydrocarbons	63-120	56-120	63-120	56-120	50 - 150	50 - 150	≤30	≤30	≤30	≤30
VOCs (BTEX, n-Hexane, MTBE, EDB and EDC)	Laboratory Specific Control Limits ¹	Laboratory Specific Control Limits ¹	Laboratory Specific Control Limits ¹	Laboratory Specific Control Limits ¹	80 - 149 (EDC-d4) 80 - 120 (All Other Surrogates)	80 - 129 (EDC-d4) 80 - 120 (All Other Surrogates)	≤30	≤30	≤30	≤30
PAHs	Laboratory Specific Control Limits ¹	Laboratory Specific Control Limits ¹	Laboratory Specific Control Limits ¹	Laboratory Specific Control Limits ¹	Laboratory Specific Control Limits ¹	Laboratory Specific Control Limits ¹	≤30	≤30	≤30	≤30
Metals (As, Cd, Cr, Pb and Hg)	80 - 120	80 - 120	75 - 125	75 - 125	--	--	≤20	≤20	≤20	≤20
Total Alkalinity	90-110	90-110					≤20	≤20	≤20	≤20
Ferrous Iron		90-110		75-125				≤20		≤20
Sulfate/Nitrate		90-110		75-125				≤20		≤20
Dissolved Manganese		80-120		75-125				≤20		≤20
Dissolved Methane		80-120		80-120		88-120 (Ethene) 72-122 (Propane)		≤30		≤30

Notes:

¹Compound-specific ranges will be provided by the laboratory when contracted.

²Percent recovery limits are expressed as ranges based on laboratory control limits. Limits will vary for individual analytes.

³Individual surrogate recoveries are compound-specific.

⁴RPD control limits are only applicable if the primary and duplicate sample concentrations are greater than 5 times the method reporting limit (MRL). For results less than 5 times the MRL, the difference between the primary and duplicate samples must be less than 2X the MRL for soil and 1X the MRL for waters.

EPA = U.S. Environmental Protection Agency

VOCs = Volatile Organic Compounds

BTEX = Benzene, Toluene, Ethylbenzene, Xylenes

MTBE = Methyl tert-butyl ether

EDB = Ethylene Dibromide

EDC = Ethylene Dichloride

PAHs = Polycyclic Aromatic Hydrocarbons

As = Arsenic; Cd = Cadmium; Cr = Chromium (total); Pb = Lead; Hg = Mercury

RL = Reporting Limit

RPD = Relative percent difference

MS = Matrix spike

Table 4
Method Analysis and Target Reporting Limits for Soil and Groundwater
 Quiet Cove Site
 Anacortes, Washington

Laboratory Analysis	CAS Number ¹	Analytical Method	Practical Quantitation Limit ² (PQL)	
			Soil (mg/kg)	Groundwater (µg/L)
Petroleum Hydrocarbons				
Gasoline-Range	8006-61-9	NWTPH-Gx	5	100
Diesel-Range	68334-30-5	NWTPH-DX	5	100
Heavy Oil-Range	30109	NWTPH-DX	10	200
Volatile Organic Compounds (VOCs)				
Benzene	71-43-2	EPA 8260	0.05	0.2
Ethylbenzene	100-41-4	EPA 8260	0.05	0.2
Toluene	108-88-3	EPA 8260	0.05	0.2
Xylenes	1330-20-7	EPA 8260	0.05	0.2
n-Hexane	110-54-3	EPA 8260	0.001	0.2
Methyl t-Butyl Ether (MTBE)	1634-04-4	EPA 8260	0.001	0.5
Ethylene Dibromide (EDB)	106-93-4	EPA 8260	0.001	0.2
Ethylene Dichloride (EDC)	107-06-2	EPA 8260	0.001	0.2
Non-carcinogenic Polycyclic Aromatic Hydrocarbons (PAHs)				
1-Methylnaphthalene	90-12-0	EPA 8270-SIM	0.0067	--
2-Methylnaphthalene	91-57-6	EPA 8270-SIM	0.0067	--
Acenaphthene	83-32-9	EPA 8270-SIM	0.0067	--
Acenaphthylene	208-96-8	EPA 8270-SIM	0.0067	--
Anthracene	120-12-7	EPA 8270-SIM	0.0067	--
Benzo[g,h,i]perylene	191-24-2	EPA 8270-SIM	0.0067	--
Fluoranthene	206-44-0	EPA 8270-SIM	0.0067	--
Fluorene	86-73-7	EPA 8270-SIM	0.0067	--
Naphthalene	91-20-3	EPA 8270-SIM	0.0067	--
Phenanthrene	85-01-8	EPA 8270-SIM	0.0067	--
Pyrene	129-00-0	EPA 8270-SIM	0.0067	--
Carcinogenic PAHs (cPAHs)				
Benzo[a]anthracene	56-55-3	EPA 8270-SIM	0.0067	--
Benzo[a]pyrene	50-32-8	EPA 8270-SIM	0.0067	--
Benzo[b]fluoranthene	205-99-2	EPA 8270-SIM	0.0067	--
Benzo[k]fluoranthene	207-08-9	EPA 8270-SIM	0.0067	--
Chrysene	218-01-9	EPA 8270-SIM	0.0067	--
Dibenz[a,h]anthracene	53-70-3	EPA 8270-SIM	0.0067	--
Indeno[1,2,3-c,d]pyrene	193-39-5	EPA 8270-SIM	0.0067	--
Metals				
Arsenic (As)	7440-38-2	EPA 6020	5.0	0.5
Cadmium (Cd)	7440-43-9	EPA 6020	0.20	0.10
Chromium (Cr) (total)	7440-47-3	EPA 6020	0.50	1.0
Lead (Pb)	7439-92-1	EPA 6020	2	0.1
Mercury (Hg)	7439-97-6	EPA 7470A/7471A	0.05	0.02

Notes:

¹ Chemical abstract service (CAS) registry number.

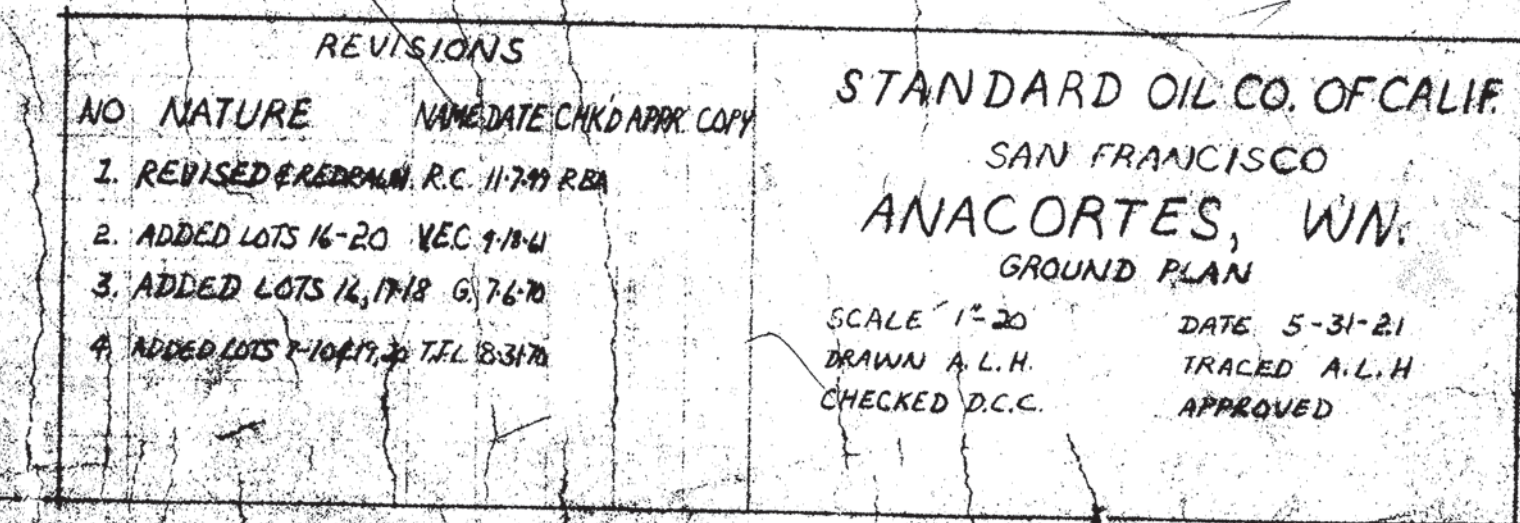
² Practical Quantitation Limit (PQL) values from ARI of Tukwila, Washington for the purposes of the RI/FS Work Plan.

mg/kg = milligram per kilogram

µg/L = microgram per liter

APPENDIX A

Standard Oil Bulk Fuel Terminal Layout



APPENDIX B

Historical Aerial Photos



Photocopy of photograph (Original print, Anacortes Museum.) The Standard Oil complex is forefront in this image with tanks, a Red Crown gasoline facility (part of Standard Oil) and Standard Oil Company offices in the lower right. Anacortes Iron Works (1019 3rd Street) is located behind the tanks at 3rd Street and O Avenue.

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

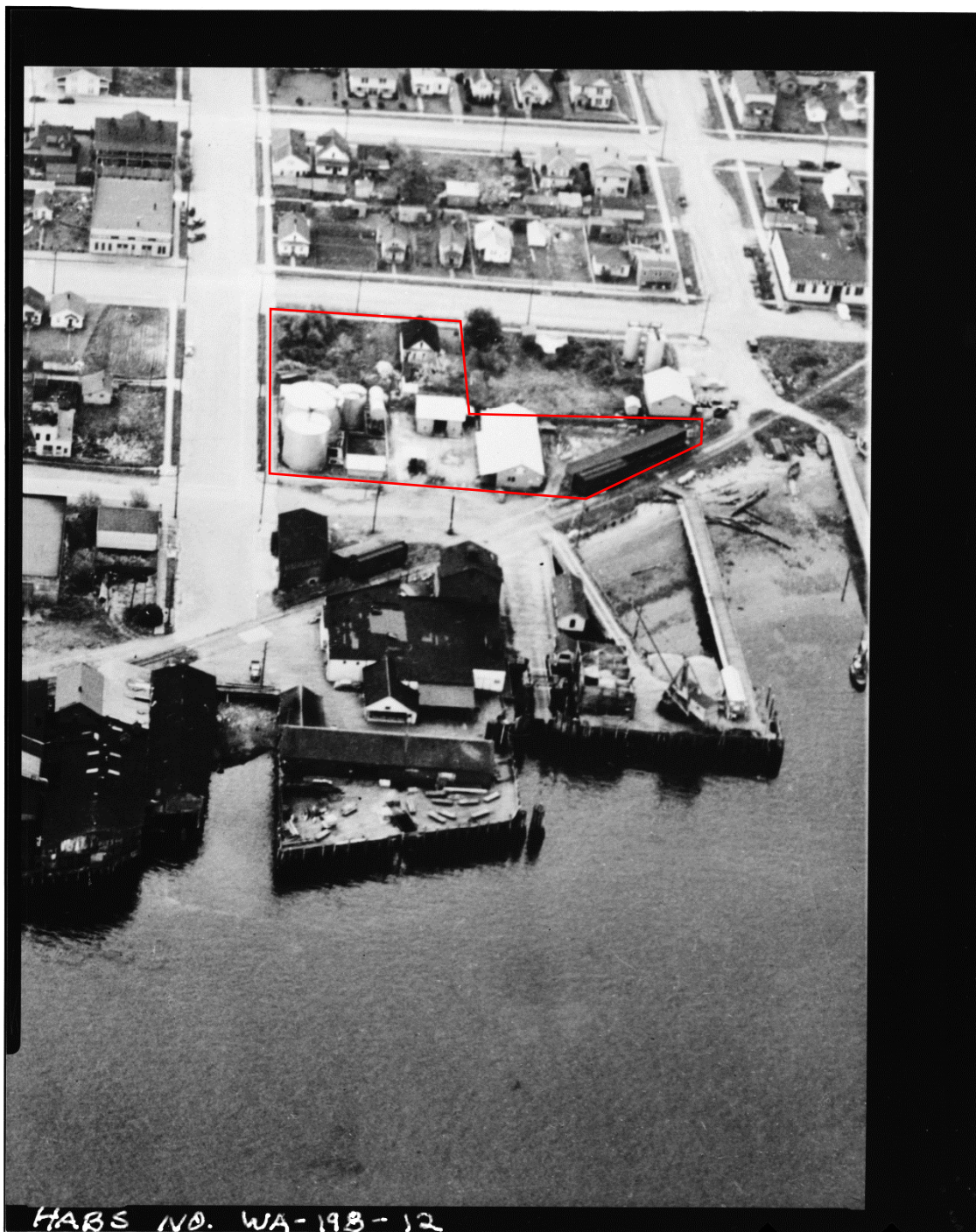
Data Source: Anacortes Museum & Maritime Heritage Center

Historical Photograph – Circa 1909 Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-1



Photocopy of photograph (Original print, Port of Anacortes.) Brady's Anacortes Studio, Photographer, date unknown. Overview of Curtis Wharf and surrounding area. North section of main dock is intact; Sand and Gravel Wharf on the right. - Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA

Photo from Survey HABS WA-198-12

Notes:

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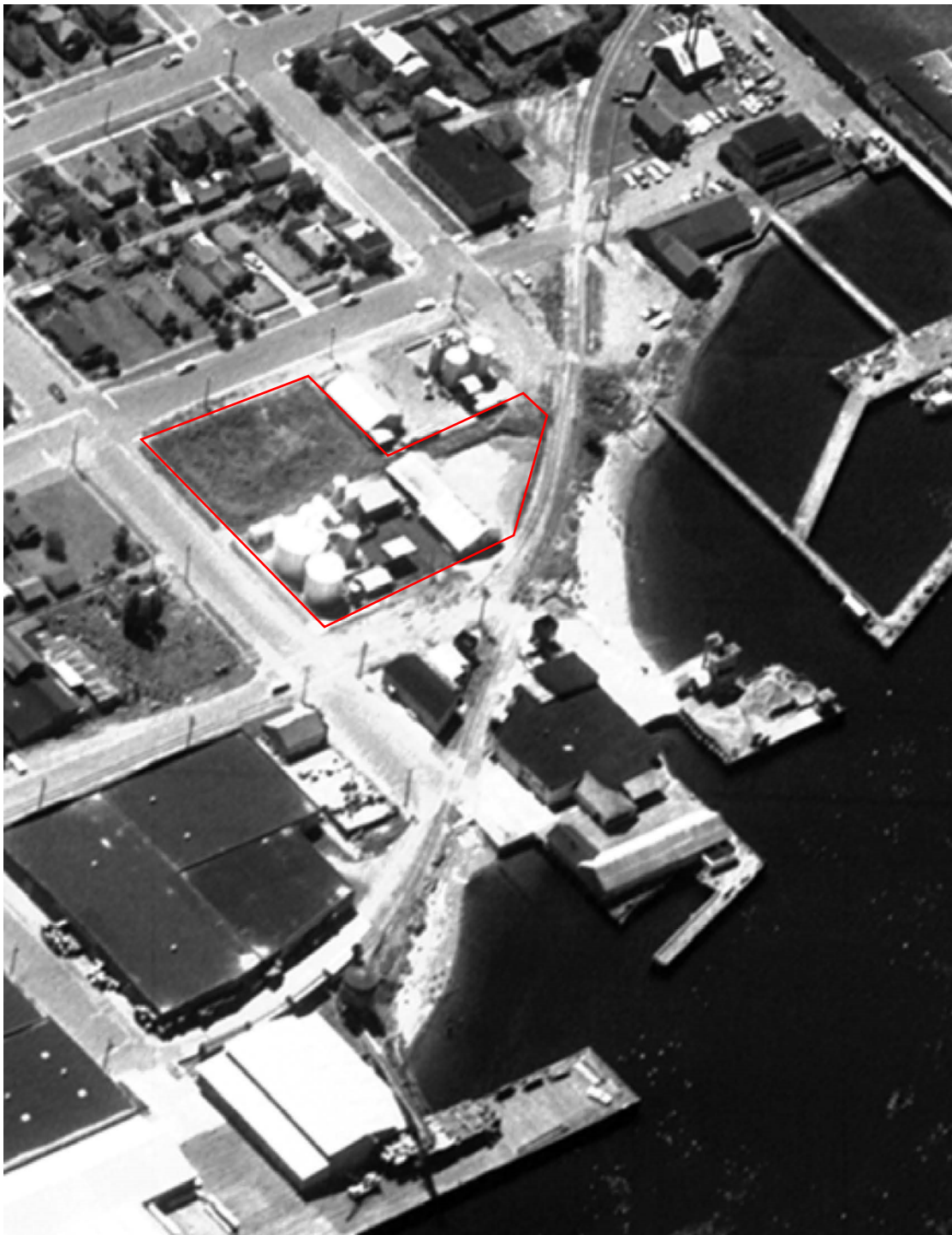
Data Source: Library of Congress

**Aerial Photograph - Circa 1920s
Quiet Cove and Surrounding Area**

Quiet Cove Site
Anacortes, Washington



Figure B-2



Overview of Quiet Cove and surrounding area. Reisner Petroleum Terminal to the south of Curtis Wharf is intact; Standard Oil Facility and railroad line in central portion of photograph. - O & Second Streets, Anacortes, Skagit County, WA

Photo from Anacortes Museum & Heritage Center

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Anacortes Museum & Heritage Center

**Aerial Photograph – Circa 1971
Quiet Cove and Surrounding Area**

Quiet Cove Site
Anacortes, Washington



Figure B-3



Overview of Quiet Cove and surrounding area. Reisner Petroleum Terminal to the southwest of Curtis Wharf is no longer intact; Standard Oil Facility and railroad line in central portion of photograph. - O & Second Streets, Anacortes, Skagit County, WA

Photo from Washington State Department of Ecology Coastal Atlas
<https://fortress.wa.gov/ecy/coastalatlas/tools/ShorePhotos.aspx>

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Washington State Department of Ecology Coastal Atlas

Aerial Photograph – Circa 1977 Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-4



Overview of Quiet Cove and surrounding area. Standard Oil Facility and railroad line is no longer intact. - O & Second Streets, Anacortes, Skagit County, WA

Photo from Washington State Department of Ecology Coastal Atlas
<https://fortress.wa.gov/ecy/coastalatlas/tools/ShorePhotos.aspx>

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Washington State Department of Ecology Coastal Atlas

**Aerial Photograph – Circa 1994
 Quiet Cove and Surrounding Area**

Quiet Cove Site
 Anacortes, Washington



Figure B-5



Overview of Quiet Cove and surrounding area - O & Second Streets, Anacortes, Skagit County, WA

Photo from Washington State Department of Ecology Coastal Atlas

<https://fortress.wa.gov/ecy/coastalatlasc/tools/ShorePhotos.aspx>

Notes:

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Data Source: Washington State Department of Ecology Coastal Atlas

Aerial Photograph – Circa 2001 Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-6



Overview of Quiet Cove and surrounding area - O & Second Streets, Anacortes, Skagit County, WA

Photo from Washington State Department of Ecology Coastal Atlas

<https://fortress.wa.gov/ecy/coastalatlas/tools/ShorePhotos.aspx>

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Data Source: Washington State Department of Ecology Coastal Atlas

Aerial Photograph – Circa 2006 Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-7

APPENDIX C

Quiet Cove Data Report

Data Report

Quiet Cove Site
Anacortes, Washington
Ecology Agreed Order No. DE 11346

for

**Washington State Department of Ecology
on Behalf of Port of Anacortes**

July 5, 2019



Data Report

Quiet Cove Site
Anacortes, Washington
Ecology Agreed Order No. DE 11346

for

**Washington State Department of Ecology
on Behalf of Port of Anacortes**

July 5, 2019



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Data Report
Quiet Cove Property
Anacortes, Washington
Ecology Agreed Order No. DE 11346

File No. 5147-024-07

July 5, 2019

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P.O. Box 47600
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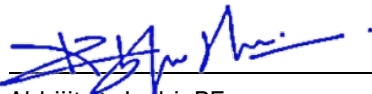
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On Behalf of:

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Anacortes, Washington 98221

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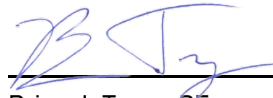
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- Attachment 8. Supplemental Investigation Work Plan Addendum

LIST OF ACRONYMS AND ABBREVIATIONS

Acronym/ Abbreviation	Description
AET	Apparent Effects Threshold
ARI	Analytical Resources, Inc.
AST	aboveground storage tank
BETX	benzene, ethylbenzene, toluene and xylenes
bgs	below ground surface
bml	below mudline
City	City of Anacortes
cPAHs	carcinogenic polycyclic aromatic hydrocarbons
CSL	Cleanup Screening Level
Cw	groundwater concentration protective of sediment
DNR	Washington Department of Natural Resources
Ecology	Washington State Department of Ecology
EDB	1,2 dibromoethane
EDC	1,2 dichloroethane
EPA	United States Environmental Protection Agency
GeoEngineers	GeoEngineers, Inc.
GPS	global positioning system
HSA	hollow-stem auger
IPG	Integrated Planning Grant
mg/kg	milligrams per kilogram
MLLW	mean lower low water
MTCA	Model Toxics Control Act
MTBE	methyl tertiary-butyl ether
ng/kg	nanograms per kilograms
Order	Agreed Order No. DE 11346
PAHs	polycyclic aromatic hydrocarbons
Port	Port of Anacortes
ppm	parts per million

PQL	practical quantitation limit
PSEP	Puget Sound Estuary Program
QA/QC	quality assurance/quality control
RI/FS	remedial investigation/feasibility study
ROW	right-of-way
SAP	Sampling and Analysis Plan
SCO	Sediment Cleanup Objective
SCUM II	Sediment Cleanup User's Manual II
SIM	selective ion monitoring
Site	Quiet Cove
SMS	Sediment Management Standards
SVOCs	semi-volatile organic compounds
TEQ	toxicity equivalent (refers to concentration basis)
TOC	total organic carbon
TS	total solids
TVS	total volatile solids
µg/L	micrograms per liter
µg/mg	micrograms per milligram
VOCs	volatile organic compounds
WAC	Washington Administrative Code

1.0 INTRODUCTION

This Data Report describes sampling and analysis activities completed as part of Remedial Investigation (RI) and Supplemental Remedial Investigation (Supplemental Investigation) for the Quiet Cove Cleanup Site (Site) located in Anacortes, Washington (Figure 1). The Site refers to the area within and surrounding the Quiet Cove property that is impacted by historical contamination released to the environment. The Site is currently listed in the Washington State Department of Ecology (Ecology) database of confirmed and suspected contaminated sites under Facility/Site Number 20859 and maintains Cleanup Site ID 12482.

The RI activities were performed by the Port of Anacortes (Port) in 2017 under an Agreed Order (AO) No. DE 11346 issued by the Ecology to evaluate the nature and extent of contamination in soil, groundwater and sediment. The Supplemental Investigation activities were completed in 2018 by the Port to fill data gaps in the initial investigation and further define the nature and extent of contamination in soil and groundwater. The Port has prepared this Data Report to present the data collected to date. The data presented in this report will be used as a basis for the interim cleanup action at the Site.

In accordance with the AO, the Port is also required to prepare an RI and Feasibility Study (RI/FS) Report per Washington Administrative Code (WAC) 173-340-350 and WAC 173-204-560 addressing contamination throughout the Site. The RI/FS Report will be prepared in the future, and the data contained in this document will be used as the basis for its preparation. The RI/FS Report will define the nature and extent of contamination, establish preliminary cleanup levels, present an evaluation of potential cleanup action alternatives for addressing identified contamination and identify a preferred cleanup action alternative.

2.0 BACKGROUND

Detailed information on Site background including location, physical description, use history, and summary of previous environmental investigations are presented in the Ecology-approved RI/FS Work Plan (GeoEngineers 2017). A brief summary is included below.

2.1. Site Description and Operational History

The Site is situated along the southeast shoreline of Guemes Channel at 202 O Avenue (at the intersection of 2nd Street and O Avenue) in Anacortes, Washington (Figure 1). The Site comprises three City of Anacortes (City) parcels – P55354, P55358, and P55359, totaling approximately 0.82 acres. Adjacent properties include a Port-owned storage yard (Parcel No. P55355) and a bulk fuel distribution facility owned and operated by Texaco/Reisner (Parcel No. P55357) to the west, Guemes Channel to the northwest and City streets including 2nd Street, O Avenue and 3rd Street to the north, east and south, respectively. The Site, surrounding areas and parcel boundaries are presented on Figure 2.

The Mean Higher High Water (MHHW) line of the Guemes Channel (shown on Figure 2) generally delineates the marine and upland areas of the Site. The Site is relatively flat and gently slopes to the northwest towards the Guemes Channel. The surfaces in the northern portions of the Site are generally at street level. The street level gradually climbs to the south and as a result the southern portion of the Site is approximately 5 to 6 feet below the adjacent street level. A retaining wall exists along the southern, and portions of the

eastern and western perimeters of the Site to support the the elevation transition. Site topography based on a recent survey (dated 2017/2018) completed by Sound Development Group (SDG) is shown on Figure 2. The Site and surrounding areas are generally covered with buildings, concrete, gravel or asphalt. Planting strips are located on the 2nd and 3rd Street, and O Avenue Rights-Of-Way (ROWs). Currently, a combined office/warehouse building measuring approximately 100 feet long by 45 feet wide and a second warehouse building measuring approximately 50 feet long by 35 feet wide are present in the northwest portion of the Site. A chain link fence surrounds the Site limiting general public access. Vehicle and pedestrian access to the Site is through a gated entrance south of 2nd Street. The utilities known to be present within or adjacent to the Site include power, water, sewer, storm drains, telephone and gas based on SDG's survey.

The Port purchased the property comprising parts of the Site in July 2013 for the purposes of redevelopment. The Site was historically used for bulk fuel storage and auto storage as early as 1925, and included five steel oil tanks, filling shed, oil warehouse, oil staging area, and an auto shed. These structures were removed at some point, but no documentation is available on when the removal occurred. Following decommissioning of the bulk fueling facility, the Site was used for storage of various marine and auto equipment. Currently the Port leases parts of the Site to companies working in the marine fishing industry, and it is primarily used as a storage yard.

2.2. Previous Environmental Investigations

The Port performed a Focused Site Investigation in 2014 as part of an Ecology's Integrated Planning Grant (IPG) to evaluate the presence of contamination in soil and groundwater at the Site. The Focused Site Investigation was completed under an Ecology-approved Work Plan. No other environmental studies are known to have been completed at the Site prior to this investigation. The results of investigation completed in 2014 are presented in the Ecology-approved Focused Environmental Site Investigation Data Report (GeoEngineers, 2014) and summarized in Ecology-approved RI/FS Work Plan (GeoEngineers 2017). Soil and groundwater sample locations completed in 2014 as part of this investigation are shown on Figure 3. Exploration logs describing materials encountered, field screening results and sample intervals for the Focused Site Investigation are provided in Attachment 1. The findings from this investigation were reviewed for technical quality relative to the quality assurance (QA) and quality control (QC) objectives presented in the Ecology-approved RI/FS Work Plan and are considered acceptable for use in the future RI Report.

3.0 SUMMARY OF REMEDIAL INVESTIGATION FIELD ACTIVITIES

The RI activities were completed in 2017 and primarily included the following:

- Topographic survey to document existing surface conditions and utilities at the Site.
- Sampling and analysis of fill and native soil to evaluate the stratigraphy and nature and extent of contamination.
- Sampling and analysis of groundwater to evaluate water quality parameters and nature and extent of contamination.
- Sampling and analysis of surface and subsurface sediment to evaluate the stratigraphy and nature and extent of contamination.

- Tidal study and hydraulic conductivity testing to evaluate aquifer characteristics including groundwater gradient and flow direction, hydraulic connection between groundwater and adjacent marine surface water and groundwater flow velocities.

Further description of the field activities performed for the RI is presented in the following sections.

3.1. Topographic Survey, and Groundwater Seep and Curtis Wharf Visual Survey

A topographic survey completed in October 2017 by professional surveyors registered in the State of Washington at Sound Development Group (SDG) documented surface conditions and utilities at the Site and included the intertidal portions of the Site extending from the northern end of N Avenue to Curtis Wharf. A portable document format (PDF) file of the survey is presented in Attachment 2.

As requested by Ecology, a visual survey of the beach area for groundwater seeps was completed along the shoreline west of the Site. In August 2017, a visual survey was performed during low tide by GeoEngineers to investigate seeps at the apparent fill and native material contact. The results of the survey did not identify discrete seeps. The visual survey identified saturated zone of sediment at elevations between approximately 0 to 2 feet NAVD88 (elevation 0.66 to 2.66 feet mean lower low water [MLLW]) throughout the beach area, indicating a general groundwater flow towards the channel. No field evidence of contamination (e.g. petroleum sheen, staining or odor) was present. See Attachment 2 for photos collected as part of the shoreline seep visual survey.

A visual survey below Curtis Wharf was completed at low tide to confirm that any potential historical product supply lines located beneath the former pier structure were removed and capped at the bulkhead. No visual evidence of supply lines beneath the existing pier bulkhead were observed, and there was no field screening evidence of contamination (e.g. petroleum sheen, staining or odor) at the bulkhead. See Attachment 2 for visual survey photos of the bulkhead area.

3.2. Soil Investigation

Soil sampling and analysis was completed in September 2017 in general accordance with the Ecology-approved RI/FS Work Plan. Soil samples were collected using direct-push and hollow-stem auger drilling techniques. Soil boring locations for the RI are shown on Figure 3. Field data including boring coordinates, ground surface elevation, sample collection method, material descriptions encountered, field screening results and sampling intervals for the samples collected as part of the RI are presented on the boring logs provided in Attachment 1.

3.2.1. Direct-Push Borings

Direct-push (DP) borings GEI-29 through GEI-44 (16 in total) were completed in September 2017 by a Washington State licensed driller (Cascade Drilling, Inc.) using a truck mounted Geoprobe drill rig to depths ranging between 6 and 15 feet below ground surface (bgs). Continuous cores were obtained from the DP boring locations using a lined 3.5-inch-diameter and 5-foot-long sampler. The sampler was driven to this full length using a pneumatic hammer.

Soil from each core interval was visually classified in general accordance with ASTM International (ASTM) D-2488 (Standard Practice for Description and Identification of Soils [Visual Manual Procedure]) and screened in the field for the presence of contamination. In addition, the presence of wood or other debris by type and estimated quantity (i.e., observed percent by volume) were also recorded when encountered.

Field screening included visual observation of contamination (i.e., staining, discoloration, etc.), water sheen testing, and organic vapor monitoring using a photo-ionization detector (PID) as described in the Ecology-approved RI/FS Work Plan. Direct-push soil boring logs presenting this information are included in Attachment 1.

3.2.2. Hollow-Stem Auger Borings

Hollow-stem auger (HSA) borings MW-6 through MW-8 and MW-10 (5 in total) were completed in September 2017 by a Washington State licensed driller (Cascade Drilling, Inc.) using a truck mounted HSA drill rig to depths ranging between 13 and 15 feet bgs. The HSA borings were advanced for the collection of soil samples and installation of groundwater monitoring wells. Soil samples were obtained from the HSA borings using a 2.5-inch-diameter and 18-inch-long split-spoon sampler. The sampler was driven to its full length using a 140-pound hammer falling a vertical distance of approximately 30 inches. The number of blows needed to advance the sampler were recorded and are presented on the boring logs.

Soil from each sampler was visually classified and screened in the field as described in Section 3.2.1 above. HSA boring logs are presented in Attachment 1.

3.2.3. Soil Sample Collection and Analysis

After the soil samples were retrieved in cores/sampler, field personnel identified sample intervals to be collected for chemical analysis in accordance with the Ecology-approved RI/FS Work Plan. The samples for volatile organic compound (VOC) analysis were collected from the undisturbed core/sampler using Environmental Protection Agency (EPA) Method 5035A. The remainder of the soil sample interval was removed from the core/sampler for field screening and sample collection. A portion of the sample interval was used for field screening and the remaining portion was homogenized to a uniform color and texture in a stainless-steel bowl and placed into laboratory-supplied containers, lightly packed, and capped with a plastic lid.

In general, soil samples were collected from materials yielding field screening evidence of contamination and/or from materials representative of the different sampling horizons (fill, water table and native). The schedule of analysis for soil samples collected from each boring location for the Focused Environmental Investigation and the RI are identified in Table 1. Samples were submitted to an Ecology-certified laboratory – Analytical Resources Inc. (ARI) located in Tukwila, Washington. Selected samples were analyzed for a combination of the following constituents in accordance with the Ecology-approved RI/FS Work Plan:

- Metals (including arsenic, cadmium, chromium, copper, lead, mercury, silver and zinc) by EPA Method 6000/7000 series.
- Gasoline-range petroleum hydrocarbons by Ecology Method NWTPH-Gx.
- Diesel- and heavy oil-range petroleum hydrocarbons by Ecology Method NWTPH-Dx.
- BETX by EPA Method 8260.
- Fuel additives including EDB, EDC, MTBE and n-hexane by EPA Method 8260.
- PAHs by EPA Method 8270D/SIM.

3.3. Groundwater Investigation

Groundwater sampling and analysis was completed in general accordance with the Ecology-approved RI/FS Work Plan. Five wells MW-6 through MW-8, MW-10 and MW-11 were constructed and developed in September 2017 as part of the RI. The groundwater investigation included two rounds of groundwater sampling and analysis completed in October 2017 and March 2018 at 10 wells MW-1 through MW-8, MW-10 and MW-11. The groundwater well locations are shown on Figure 3.

3.3.1. Monitoring Well Construction and Development

Drilling and construction of the monitoring wells was completed by Cascade Drilling, Inc., a Washington State licensed driller, in general accordance with the Minimum Standards for Construction and Maintenance of Wells (WAC 173-160). Monitoring well borings were drilled using a truck mounted HSA drill rig. Installation of the monitoring wells was observed by a GeoEngineers representative, who maintained a detailed log of the well construction.

Wells were constructed using a 2-inch-diameter, flush-threaded, Schedule 40 polyvinyl chloride (PVC) casing with a machine-slotted PVC screen (0.010-inch). The top of the well screen was positioned approximately 5 feet above the observed groundwater level at the time of drilling, or approximately 3 feet bgs, whichever was deeper. Well screened intervals ranging from 5 to 10 feet in length were positioned across the water table.

Following placement of the well screen and casing in the borehole, a filter pack was installed around the well screen from the bottom to approximately 1 to 2 feet above the top of the well screen. An approximately 1-foot thick bentonite annular seal was placed above the filter pack. Each well was completed with an approximately 1 to 2-foot thick concrete seal that contains a flush-mount monument. Field data including sample coordinates and monitoring well construction details are presented in the exploration logs in Attachment 1.

The monitoring wells were developed in September 2017. For the well development, a decontaminated slug rod was used to create a surging effect and reduce fine sediment from caking around the installed screened intervals. The surge block was decontaminated prior to use at each well in accordance with the Ecology-approved RI/FS Work Plan. Then a low flow peristaltic pump purged a minimum of 3 well volumes of groundwater until low turbidity water was measured <25 NTU (nephelometric turbidity units). Purged water was placed in 55-gallon drums and stored at the Site.

Upon completion, a licensed surveyor (Sound Development Group) surveyed the location of each monitoring well and recorded the ground surface elevation of the well monument rim as well as top of casing elevation to the nearest 0.01 foot referencing the northern portion of the rim and casing. The survey completed by SDG is presented in Attachment 2.

3.3.2. Groundwater Sampling and Analysis

Groundwater samples from monitoring wells MW-1 through MW-8, MW-10 and MW-11 were collected for analysis and submitted to ARI located in Tukwila, Washington during two rounds of sampling (October-November 2017 and March 2018). Groundwater samples were analyzed for a combination of the following chemical constituents in accordance with the Ecology-approved RI/FS Work Plan:

- Total and dissolved metals (including arsenic, cadmium, chromium, copper, lead, mercury, silver and zinc) by EPA Method 200.8 and 6000/7000 series.
- Gasoline-range petroleum hydrocarbons by Ecology Method NWTPH-Gx.
- Diesel- and heavy oil-range petroleum hydrocarbons by Ecology Method NWTPH-Dx.
- BETX by EPA Method 8260.
- Fuel additives including EDB, EDC, MTBE and n-hexane by EPA Method 8260.
- cPAHs by EPA Method 8270D/SIM.

The schedule of analysis for groundwater samples collected as part of the RI is summarized in Table 2. In accordance with the Ecology-approved RI/FS Work Plan, groundwater samples were obtained using low-flow/low-turbidity sampling techniques to minimize the suspension of sediment in the samples. Prior to sample collection, each well was purged using a peristaltic pump and disposable polyethylene tubing at a rate not to exceed draw down in the well by more than five percent or 500 millimeters per minute. A YSI Pro series water quality meter with a flow-through cell was used to monitor water quality parameters during purging including electrical conductivity, dissolved oxygen, pH, salinity, total dissolved solids, oxidation-reduction potential and temperature. A Hach turbidimeter was used to measure turbidity. Samples were collected from the wells after water quality parameters stabilized and varied by less than 10 percent on three consecutive measurements. Samples collected for dissolved metals analyses were filtered in the field using a disposable inline 0.45-micron filter. Samples were collected directly into laboratory provided containers in accordance with the Ecology-approved RI/FS Work Plan.

3.4. Sediment Investigation

In accordance with the Ecology-approved RI/FS Work Plan, a sediment investigation was completed in a tiered approach. Tier 1 included collection of sediment samples in conjunction with upland area soil sampling field activities. Following the analytical results of the Tier 1 sediment samples, Tier 2 sediment sampling and analysis was completed in coordination with Ecology to further investigate the nature and extent of contamination in sediment. The following sections describe both the Tier 1 and 2 sediment sampling and analysis activities:

3.4.1. Tier 1 Sediment Sampling and Analysis

The objective of the Tier 1 sediment sampling was to determine if contaminated sediment exists adjacent to the Site. If the Tier 1 sampling identified contaminated sediment, then additional characterization would be completed under a Tier 2 sediment investigation.

Tier 1 sediment sampling was completed by Cascade Drilling on September 15, 2017 using a restricted access direct push drilling rig during low tide conditions. Three sample locations SED-1A, -1B and -1C positioned in the intertidal area of the Site (Figure 3) were attempted to collect surface and subsurface samples. A surface composite grab sample was collected from SED-1A, SED-1B and SED-1C by GeoEngineers field personnel from 0 to 10 centimeters (cm) in depth. The surface composite grab sample was collected with a decontaminated stainless-steel spoon and homogenized in a decontaminated stainless-steel bowl prior to collection in laboratory provided containers.

Discrete subsurface samples were planned to be collected at the three locations (SED-1A through -1C) to depths approximately 8 to 12 feet below mudline (bml). However, refusal was encountered upon multiple

attempts at SED-1A at approximately 1 to 2 feet bml due to rock and concrete and therefore, the location was abandoned and a sediment core was not completed. Sediment cores were completed at locations SED-1B and SED-1C to depths of 9 and 12 feet bml, respectively. Due to the loose nature of coarse sand and saturation of the sediment, the recovery from these core locations below approximately 5 to 6 feet bml was poor and not enough to provide the required sediment volume for the proposed sediment laboratory analyses. Ecology project managers were at the Site during the sampling and decided that subsurface sediment material from the cores in SED-1B and -1C be composited to provide sufficient sample volume for analysis. GeoEngineers and Ecology examined the sediment cores and decided to collect a total of two composite samples by combining two core intervals from SED-1B and SED-1C. These intervals were selected based on similar lithology and depths. First composite sample was collected by combining interval ranging from 1 to 3 feet bml from both location and the second composite sample was collected by combining interval ranging from 4 to 6 feet bml from both locations. The decisions for compositing these subsurface intervals was completed in the field in collaboration with Ecology personnel. Subsurface sediment samples were collected consistent with the Ecology-approved RI/FS Work Plan and as described in the soil sampling Section 3.2.3 above.

Tier 1 sediment samples were submitted for analysis to ARI located in Tukwila, Washington. Sediment samples were analyzed for a combination of the following Sediment Management Standards (SMS) constituents in accordance with the Ecology-approved RI/FS Work Plan:

- Conventional parameters including total organic carbon (TOC), total volatile solids (TSS), total solids (TS), sulfide and ammonia.
- Grain size by PSEP 1986 or ASTM International (ASTM)-Mod.
- Metals (including arsenic, cadmium, chromium, copper, lead, mercury, silver and zinc by EPA Method 200.8 and 6000/7000 series.
- Gasoline-range petroleum hydrocarbons by Ecology Method NWTPH-Gx.
- Diesel- and heavy oil-range petroleum hydrocarbons by Ecology Method NWTPH-Dx.
- BETX by EPA Method 8260.
- Fuel additives including EDB, EDC, MTBE and n-hexane by EPA Method 8260.
- SMS PAHs and semi-volatile organic hydrocarbons (SVOCs) by EPA Method 8270-SIM.

The schedule of analysis for Tier 1 sediment samples collected is summarized in Table 3. Exploration logs for the sediment cores are included in Attachment 1.

3.4.2. Tier 2 Sediment Sampling and Analysis

In accordance with the Ecology-approved RI/FS Work Plan, Tier 2 sediment sampling and analysis was triggered based on the analytical results of the Tier 1 samples. The Port and GeoEngineers developed a Quiet Cove RI Tier 2 Sampling Memorandum (GeoEngineers, 2018) to present Tier 2 sediment sampling and analysis plan utilizing the upland and Tier 1 sediment analytical results. The Quiet Cove RI Tier 2 Sampling Letter was approved by Ecology in April 2018 and is included as Attachment 3.

Tier 2 sediment sampling was completed in July 2018 with oversight by Ecology. Sediment samples were collected using both land-based and boat-mounted equipment. Land-based equipment used for sediment

sampling included hand tools and rotary hammer driven core tubes. Boat-mounted equipment included power-grab and vibracore owned and operated by Gravity Environmental (Gravity). GeoEngineers personnel collected surface samples on the upper beach using hand tools and sampling using power grab, vibracore and rotary hammer methods was performed by Gravity with oversight by GeoEngineers.

Five surface sediment samples SED-5 through SED-9 were collected from 0 to 10 cm bml via beach access at low tides using stainless-steel hand trowels and placed in a stainless-steel bowl for field screening and homogenization. Four surface sediment samples SED-2 through SED-4 and SED-10 were collected from 0 to 10 cm bml by a power-grab sampler deployed from Gravity's sampling boat at higher tides. These samples were also field screened and homogenized in stainless-steel bowls on the research vessel. Surface sediment samples were placed in laboratory provided jars required for analysis.

Tier 2 sediment core locations in the portions of the upper beach were not possible for the research vessel to attempt using vibracore methods due to tidal conditions. Per the contingency plan in the Quiet Cove RI Tier 2 Sampling Memorandum these cores were attempted using land-based equipment. Three subsurface core locations in the upper beach (SED-6, SED-7 and SED-9) were completed using a portable electric rotary hammer to drive a 3.5-inch-diameter Lexan core tube to depths up to 5-feet bml. The success of this coring method was variable because refusal was encountered due to debris including asphalt and concrete in portions of the beach. Upon completion of the core, the Lexan core tube was cut open, and material was field screened. Sample intervals were then selected according to the sampling plan. Samples were collected for analysis consistent with procedures in the Ecology-approved RI/FS Work Plan and described in Section 3.2.3 above. The rotary hammer sampling method in these locations did not achieve full depth to reach the native horizon for cores as proposed in the Quiet Cove RI Tier 2 Sampling Memorandum.

Six sediment core locations at lower elevations (SED-2 through SED-5, SED-8 and SED-10) were completed during high tides using vibracore methods from Gravity's research vessel during higher tidal conditions. Vibracoring was completed by using 5-inch-diameter Lexan core tube lined with a polyethylene bag. Core tubes up to 10-feet in length were equipped with a sediment catcher on the bottom to minimize sediment loss when the core was removed through the water column. The core tube was positioned on the sampling location utilizing Gravity's integrated GPS software on the research vessel and recorded by a GeoEngineers representative. Once retrieved, the core tube was transferred to an upland sample processing station for field screening and logging the sediment core. Processing the cores included first removing the polyethylene liner to view, log and field screen the core; then sample interval selection; and lastly collection of samples for analysis and archive consistent with the Ecology-approved RI/FS Work Plan and as described in Section 3.2.3 above.

Tier 2 sediment samples were submitted to ARI located in Tukwila, Washington. Sediment samples were analyzed for a combination of the following constituents in accordance with the Ecology-approved RI/FS Work Plan:

- Conventional parameters including total organic carbon (TOC), total volatile solids (TSS), total solids (TS), sulfide and ammonia.
- Grain size by PSEP 1986 or ASTM International (ASTM)-Mod.
- Metals (including arsenic, cadmium, chromium, copper, lead, mercury, silver and zinc by EPA Method 200.8 and 6000/7000 series.

- Gasoline-range petroleum hydrocarbons by Ecology Method NWTPH-Gx.
- Diesel- and heavy oil-range petroleum hydrocarbons by Ecology Method NWTPH-Dx.
- BETX by EPA Method 8260.
- Fuel additives including EDB, EDC, MTBE and n-hexane by EPA Method 8260.
- SMS PAHs and semi-volatile organic hydrocarbons (SVOCs) by EPA Method 8270-SIM.

Following review of Tier 2 sediment sample analytical results, additional archive samples from locations SED-2 through SED-4 were submitted for analysis. These additional analyses were completed in coordination with Ecology via email exchanges in October and November 2018 with Ecology providing concurrence on the archive analysis on November 2, 2018. The schedule of analysis for Tier 2 sediment samples collected is summarized in Table 3. Exploration logs for the sediment cores are included in Attachment 1.

3.5. Hydrogeological Investigation

Hydrogeological investigation was completed in accordance with the Ecology-approved RI/FS Work Plan and included completion of a tidal study and hydraulic conductivity testing at selected monitoring well locations (Figure 4). The following sections summarize field activities completed as part of hydrogeological investigation. A more detailed description of the procedures and results of the hydrogeological investigation are provided in Attachment 4.

3.5.1. Tidal Study and Groundwater Flow

A 72-hour tidal study was completed between 8:00 am on November 7 and 8:00 am on November 9, 2017 using a subset of the Site monitoring wells to evaluate the influence of tidal variations in the level of surface water in Puget Sound/Guemes Channel on groundwater levels. Monitoring well locations adjacent to the shoreline including MW-1, MW-2, MW-3, and MW-8 and wells located at varying distances from the shoreline including MW-4, MW-5, MW-6, MW-7, MW-10, and MW-11 were selected to evaluate influence of tidal action on groundwater. The locations that were monitored as part of the tidal study are shown on Figure 4.

The tidal study recorded groundwater/potentiometric level response to tidal fluctuations using electronic water-level sensors consisting of a pressure transducer and automated datalogger temporarily installed in monitoring wells. Additionally, an electronic water-level sensor was installed in Guemes Channel to directly monitor and record the surface water level for comparison to water levels recorded in monitoring wells. The water-level sensors were removed from the monitoring locations and Guemes Channel after completion of data collection and the data was downloaded for analysis.

The data generated as part of the tidal study was analyzed using the Serfes (1991) method to identify the mean groundwater elevations and flow direction during the 72-hour tidal study, and the Ferris (1951) method to evaluate hydraulic parameters of the aquifer at the Site. The results from the tidal study are presented in Attachment 4.

Data from the 72-hour tidal study performed at monitoring well locations MW-1 through MW-8, MW-10, and MW-11 (Figure 4) in November 2017 was utilized to characterize groundwater flow characteristics and gradients at the Site. Water level elevation data was collected every 15 minutes in each monitoring well

using electronic data loggers and well transducers. Electronic data measurements were confirmed by periodically obtaining manual water level measurements during the study.

3.5.2. Hydraulic Conductivity Testing

Slug testing was performed on selected monitoring locations at the Site on November 16, 2017. The purpose of the slug testing was to use the data, in combination with data gathered during the tidal study, to estimate hydraulic conductivity (K) within the aquifer in the vicinity of the test locations. Slug testing was performed at six locations (MW-2, MW-3, MW-4, MW-6, MW-7 and MW-11) as shown in Figure 4. Procedures for performing the slug tests and results are presented in Attachment 4.

3.6. Disposal of Investigation Derived Waste

Soil cuttings (unused soil from the explorations) from explorations completed during the RI, purge water generated during well development and groundwater sampling activities, and wash water used to decontaminate the reusable sampling equipment was placed in separate labeled and sealed 55-gallon drums pending permitted disposal. Disposable sampling equipment including gloves, sample liners, paper towels, foil, and plastic bags were disposed of as solid waste.

Upon completion of the soil and groundwater investigation, soil cuttings, purge water and decontamination water stored in drums were transferred from the property by Waste Management (WM) for permitted disposal on March 7, 2018. Six (6) 55-gallon drums of water and four (4) 55-gallon drums of soil cuttings were disposed of. See Attachment 5 for Waste Disposal records.

3.7. Quality Assurance and Quality Control

The scope of the RI field investigation and associated QA/QC procedures were defined in the Ecology-approved RI/FS Work Plan. This section includes discussion of laboratory sample handling, laboratory data quality and deviations from the Ecology-approved RI/FS Work Plan for the field activities performed.

3.7.1. Sample Handling and Shipment

Soil, groundwater and sediment samples collected during the investigation were transported to ARI, using chain-of-custody procedures described in the Ecology-approved RI/FS Work Plan. Samples were placed in laboratory-prepared containers and stored in coolers with ice following collection and during transport to the testing laboratory. Sampling and handling procedures were completed in accordance with the Ecology-approved RI/FS Work Plan.

3.7.2. Laboratory Data Quality

Laboratory data from conventional and chemical analyses underwent data quality review and validation. The laboratory data was identified to be of adequate quality for the intended use. Laboratory reports are provided in Attachment 6 and Data Validation Reports are provided in Attachment 7.

3.7.3. Deviations from the Ecology-approved RI/FS Work Plan

The following are deviations from the Ecology-approved RI/FS Work Plan:

- Drilling and soil sampling at location GEI-45 was not completed after multiple attempts because direct push explorations encountered refusal at approximately 2 feet bgs due to buried concrete debris in the subsurface.
- Installation of monitoring well MW-9 could not be completed because subsurface concrete and debris was encountered approximately 2 feet bgs at the proposed location. Multiple attempts in the vicinity of proposed MW-9 were performed without success. It is assumed that this location is underlain by a thick concrete layer adjacent to the Curtis Wharf facility. Equipment was not available on Site to core through the concrete. Ecology was on Site during the field work and concurred that this well could not be constructed as planned.
- Two monitoring wells MW-6 and MW-10 were moved from their planned location. Monitoring well MW-6 was moved approximately 20 feet to the east due to existing overhead power lines. Monitoring well MW-10 was moved approximately 25 feet to the north inside the property boundary due to conflicts with overhead utilities. Ecology was in the field during monitoring well installation activities and was in agreement with the change in location for these two wells.
- Tier 1 sediment sampling was modified in the field in collaboration with Ecology as discussed in detail in Section 3.4.1 above.
- Tier 2 sediment sampling as detailed in the Ecology-approved RI/FS Work Plan was modified as documented in Quiet Cove RI Tier 2 Sampling Memorandum that was reviewed and approved by Ecology prior to sample collection. Tier 2 Sampling was completed in accordance with the Tier 2 Sampling
- Tier 2 sediment sample locations in the upper areas of the beach (SED-5 through SED-9) were not completed to proposed depths due to refusal from subsurface rock, concrete and/or debris as described in Section 3.4.2 above. The equipment and methods available during the field activities were not sufficient to reach the proposed depths.

4.0 SUMMARY OF SUPPLEMENTAL REMEDIAL INVESTIGATION FIELD ACTIVITIES

Upon completion of the RI field activities the Port requested to complete a Supplemental Remedial Investigation (Supplemental Investigation) in the upland portion of the Site to fill identified data gaps in the Site soil and groundwater characterizations. The RI primarily focused on defining the extent and limits of contamination, but additional information was needed for defining the nature of contaminated soil and groundwater in the most contaminated area of the Site. The Port and GeoEngineers developed a Work Plan Addendum (Work Plan Addendum; GeoEngineers 2018; Attachment 8), which presented a detailed plan for Supplemental Investigation. The Work Plan Addendum was developed in coordination with Ecology and was approved by Ecology on October 4, 2018. The Supplemental Investigation included soil borings, construction of a new monitoring well, installation of pre-pack well points, and soil and groundwater sampling and analysis. The following sections provide documentation of the Supplemental Investigation field activities.

4.1. Supplemental Investigation Soil Investigation

Soil borings were completed to further define the nature and extent of contaminated soil at the Site by sampling shallow fill, contaminated fill, water table and native soil horizons. Drilling activities were completed by Cascade Drilling, Inc. on October 17 and 18, 2018. Soil borings SD-1 through SD-10 and

MW-12 were completed to depths of 10 to 20 feet bgs using direct-push drilling methods. The objective for the supplemental soil sample collection was to collect and analyze samples at up to four (4) intervals in each core including: near surface fill, vadose zone fill with highest PID reading, water table fill and, native material. Boring locations are presented in Figure 3. Soil cores were logged and sample intervals approximately 1 to 2 ft in length were identified and collected for analysis in accordance with the Ecology-approved Work Plan Addendum using procedures consistent with the RI soil sampling activities as described in Section 3.2.3. The sample intervals collected were consistent with the intent of the Ecology-approved Work Plan Addendum. In some soil cores (SD-3, SD-4 and SD-5) the highest PID reading interval corresponded with the water table interval, and therefore only three (3) samples were collected at those boring locations.

Attachment 1 presents the boring logs and identifies the sample intervals collected. Table 4 presents samples collected from each soil boring location and the schedule of analysis.

Supplemental Investigation soil samples were submitted to ARI located in Tukwila, Washington for analysis and archival. Soil samples were analyzed for a combination of the following constituents in accordance with the Work Plan Addendum:

- Metals (arsenic, cadmium, chromium, lead and mercury) by EPA 6000/7000;
- Gasoline-range total petroleum hydrocarbons (TPH) by NWTPH-Gx;
- Heavy oil- and diesel-range TPH by NWTPH-Dx;
- BETX by EPA 8260;
- Fuel additives including EDB, EDC, MTBE and n-hexane by EPA Method 8260;
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs) by EPA 8270-SIM; and/or
- Naphthalenes by EPA 8270-SIM.

4.2. Supplemental Investigation Groundwater Monitoring

The Supplemental Investigation groundwater monitoring was completed in October and November 2018 in general accordance with the Ecology-approved Work Plan Addendum and included monitoring well construction and development, pre-pack well installation, water/product level measurement and groundwater sampling and analysis. The following sections present details on the groundwater field activities for the Supplemental Investigation.

4.2.1. Monitoring Well Construction and Development

Monitoring well MW-12 was drilled and constructed on October 18, 2018 in accordance with the Ecology-approved Work Plan Addendum. Drilling and construction of the monitoring wells was conducted by a Washington State licensed driller from Cascade Drilling, Inc. in general accordance with the Minimum Standards for Construction and Maintenance of Wells (WAC 173-160). Monitoring well MW-12 was drilled using a truck mounted HSA drill rig. Installation of the monitoring wells was observed by a GeoEngineers representative, who maintained a detailed log of the well construction.

MW-12 was constructed using a 2-inch-diameter, flush-threaded, Schedule 40 polyvinyl chloride (PVC) casing with a machine-slotted PVC screen (0.010-inch). The top of the well screen was positioned

approximately 3 feet above the observed groundwater level at the time of drilling. The well screen interval is 10 feet in length positioned across the water table. The well construction log is included in Attachment 1.

The monitoring well was developed on October 18, 2018. First a slug rod was used to create a surging effect and reduce fine sediment from caking around the installed screened intervals. The surge block was decontaminated prior to use at each well in accordance with the Ecology-approved RI/FS Work Plan. Then a low flow peristaltic pump purged a minimum of 3 well volumes of groundwater until low turbidity water was measured <25 NTU (nephelometric turbidity units). Purged water was deposited into 55-gallon drums that were stored at the Site.

4.2.2. Pre-Pack Well Installation

Pre-pack wells were installed at soil boring locations SD-2 and SD-8 (see Figure 3) to facilitate groundwater and/or product level measurements at these locations as further described in Section 4.2.4. These 2-inch-diameter monitoring well points were installed by Washington State licensed driller from Cascade Drilling, Inc. The pre-pack wells were installed for the purposes of measuring water and product levels and they were not developed. The pre-pack wells remain installed at the Site and may be used for future groundwater level measurements.

4.2.3. Survey

Upon completion of Supplemental Investigation field activities, a Washington State licensed surveyor (Sound Development Group) surveyed the location of each soil boring location, monitoring well and temporary pre-pack well along with the ground surface elevation of the well monument rim and the top of casing elevation to the nearest 0.01 foot referencing the northern portion of the rim and casing for monitoring wells and pre-pack wells. A copy of the survey completed by Sound Development Group is presented in Attachment 2.

4.2.4. Water and Product Level Measurements

Groundwater and product level measurements were collected on November 9, 2018 at the eleven (11) wells (MW-1 through MW-8 and MW-10 through MW-12, note that MW-9 was not completed) and the two (2) pre-pack wells that were installed at soil sample locations SD-2 and SD-8. The groundwater and product level measurements are presented in Table 5. Measurable product of 1.46 feet thick was detected in MW-11 and a minimal amount of product, 0.01 feet, was measured in MW-1.

4.2.5. Groundwater Sample Collection and Processing

Groundwater monitoring was completed at the 10 existing wells (MW-1 through MW-8, MW-10 and MW-11, note that MW-9 does not exist) and new well MW-12 on October 29 through October 31, 2018. Samples were collected consistent with the Ecology-approved Work Plan Addendum.

Supplemental Investigation groundwater samples were submitted to ARI for analysis and archive. Samples were analyzed for a combination of the following chemical constituents in accordance with the Ecology-approved Work Plan Addendum:

- Gasoline-range TPH by NWTPH-Gx.
- Heavy oil- and diesel-range TPH by NWTPH-Dx (no silica gel cleanup).
- Duplicate heavy oil- and diesel-range TPH by NWTPH-Dx with silica gel cleanup procedures.

- BETX by EPA 8260.
- Total alkalinity by SM 2420 B-97.
- Ferrous iron by SM 3500-Fe B-97.
- Nitrate and sulfate by EPA 300.0.
- Dissolved manganese by EPA 6020A.
- Dissolved methane by EPA RSK-175.

The schedule of analysis for groundwater samples collected as part of the Supplemental Investigation is presented in Table 6. In accordance with the Ecology-approved Work Plan Addendum, groundwater samples were obtained using low-flow/low-turbidity sampling techniques, as described in Section 3.3.2 above, and water quality parameters were monitored during purging including electrical conductivity, dissolved oxygen, pH, salinity, total dissolved solids, oxidation-reduction potential and temperature. A turbidimeter was used to measure turbidity. Samples were collected from the wells after water quality parameters stabilized and varied by less than 10 percent on three consecutive measurements.

The Ecology-approved Work Plan Addendum proposed up to three groundwater sampling events. One groundwater sampling event has been completed as of October 2018.

4.3. Disposal of Investigation Derived Waste

Soil cuttings (unused soil from the explorations) from explorations completed during the Supplemental Investigation, purge water generated during well development and groundwater sampling activities, and wash water used to decontaminate reusable sampling equipment were placed in separate labeled and sealed 55-gallon drums pending permitted disposal. Disposable sampling equipment including gloves, sample liners, paper towels, foil, and plastic bags were disposed of as solid waste.

Upon completion of the soil and groundwater investigation, soil cuttings, purge water and decontamination water stored in drums were transferred from the property by Waste Management (WM) for permitted disposal on January 24, 2019. Three (3) drums of soil cuttings and four (4) drums of water were disposed of. Note that the water drums for development and purge water from the Supplemental Investigation were combined with existing groundwater purge drums from the RI field work and disposed. See Attachment 5 for Waste Disposal records.

4.4. Quality Assurance and Quality Control

The scope of the RI field investigation and associated Quality Assurance and Quality Control (QA/QC) procedures were defined in the Work Plan Addendum and Ecology-approved RI/FS Work Plan. This section includes discussion of laboratory sample handling, laboratory data quality and deviations from the Ecology-approved Work Plan Addendum for the field activities performed.

4.4.1. Sample Handling and Shipment

Soil and groundwater samples collected during the investigation were transported to ARI, using chain-of-custody procedures described in the Ecology-approved Work Plan Addendum. Samples were placed in laboratory-prepared containers and stored in coolers with ice following collection and during transport to the testing laboratory. Sampling and handling procedures were completed in accordance with the Ecology-approved Work Plan Addendum.

4.4.2. Laboratory Data Quality

Laboratory data from conventional and chemical analyses underwent data quality review and validation. The laboratory data was identified to be of adequate quality for the intended use. Laboratory reports are provided in Attachment 6 and Data Validation Reports are provided in Attachment 7.

4.4.3. Deviations from the Work Plan Addendum

The following are deviations from the Ecology-approved Work Plan Addendum:

- Boring location SD-3 was relocated approximately 25 feet to the southwest
- Boring location SD-9 was moved approximately 15 feet to the east due to heavy equipment storage.
- Boring location SD-4 was relocated approximately 10 feet to the north to allow space for the drill rig adjacent to the buildings.
- Soil boring and monitoring well location MW-12 was relocated approximately 5 feet south to avoid being installed in the 2nd Street right-of-way.

5.0 SUMMARY OF RESULTS

This section presents the results of the RI and Supplemental Investigation activities. As discussed in Section 1.0, evaluation of these results and nature and extent of contamination at the Site will be completed as part of the RI/FS Report, which will be prepared at a later date.

5.1. Soil Stratigraphy

The general stratigraphy at the Site presented is based on observations of material encountered in soil exploration completed as part of the RI, Supplemental Investigation and previous investigations. The stratigraphy at the Site generally consists of fill soil deposits overlying native as described below:

- **Historical Fill Deposits:** The Site was originally developed in the early 1900s and this included both in the upland portion of the Site to build the bulk fuel storage and distribution facility and in the marine area to build dock(s). This fill material is generally comprised of layers of sand, silty sand and silt with variable gravel content at the depths ranging from about 4 to 17 bgs. In the southern part of the Site the fill material is shallow relative to the ground surface (approximately 4 to 6 feet bgs) because the Site is cut into the slope and the south and east property boundaries have retaining walls. Contained in the historical fill deposits are occasional debris including concrete asphalt, brick and wood fragments. Along the shoreline and beach more debris was encountered at shallower depths potentially related to the dock(s) and the adjacent Curtis Wharf.
- **Native Deposits:** Native material underlying the fill deposits at the Site include beach sands overlying glacial deposits. The beach sand deposits are typically poorly sorted and loose in nature and vary in thickness from 2 to 6 feet. Glacial deposits consist of a medium dense glaciomarine drift with varying amounts of silt, sand, and gravel. A layer of dark brown organic soil is present below the fill layer in north and northern portion of the Site. The organic layer varies in thickness from several inches to 2 feet.

5.2. Hydrogeologic Conditions

Hydrogeologic conditions including tidal influence, groundwater flow direction and gradients, hydraulic conductivity and groundwater velocities at the Site were estimated based on the results of tidal and hydraulic conductivity studies completed for the RI as described in Section 3.5. Attachment 4 presents the detailed procedures and results from the Hydrogeologic Investigation.

5.2.1. Tidal Study

Figure 4 shows the monitoring wells that were used for the tidal study. In general the tidal study indicated a relatively low degree of tidal influence on the monitoring wells at the Site. The three monitoring wells observed to be the most tidal influence during the 72-hour tidal study are MW-6, MW-7 and MW-10. The remaining monitoring wells used, including monitoring wells MW-1, MW-2, and MW-3 indicated less tidal influence. Further detail on the tidal study results are presented in Hydrogeologic Investigation (Attachment 4).

5.2.2. Hydraulic Conductivity

As stated in Section 5.2.1 the timing and degree of tidal influence observed in the monitoring wells was not proportional to distance from shoreline and the diffusivity could not be calculated, therefore the results of slug testing were used instead to estimate hydraulic parameters for the aquifer

The hydraulic conductivity for the aquifer was estimated using the results of slug testing in six monitoring wells (MW-2, MW-3, MW-4, MW-6, MW-7, and MW-11) as shown on Figure 4. Diffusivity could not be used to estimate the hydraulic parameters due to the unproportional timing and degree of the observed tidal influence. Based on the slug test results, hydraulic conductivity for the aquifer ranges between 0.02 and 4.11 feet/day with a mean value of 1.25 feet/day. Attachment 4 has additional details on how the hydraulic conductivity was calculated.

5.2.3. Groundwater Flow Direction and Gradient

The groundwater flow direction and gradient during the tidal study was determined using the mean groundwater elevations. The mean groundwater flow direction based on the results of the tidal study is generally to the north and northwest toward Guemes Channel (see Figure 5). Mean hydraulic gradient was calculated using two monitoring well pairs (MW-10/MW-2 and MW-5/MW-4). In the western portion of the Site, the calculated hydraulic gradient is 0.013 feet per foot (ft/ft) between monitoring wells MW-10 and MW-2. In the eastern portion of the Site, the calculated hydraulic gradient is 0.023 ft/ft between monitoring wells MW-5 and MW-4. Figure 5 presents the groundwater flow direction and calculated gradients.

5.2.4. Groundwater Velocity

The average linear groundwater velocity between monitoring wells MW-10 and MW-2 is 0.07 feet per day (ft/day) with a flow direction to the northwest. The average linear groundwater velocity between monitoring locations MW-5 and MW-4 is 0.09 ft/day with a groundwater flow direction toward the north, as shown in Figure 5.

5.3. Chemical Analytical Results

This section presents soil, groundwater and sediment chemical analytical results from the RI and Supplemental Investigation. Additionally, soil chemical analytical results from Focused Site Investigation of

2014 are also incorporated to help in evaluation of the nature and extent of contamination. The results were screened against the preliminary screening levels presented in the Ecology-approved RI/FS Work Plan to identify exceedances. The results have also been uploaded to Ecology's Environmental Information Management (EIM) database in accordance with the AO.

5.3.1. Soil

The chemical analytical results for soil samples analyzed as part of the Focused Site Investigation, RI and Supplemental Investigation are presented in Table 7. The results are screened, and preliminary screening level exceedances are identified on this table. Figures 6 through 10 summarize results for TPH, VOCs, cPAHs TEQ, PAHs and metals, respectively. For the purposes of summarizing the data on these figures, soil samples collected from each boring are categorized into three sampling horizons – fill, water table and native. Figures 6 through 10 summarize exceedances observed in the sampled horizons at each boring location. The following chemicals exceeded preliminary screening levels in soil:

- Total Petroleum Hydrocarbons (TPH) including gasoline-, diesel- and heavy oil-range;
- Volatile Organic Compounds (VOCs) including benzene, ethylbenzene, toluene and xylenes (BETX) and n-Hexane;
- Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs) Toxicity Equivalent Quotient (TEQ);
- Various individual PAH analytes; and
- Metals including cadmium, chromium, lead and mercury.

The analytical results provide evidence of petroleum related contaminants in soil (TPH and fuel related VOCs presented in Figures 6 and 7) are located in the northern half of the Site in the vicinity of the former bulk fuel facility operations and extend north into 2nd Street and west towards the beach area. Elevated concentrations of metals and PAHs were primarily identified within the fill deposits with some isolated deeper contamination (up to approximately 8 to 12 feet bgs) found in the underlying native sand deposits (e.g., GEI-30 and GEI-39).

Fuel-related VOCs are located primarily within the historical fuel operation facility and are comingled with elevated TPH in soil. The depth of petroleum contamination ranges from approximately 4 to 12 feet bgs within the fill formation in both vadose and saturated soil. Petroleum-related contamination is bounded to the east by O Avenue and to the north by sample locations where exceedances were not detected. The extent of contamination to the south is defined by soil sample results where exceedances were not detected. There is uncertainty of the soil quality below the existing buildings in the southwest portion of the former bulk fuel operation area. To the west the data does not provide clear evidence on whether GEI-39 (at the top of the beach slope) is an isolated soil occurrence or contiguous with the upland source area.

Soil analytical results also indicate evidence of isolated areas of PAH and metals contamination in the northern part of the Site (presented in Figures 8 through 10). These results indicate that metals and PAHs contamination in soil is in isolated areas. In general metals and PAHs have a higher frequency of exceedance to the west part of the Site, closer to the shoreline area.

The laboratory data reports for the RI and Supplemental Investigation are presented in Attachment 6. The laboratory data reports for Focused Site Investigations were presented in Focused Environmental Site Investigation Data Report (GeoEngineers, 2014). EPA-defined Stage 2B data validation (EPA Document

540-R-08-005; USEPA 2009) was performed on laboratory data and the data was identified to be of adequate quality for the intended use. The results of the data quality review are presented in Validation Reports provided in Attachment 7.

5.3.2. Groundwater

The chemical analytical results for groundwater samples analyzed as part of the RI and Supplemental Investigation are presented in Table 8 and 9, respectively. The results are screened, and preliminary screening level exceedances are identified on these tables. Figures 11 through 15 summarize results for TPH, VOCs, cPAHs TEQ, PAHs and metals, respectively for two groundwater monitoring events (November 2017 and March 2018) completed as part of the RI. During the Supplemental Investigation, diesel- and heavy oil-range hydrocarbon analysis was performed with and without silica gel cleanup procedures. Note that previous groundwater monitoring events for these analytes were completed without the silica gel cleanup. Figure 16 presents groundwater results for diesel- and heavy oil-range TPH performed with and without silica gel cleanup laboratory preparation that were analyzed as part of the Supplemental Investigation in October 2018. As described in the Work Plan Addendum this data will be evaluated in the RI to determine if there is potential organic interference in the analytical method used (NWTPH-Dx). Groundwater samples for MW-8 and MW-11 were also analyzed for TPH-Gx and BETX as part of the Supplemental Investigation and the results are presented in Table 9. The following chemicals exceeded preliminary screening levels in groundwater:

- Total Petroleum Hydrocarbons (TPH) including gasoline-, diesel- and heavy oil-range;
- Volatile Organic Compounds (VOCs) including benzene and 1,2-dibromoethane (EDB); and
- Metals including arsenic (total and dissolved) and lead (total only).

Groundwater analytical results generally indicate that petroleum-related contamination in groundwater exists within the northern area of the Site within the former bulk fuel operation footprint and in wells located downgradient to the north and west. The highest concentration of TPH and fuel-related VOCs in groundwater are at MW-11, where free product has been measured as approximately 1.5 feet thick, and is, located in the center of the historical fueling operations. Petroleum-related contamination is bounded to the north, south and east by monitoring well MW-7, MW-10 and MW-6, respectively. Wells along the shoreline indicate diesel-range TPH exceedances. Based on the groundwater flow direction, the extent of petroleum-related contamination is generally within the source area and downgradient of the source. MW-8 is located cross-gradient relative to the source area for the Site and was found to have diesel-range TPH in groundwater above preliminary screening levels during the first monitoring event with concentrations below screening levels in subsequent events. Fuel-related VOCs including benzene and EDB were detected within the Site at MW-11. Monitoring wells along the shoreline downgradient of the source area were not found to have petroleum-related VOCs in groundwater. Benzene was detected at MW-8 and is cross-gradient from the source area, and uncertainty exists as to the source of benzene contamination at this location.

As previously noted the Supplemental Investigation groundwater was analyzed for diesel- and heavy-oil TPH with and without the silica gel cleanup preparation method. Figure 16 presents these analytical results for diesel- and heavy oil-range TPH side by side. The results indicate that without the silica gel cleanup diesel-range hydrocarbons are present above screening levels throughout the source area and downgradient wells consistent with results from the RI groundwater monitoring. With the silica cleanup gel procedure the only exceedance for diesel- and/or heavy-oil range TPH is at MW-11. The results indicate

that the silica gel cleanup method lowers concentration below preliminary screening levels at the majority monitoring wells sampled. Further evaluation will be completed to determine if the silica gel cleanup procedure provides accurate analysis of petroleum contamination or if the procedure removes petroleum and artificially lowers concentrations in groundwater.

Groundwater did not exceed preliminary screening levels for PAH or cPAH analytes. Isolated, low concentrations of dissolved arsenic above preliminary screening levels (exceedance ratios of approximately 2 or less) in groundwater were detected at the Site. Arsenic-contaminated soil was not identified at the Site.

As described in Section 4.2.5 groundwater samples were also submitted for laboratory analysis of natural attenuation parameters that do not have preliminary screening levels including methane, nitrate, sulfate, total alkalinity, ferrous iron and dissolved manganese at wells MW-1 through MW-12. These results are presented in Table 9 and the analytical data will be evaluated as part of the RI.

The laboratory data reports for the RI and Supplemental Investigation groundwater sample analyses are provided in Attachment 6. EPA-defined Stage 2B data validation (EPA Document 540-R-08-005; USEPA 2009) was performed on laboratory data and the data was identified to be of adequate quality for the intended use. The results of the data quality review are presented in Validation Reports provided in Attachment 7.

5.3.3. Sediment

In accordance with the Ecology-approved RI/FS Work Plan sediment results were screened for protection of benthic organisms and protection of human health and higher trophic level (HH/HTL) receptors. Figures 6 through 10 summarize results for TPH, VOCs, cPAHs TEQ, PAHs and metals, respectively. Sediment intervals sampled at each location and exceedances of both benthic and human health preliminary screening levels are shown on these figures. The chemical analytical results for sediment samples compared to preliminary screening levels for protection of benthic organisms are presented in Table 10. The results are screened, and preliminary screening level exceedances are identified in these tables. The following chemicals exceeded preliminary screening levels in sediment for protection of benthic organisms:

- Sum of Low Molecular Weight PAHs (LPAHs);
- Sum of High Molecular Weight PAHs (HPAHs);
- Various individual LPAH and HPAH analytes; and
- Pentachlorophenol.

Analytical data indicate that TPH, petroleum-related VOCs and metals in sediment are protective of benthic organisms in sediment samples collected for the RI (see Table 10). Isolated sediment samples exceeded individual PAH analyte screening levels for protection of benthic organisms in the beach area at sample locations SED-1 and SED-8 through SED-10 ranging in depth from surface to 6 feet bml. These PAH concentrations include exceedances of Sediment Cleanup Objective (SCO) and/or Cleanup Screening Level (CSL) concentrations as presented in Table 10. One isolated occurrence of pentachlorophenol above the CSL was present in sediment at composite sample SED-1 in the 4 to 6 foot bml sample interval.

The chemical analytical results for sediment samples compared to preliminary screening levels for protection of HH/HTL are presented in Table 11. The following chemicals exceeded preliminary screening levels in sediment for protection of HH/HTL receptors:

- Various individual LPAH and HPAH analytes;
- cPAH TEQ;
- Pentachlorophenol; and
- Metals including lead and mercury.

Analytical data indicate that TPH and petroleum-related VOCs in sediment are protective of HH/HTL (see Table 10). Sediment sample analytical results indicate that sediment with individual PAHs and cPAH TEQ concentrations greater than the HH/HTL screening level exist throughout the beach area that was investigated for the RI (see Figures 8 and 9). Depths of contaminated sediment range from surface to 6 feet below mudline (bml), and the sediment sampling and analysis did not bound the extent of contamination in the vertical or horizontal directions. One isolated occurrence of pentachlorophenol above the HH/HTL was present in sediment at composite sample SED-1 in the 4 to 6 foot bml interval as presented in Table 11. Analytical results for lead in sediment was also found to exceed HH/HTL screening levels throughout the sediment area ranging in depths from surface to 6 feet bml. Similar to PAHs the data results do not define the horizontal or vertical extent of lead contamination above the HH/HTL screening levels within the investigation area. There is one isolated mercury sample at composite sample location SED-1 from 4 to 6 feet bml with mercury concentration greater than the screening level protective of HH/HTL receptors.

The laboratory data reports for the sediment samples are presented in Attachment 6. EPA-defined Stage 2B data validation (EPA Document 540-R-08-005; USEPA 2009) was performed on laboratory data and the data was identified to be of adequate quality for the intended use. The results of the data quality review are presented in Validation Reports provided in Attachment 7.

6.0 REFERENCES

- Ferris, J.G. (1951). Cyclic Fluctuations of Water Levels as a Basis for Determining Aquifer Transmissibility. International Union of Geodesy and Geophysics, Assoc. Sci. Hydrology Assembly, Publication 33, Brussels V.2:148-155.
- GeoEngineers, 2014. Focused Environmental Site Investigation Data Report, Quiet Cove Property, Anacortes, Washington, GEI No. 5147-024-01, dated October 20, 2014
- GeoEngineers, 2017. FINAL Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan); Quiet Cove Property; Anacortes, WA; Ecology Agreed Order No. DE 11346. GEI No. 5147-024-03, dated January 25, 2017.
- GeoEngineers, 2018. Work Plan Addendum for Supplemental Upland Area Soil and Groundwater Investigation at the Quiet Cove Site, Anacortes, Washington (Work Plan Addendum). GEI No. 5147-024-06, dated October 1, 2018.

Serfes, M.E. (1991). Determining the Mean Hydraulic Gradient of Groundwater affected by Tidal Fluctuations. Ground Water 29 (4): 549-555.

U.S. Environmental Protection Agency (USEPA), 2009 "Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use," EPA-540-R-08-005. January 2009.

7.0 LIMITATIONS

We have prepared this report for the Quiet Cove Site located at 202 O Avenue in Anacortes, Washington for use by the Port of Anacortes. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

Table 1
Focused Environmental Investigation and Remedial Investigation Soil Analytical Schedule
 Quiet Cove
 Anacortes, Washington

Sample Location ¹	Sample Identification	Date Sampled	Sample Interval (ft bgs)	Sample Type	Sample Horizon	Laboratory Analysis ²									
						Metals	NWTPH-G	NWTPH-Dx	BETX	EDB, EDC, MTBE and n-Hexane	Other VOCs	Napthalene	PAHs	cPAHs	PCB Aroclors
2014 Focused Environmental Investigation															
GEI-1	GEI-1-3-033114	03/31/14	4 - 6	Saturated	Fill		●	●	●						
	GEI-1-5-033114	03/31/14	8 - 10	Saturated	Native		●	●	●						
GEI-2	GEI-2-1-033114	03/31/14	0 - 2	Vadose	Fill		●	●	●						
	GEI-2-3-033114	03/31/14	4 - 6	Saturated	Fill		●	●	●						
	GEI-2-5-033114	03/31/14	8 - 10	Saturated	Native		●	●	●						
GEI-3	GEI-3-3-033114	03/30/14	4 - 6	Vadose	Fill		●	●	●						
GEI-4	GEI-4-1-040114	04/01/14	0 - 2	Vadose	Fill		●	●	●						
	GEI-4-2-040114	04/01/14	2 - 3	Vadose	Fill/Native	●	●	●	●	●	●	●		●	●
	GEI-4-3-040114	04/01/14	4 - 6	Saturated	Native		●	●	●						
GEI-8	GEI-8-3-033114	03/31/14	4 - 6	Saturated	Fill/Native		●	●	●						
	GEI-8-5-033114	03/31/14	8 - 10	Saturated	Native		●	●	●						
GEI-9	GEI-9-3-040114	04/01/14	5 - 7	Saturated	Native		●	●	●						
	GEI-9-5-040114	04/01/14	8 - 10	Saturated	Native		●	●	●						
GEI-10	GEI-10-1-033114	03/31/14	0 - 2	Vadose	Fill		●	●	●						
	GEI-10-3-033114	03/31/14	4 - 6	Saturated	Fill	●	●	●	●	●	●	●		●	●
	GEI-10-6-033114	03/31/14	8 - 10	Saturated	Native		●	●	●						
GEI-12	GEI-12-3-040114	04/01/14	5 - 7	Saturated	Fill		●	●	●						
GEI-13	GEI-13-2-040114	04/01/14	2 - 3	Vadose	Fill		●	●	●						
	GEI-13-4-040114	04/01/14	6 - 8	Saturated	Native		●	●	●						
GEI-14	GEI-14-3-040114	04/01/14	4 - 6	Saturated	Native		●	●	●						
GEI-16	GEI-16-3-033114	03/31/14	4 - 6	Saturated	Fill		●	●	●						
	GEI-16-5-033114	03/31/14	8 - 10	Saturated	Native		●	●	●						
GEI-17	GEI-17-3-033114	03/31/14	4 - 6	Saturated	Fill		●	●	●						

Sample Location ¹	Sample Identification	Date Sampled	Sample Interval (ft bgs)	Saturated vs. Unsaturated	Saturated vs. Unsaturated	Laboratory Analysis ²									
						Metals	NWTPH-G	NWTPH-Dx	BETX	EDB, EDC, MTBE and n-Hexane	Other VOCs	Napthalene	PAHs	cPAHs	PCB Aroclors
GEI-18	GEI-18-1-033114	03/31/14	0 - 2	Vadose	Fill		●	●	●						
	GEI-18-3-033114	03/31/14	4 - 6	Saturated	Native		●	●	●						
	GEI-18-5-033114	03/31/14	8 - 10	Saturated	Native		●	●	●						
GEI-19	GEI-19-1-040114	04/01/14	0 - 2	Vadose	Fill		●	●	●						
	GEI-19-3-040114	04/01/14	4 - 6	Saturated	Native		●	●	●						
GEI-20	GEI-20-3-040114	04/01/14	4 - 6	Saturated	Native		●	●	●						
GEI-21	GEI-21-3-040114	04/01/14	4 - 6	Saturated	Native		●	●	●						
GEI-25	GEI-25-1-040114	04/01/14	0 - 2	Vadose	Fill		●	●	●						
	GEI-25-3-040114	04/01/14	4 - 6	Saturated	Fill	●	●	●	●	●	●	●		●	
	GEI-25-5-040114	04/01/14	8 - 10	Saturated	Native		●	●	●						
GEI-27	GEI-27-3-040214	04/02/14	6 - 7.5	Saturated	Fill		●	●	●						
GEI-28	GEI-28-4-040214	04/02/14	6 - 8	Saturated	Native		●	●	●						
2017 Remedial Investigation															
GEI-29	GEI-29-5-7_091217	9/12/2017	5 - 7	Vadose	Fill	●	●	●	●	●		●	●	●	
	GEI-29-10-12_091217	9/12/2017	10 - 12	Saturated	Native	●	●	●	●	●		●	●	●	
	GEI-29-13-15_091217	9/12/2017	13 - 15	Saturated	Native	●	●	●	●	●		●	●	●	
GEI-30	GEI-30-2-4_091217	9/12/2017	2 - 4	Vadose	Fill	●	●	●	●	●		●	●	●	
	GEI-30-6-8_091217	9/12/2017	6 - 8	Saturated	Fill/Native	●	●	●	●	●		●	●	●	
	GEI-30-9-11_091217	9/12/2017	9 - 11	Saturated	Native	●	●	●	●	●		●	●	●	
GEI-31	GEI-31-3-5_091117	9/11/2017	3 - 5	Vadose	Fill	●	●	●	●	●		●	●	●	
	GEI-31-13-15_091117	9/11/2017	13 - 15	Saturated	Fill/Native	●	●	●	●	●		●	●	●	
	GEI-31-6-8_091117	9/11/2017	6 - 8	Saturated	Native	●	●	●	●	●		●	●	●	
GEI-32	GEI-32-3-4.5_091117	9/11/2017	3 - 4.5	Vadose	Fill	●	●	●	●	●		●	●	●	
	GEI-32-10-12_091117	9/11/2017	10 - 12	Saturated	Native	●	●	●	●	●		●	●	●	
	GEI-32-7-9_091117	9/11/2017	7 - 9	Saturated	Native	●	●	●	●	●		●	●	●	
GEI-38	GEI-38-2-4_091917	9/19/2017	2 - 4	Vadose	Fill	●	●	●	●	●		●	●	●	
	GEI-38-5-7_091917	9/19/2017	5 - 7	Saturated	Fill	●	●	●	●	●		●	●	●	
	GEI-38-12-14_091917	9/19/2017	12 - 14	Saturated	Native	●	●	●	●	●		●	●	●	

Sample Location ¹	Sample Identification	Date Sampled	Sample Interval (ft bgs)	Saturated vs. Unsaturated	Saturated vs. Unsaturated	Laboratory Analysis ²									
						Metals	NWTPH-G	NWTPH-Dx	BETX	EDB, EDC, MTBE and n-Hexane	Other VOCs	Napthalene	PAHs	cPAHs	PCB Aroclors
GEI-39	GEI-39-1-3_091517	9/15/2017	1 - 3	Vadose	Fill	●	●	●	●	●		●	●	●	
	GEI-39-5-7_091517	9/15/2017	5 - 7	Saturated	Fill	●	●	●	●	●		●	●	●	
	GEI-39-8-10_091517	9/15/2017	8 - 10	Saturated	Fill/Native	●	●	●	●	●		●	●	●	
GEI-40	GEI-40-2-4_091917	9/19/2017	2 - 4	Vadose	Fill	●	●	●	●	●		●	●	●	
	GEI-40-12-14_091917	9/19/2017	12 - 14	Saturated	Fill	●	●	●	●	●		●	●	●	
	GEI-40-5-7_091917	9/19/2017	5 - 7	Saturated	Native	●	●	●	●	●		●	●	●	
GEI-41	GEI-41-5-7_091317	9/13/2017	5 - 7	Vadose	Natvie	●	●	●	●	●		●	●	●	
GEI-42	GEI-42-1-3_091317	9/13/2017	1 - 3	Vadose	Fill	●	●	●	●	●		●	●	●	
	GEI-42-6-8_091317	9/13/2017	6 - 8	Saturated	Native	●	●	●	●	●		●	●	●	
GEI-43	GEI-43-3-5_091317	9/13/2017	3 - 5	Vadose	Fill/Native	●	●	●	●	●		●	●	●	
	GEI-43-5-7_091317	9/13/2017	5 - 7	Saturated	Native	●	●	●	●	●		●	●	●	
GEI-44	GEI-44-2-4_091317	9/13/2017	2 - 4	Vadose	Fill	○ ³	○ ³	○ ³	○ ³	○ ³		○ ³	○ ³	○ ³	
	GEI-44-10-12_091317	9/13/2017	10 - 12	Saturated	Fill/Native	○ ³	○ ³	○ ³	○ ³	○ ³		○ ³	○ ³	○ ³	
	GEI-44-7-9_091317	9/13/2017	7 - 9	Saturated	Native	○ ³	○ ³	○ ³	○ ³	○ ³			○ ³	○ ³	
MW-8	MW-8-2-4_091917	9/19/2017	2 - 4	Vadose	Fill		○ ³	○ ³	○ ³	○ ³					
	MW-8-5-7_091917	9/19/2017	5 - 7	Saturated	Fill		○ ³	○ ³	○ ³	○ ³					

Notes:

¹ Sample locations are shown on Figure 2.

² Laboratory results are summarized in Table 3.

³ Tier 2 sample analysis based on communications with Ecology.

EDB = 1,2-Dibromoethane

EDC = 1,2-Dichloroethane

BETX = Benzene, Ethyl Benzene, Toluene and Xylenes

MTBE = Methyl t-butyl ether

VOCs = Volatile Organic Compounds

PAHs = Polycyclic Aromatic Hydrocarbons

cPAHs = Carcinogenic Polycyclic Aromatic Hydrocarbons

PCBs = Polychlorinated Biphenyls

ft = feet

bgs = below ground surface

F_S = Shallow fill soil

F_D = Deep fill soil

PT = Organic deposits (Peat)

N_S = Shallow native soil

● = Sample collected and submitted for conventional and chemical analysis.

○ = Archive sample collected and subsequently submitted for chemical analysis.

Table 2
Focused Environmental Investigation and Remedial Investigation Groundwater Analytical Schedule
 Quiet Cove
 Anacortes, Washington

Sample Location ¹	Sample Identification	Date Sampled	Well Location	Tidal Influence	Laboratory Analysis ²										
					Total Metals	Dissolved Metals	NWTPH-G	NWTPH-Dx	BETX	EDB, EDC, MTBE and n-Hexane	Other VOCs	Napthalene	PAHs	cPAHs	PCB Aroclors
2014 Focused Environmental Investigation															
MW-1	QC-MW-1-7.1.14	07/01/14	Shoreline	Indeterminate ³			●	●	●					●	
MW-2	QC-MW-2-7.1.14	07/01/14	Shoreline	Indeterminate ³			●	●	●					●	
MW-3	QC-MW-3-7.1.14	07/01/14	Shoreline	Indeterminate ³	●	●	●	●	●	●	●	●	●	●	●
MW-4	QC-MW-4-7.1.14	07/01/14	Upland	Indeterminate ³			●	●	●					●	
MW-5	QC-MW-5-7.1.14	07/01/14	Upland	Indeterminate ³	●	●	●	●	●	●	●	●	●	●	●
2017 Remedial Investigation															
MW-1	MW-1-110917	11/09/17	Shoreline	Indeterminate ³	●	●	●	●	●	●				●	
	MW-1_031918	03/19/18			●	●	●	●	●	●				●	
MW-2	MW-2-110917	11/09/17	Shoreline	Indeterminate ³	●	●	●	●	●	●				●	
	MW-2_032018	03/20/18			●	●	●	●	●	●				●	
MW-3	MW-3_101817	10/18/17	Shoreline	Indeterminate ³	●	●	●	●	●	●				●	
	MW-3_032018	03/20/18			●	●	●	●	●	●				●	
MW-4	MW-4_101817	10/18/17	Upland	Indeterminate ³	●	●	●	●	●	●				●	
	MW-4_031918	03/19/18			●	●	●	●	●	●				●	
MW-5	MW-5_101817	10/18/17	Upland	Indeterminate ³	●	●	●	●	●	●				●	
	MW-5_032018	03/20/18			●	●	●	●	●	●				●	
MW-6	MW-6_101817	10/18/17	Upland	Yes	●	●	●	●	●	●				●	
	MW-6_032018	03/20/18			●	●	●	●	●	●				●	
MW-7	MW-7_101817	10/18/17	Shoreline	Yes	●	●	●	●	●	●				●	
	MW-7_032018	03/20/18			●	●	●	●	●	●				●	
MW-8	MW-8-110917	11/09/17	Shoreline	Indeterminate ³	●	●	●	●	●	●				●	
	MW-8_031918	03/19/18			●	●	●	●	●	●				●	

Sample Location ¹	Sample Identification	Date Sampled	Well Location	Tidal Influence	Laboratory Analysis ²										
					Total Metals	Dissolved Metals	NWTPH-G	NWTPH-Dx	BETX	EDB, EDC, MTBE and n-Hexane	Other VOCs	Napthalene	PAHs	cPAHs	PCB Aroclors
MW-10	MW-10-110917	11/09/17	Upland	Yes	●	●	●	●	●	●				●	
	MW-10_031918	03/19/18			●	●	●	●	●	●	●				●
MW-11	MW-11-110917	11/09/17	Upland	Indeterminate ³	●	●	●	●	●	●				●	
	MW-11_032018	03/20/18			●	●	●	●	●	●	●				●

Notes:

¹ Sample locations are shown on Figure 2.

² Laboratory results are summarized in Table 4.

³ Tidal effects below the threshold of significance (Stage Ratio less than 3 percent).

EDB = 1,2-Dibromoethane

EDC = 1,2-Dichloroethane

BETX = Benzene, Ethyl Benzene, Toluene and Xylenes

MTBE = Methyl t-butyl ether

VOCs = Volatile Organic Compounds

PAHs = Polycyclic Aromatic Hydrocarbons

cPAHs = Carcinogenic Polycyclic Aromatic Hydrocarbons

PCBs = Polychlorinated Biphenyls

F_S = Shallow fill soil

F_D = Deep fill soil

PT = Organic deposits (Peat)

N_S = Shallow native soil

● = Sample collected and submitted for conventional and chemical analysis.

Table 3
Remedial Investigation Sediment Analytical Schedule
 Quiet Cove
 Anacortes, Washington

Sample Location ¹	Sample Identification	Date Sampled	Sample Interval (ft bgs)	Sample Type	Sample Horizon	Laboratory Analysis ²										
						NWTPH-Gx	NWTPH-Dx	BTEX (8260)	EDB, EDC, MTBE and n-Hexane	Grain size	TOC, TVS, TS	Sulfides & Ammonia	SMS Metals (8270D/SIM)	SMS VOCs (8270D/SIM)	PCBs (EPA 1668C)	Dioxins/Furans (1631)
2017 Sediment Tier 1 Investigation																
GEI-1	SED-COMP-1_091517	09/15/17	0 - 0.5	Composite	Fill	●	●	●	●	●	●	●	●	●	○	○
	SED1-1-3_091517	09/15/17	1 - 3	Composite	Fill	●	●	●	●	●	●	●	●	●	○	○
	SED1-4-6_091517	09/15/17	4 - 6	Composite	Fill	●	●	●	●	●	●	●	●	●	○	○
2018 Sediment Tier 2 Investigation																
SED-2	SED-2-0-0.5_071618	7/16/2018	0 - 0.5	Surface	Fill	○	○	○	○	○	○	○	○	○	○	○
	SED-2-0-2_071718	7/17/2018	0 - 2	Core	Fill	○	☒	○	○	○	○	○	☒	☒	○	○
	SED-2-2-4_071718	7/17/2018	2 - 4	Core	Native	○	☒	○	○	○	○	○	○	○	○	○
SED-3	SED-3-0-0.5_071618	7/16/2018	0 - 0.5	Surface	Fill	○	○	○	○	○	○	○	○	○	○	○
	SED-3-0-2_071718	7/17/2018	0 - 2	Core		○	☒	○	○	○	○	○	☒	☒	○	○
	SED-3-2-3.5_071718	7/17/2018	2 - 3.5	Core		○	☒	○	○	○	○	○	○	○	○	○
	SED-3-3.5-5_071718	7/17/2018	3.5 - 5	Core	Native	○	○	○	○	○	○	○	○	○	○	○
SED-4	SED-4-0-0.5_071618	7/16/2018	0 - 0.5	Surface	Fill	●	●	●	●	●	●	●	●	●	○	○
	SED-4-0-1.5_071618	7/16/2018	0 - 1.5	Core		○	☒	○	○	○	○	○	☒	☒	○	○
	SED-4-1.5-3_071618	7/16/2018	1.5 - 3	Core		○	☒	○	○	○	○	○	☒	☒	○	○
	SED-4-3-4.5_071618	7/16/2018	3 - 4.5	Core	Native	○	○	○	○	○	○	○	○	○	○	○
SED-5	SED-5-0-0.5_071618	7/16/2018	0 - 0.5	Surface	Fill	●	●	●	●	●	●	●	●	●	○	○
	SED-5-0-2_071618	7/16/2018	0 - 2	Core		○	○	○	○	○	○	○	○	○	○	○
	SED-5-2-4_071618	7/16/2018	2 - 4	Core	Native	●	●	●	●	●	●	●	●	●	○	○
SED-6	SED-6-0-0.5_071718	7/16/2018	0 - 0.5	Surface	Fill	●	●	●	●	●	●	●	●	●	○	○
	SED-6-0-1_071718	7/17/2018	0 - 1	Core		○	○	○	○	○	○	○	○	○	○	○
	SED-6-1-3_071718	7/17/2018	1 - 3	Core	Fill	●	●	●	●	●	●	●	●	●	○	○
SED-7	SED-7-0-0.5_071618	7/16/2018	0 - 0.5	Surface	Fill	●	●	●	●	●	●	●	●	●	○	○
	SED-7-0-1_071718	7/17/2018	0 - 1	Core	Fill	●	●	●	●	●	●	●	●	●	○	○
SED-8	SED-8-0-0.5_071618	7/16/2018	0 - 0.5	Surface	Fill	●	●	●	●	●	●	●	●	●	○	○
	SED-8-0-1.7_071618	7/16/2018	0 - 1.7	Core		○	○	○	○	○	○	○	○	○	○	○
	SED-8-1.7-3.2_071618	7/16/2018	1.7 - 3.2	Core		○	○	○	○	○	○	○	○	○	○	○
	SED-8-3.2-4.5_071618	7/16/2018	3.2 - 4.5	Core		●	●	●	●	●	●	●	●	●	○	○

SED-9	SED-9-0-0.5_071618	7/16/2018	0 - 0.5	Surface	Fill	●	●	●	●	●	●	●	●	●	○	○
	SED-9-0-1.7_071718	7/17/2018	0 - 1.7	Core		○	○	○	○	○	○	○	○	○	○	○
	SED-9-1.7-2.3_071718	7/17/2018	1.7 - 2.3	Core	Fill	●	●	●	●	●	●	●	●	●	○	○
SED-10	SED-10-0-0.5_071618	7/16/2018	0 - 0.5	Surface	Fill	●	●	●	●	●	●	●	●	●	○	○
	SED-10-0-2_071718	7/17/2018	0 - 2	Core		○	○	○	○	○	○	○	○	○	○	○
	SED-10-2-4_071718	7/17/2018	2 - 4	Core		●	●	●	●	●	●	●	●	●	○	○
	SED-10-4-5.6_071718	7/17/2018	4 - 5.6	Core	Native	○	○	○	○	○	○	○	○	○	○	○

Notes:

¹ Sample locations are shown on Figure 2.

² Laboratory results are summarized in Table 3.

³ Tier 2 sample analysis based on communications with Ecology.

EDB = 1,2-Dibromoethane

EDC = 1,2-Dichloroethane

BETX = Benzene, Ethyl Benzene, Toluene and Xylenes

MTBE = Methyl t-butyl ether

VOCs = Volatile Organic Compounds

PAHs = Polycyclic Aromatic Hydrocarbons

cPAHs = Carcinogenic Polycyclic Aromatic Hydrocarbons

PCBs = Polychlorinated Biphenyls

ft = feet

bgs = below ground surface

F_S = Shallow fill soil

F_D = Deep fill soil

PT = Organic deposits (Peat)

N_S = Shallow native soil

● = Sample collected and submitted for conventional and chemical analysis.

☒ = Archive sample collected and subsequently submitted for chemical analysis.

○ = Archive sample collected.

Table 4
Supplemental Investigation Soil Analytical Schedule
 Quiet Cove Property
 Anacortes, Washington

Sample Location ¹	Sample Identification	Date Sampled	Sample Interval (feet bgs)	Sample Horizon ²	Total Petroleum Hydrocarbons (TPH)		Volatile Organic Compounds (VOCs)		Metals	Polycyclic Aromatic Hydrocarbons (PAHs)	
					Gasoline-Range (NWTPH-Gx)	Diesel- and Heavy Oil-Range (NWTPH-Dx)	BETX (EPA 8260)	EDB, EDC, MTBE and n-Hexane (EPA 8260)	MTCA Metals ⁴ (EPA 6000/7000)	Carcinogenic PAHs (EPA 8270-SIM)	Naphthalenes (EPA 8270-SIM)
Direct-Push (DP) Sample Location											
SD-1	SD-1-2-4	10/17/2018	2-4	S	●	●	●				
	SD-1-5-6.5	10/17/2018	5-6.5	X	●	●	●				
	SD-1-10-12	10/17/2018	10-12	W	●	●	●				
	SD-1-13-15	10/17/2018	13-15	W							
	SD-1-17-19	10/17/2018	17-19	N	●	●	●				
SD-2	SD-2-2-3	10/17/2018	2-3	S	●	●	●				
	SD-2-6-8	10/17/2018	6-8	X	●	●	●				
	SD-2-11-12	10/17/2018	11-12	W	●	●	●				
	SD-2-14-15	10/17/2018	14-15	N	●	●	●				
SD-3	SD-3-2.5-3	10/17/2018	2.5-3	S	●	●	●				
	SD-3-7-8.5	10/17/2018	7-8.5	X,W	●	●	●				
	SD-3-12-13	10/17/2018	12-13	N	●	●	●				
SD-4	SD-4-2.5-3.5	10/18/2018	2.5-3.5	S	●	●	●				
	SD-4-6.5-7.5	10/18/2018	6.5-7.5	X,W	●	●	●				
	SD-4-12-13	10/18/2018	12-13	N	●	●	●				
SD-5	SD-5-0.5-2	10/18/2018	0.5-2	S	●	●	●				
	SD-5-5.5-6	10/18/2018	5.5-6	X,W	●	●	●				
	SD-5-9-10	10/18/2018	9-10	N	●	●	●				
SD-6	SD-6-1-2	10/18/2018	1-2	S	●	●	●				
	SD-6-4-5	10/18/2018	4-5	X	●	●	●				
	SD-6-6-7	10/18/2018	6-7	W	●	●	●				
	SD-6-9-10	10/18/2018	9-10	N	●	●	●				
SD-7	SD-7-1-2	10/17/2018	1-2	S	●	●	●			●	●
	SD-7-2-3.5	10/17/2018	2-3.5	X	●	●	●			●	●
	SD-7-9-10	10/17/2018	9-10	W	●	●	●			●	●
	SD-7-15-16.5	10/17/2018	15-16.5	W							
	SD-7-18.5-20	10/17/2018	18.5-20	N	●	●	●			●	●

Sample Location ¹			Sample Interval (feet bgs)	Sample Horizon ²	Total Petroleum Hydrocarbons (TPH)		Volatile Organic Compounds (VOCs)		Metals	Polycyclic Aromatic Hydrocarbons (PAHs)	
					Gasoline-Range (NWTPH-Gx)	Diesel- and Heavy Oil-Range (NWTPH-Dx)	BETX (EPA 8260)	EDB, EDC, MTBE and n-Hexane (EPA 8260)	MTCA Metals ⁴ (EPA 6000/7000)	Carcinogenic PAHs (EPA 8270-SIM)	Naphthalenes (EPA 8270-SIM)
SD-8	SD-8-2-4	10/17/2018	0-2	S	●	●	●				
	SD-8-6-8	10/17/2018	2-4	X	●	●	●				
	SD-8-9-11	10/17/2018	4-6	W	●	●	●				
	SD-8-13-15	10/17/2018	6-8	N	●	●	●				
SD-9	SD-9-2.5-4	10/18/2018	2.5-4	S	●	●	●	●	●	●	●
SD-10	SD-10-4-5	10/18/2018	4-5	S	●	●	●	●	●	●	●
Hollow-Stem Auger Sample Location											
MW-12	MW-12-3-4	10/18/2018	3-4	S	●	●	●			●	●
	MW-12-7.5-9.5	10/18/2018	7.5-9.5	X	●	●	●				
	MW-12-11-12	10/18/2018	11-12	W	●	●	●				
	MW-12-14-15	10/18/2018	14-15	N	●	●	●				

Notes:

¹ Sample locations are shown on Figure 1.

² Sample intervals may be adjusted based on observed field conditions to collect samples representative of the fill and native soil horizon, and interface between the saturated and vadose zone. Samples will be collected for analysis based on (1) shallow soil approximately 0-2 feet; (2) highest PID reading; (3) interval at the interface of the saturated and vadose zone and; (4) deepest sample in the boring (native material). If the highest PID reading and water table sample interval overlap, only 3 samples will be collected for analysis. The sample intervals for analysis are anticipated in the table. The exploration will be advanced to at least three feet into native soil or to approximately 14 feet below ground surface (bgs), whichever occurs first. If field screening evidence of contamination is observed, the exploration will be advanced to at least three feet below the observed depth of contamination, or until refusal.

³ Field screening will be completed for each 2-foot interval throughout the boring in accordance with the approved RI/FS Work Plan.

⁴ MTCA metals include arsenic, cadmium, chromium (total), lead and mercury.

Sample for analysis (approximate interval location in table)

S = Shallow Sample

X = Highest PID Reading Sample

W = Water Table Sample

N = Selected sample for initial chemical analysis .

bgs = below ground surface

BETX = Benzene, Ethylbenzene, Toluene and Xylenes

EDB = 1,2-Dichloroethane

EDC = 1,2-Dichloroethane

EPA = Environmental Protection Agency

MTBE = Methyl t-Butyl Ether

MTCA = Model Toxics Control Act

Table 5
Supplemental Investigation Product and Groundwater Measurements
 Quiet Cove Property
 Anacortes, Washington

Well Identification	Date	Time	DTP (ft)	DTW (ft)	Product Thickness (ft)	Top of Casing Elevation (feet NAVD 88)	Product elevation (feet NAVD 88)	Groundwater Elevation (feet NAVD 88)	Field Notes
MW-1	11/9/18	15:02	3.45	3.46	0.01	11.91	8.46	8.45	Trace product encountered
MW-2	11/9/18	15:00	--	4.87	0	12.01	NP	7.14	
MW-3	11/9/18	14:56	--	5.66	0	12.42	NP	6.76	
MW-4	11/9/18	15:25	--	5	0	12.42	NP	7.42	
MW-5	11/9/18	15:35	--	4.54	0	14.48	NP	9.94	
MW-6	11/9/18	15:38	--	4.96	0	15.43	NP	10.47	
MW-7	11/9/18	15:15	--	6.11	0	12.62	NP	6.51	
MW-8	11/9/18	15:08	--	4.53	0	13.13	NP	8.6	
MW-10	11/9/18	14:31	--	3.84	0	14.17	NP	10.33	
MW-11	11/9/18	14:42	3.37	4.83	1.46	12.28	8.91	7.45	Product encountered
MW-12	11/9/18	15:29	--	1.83	0	11.17	NP	9.34	
SD-2	11/9/18	14:40	--	2.46	0	12.04	NP	9.58	Temporary pre-pack well
SD-8	11/9/18	14:37	--	2.64	0	12.47	NP	9.83	Temporary pre-pack well

Notes:

DTP = Depth to product

DTW = Depth to water

NA = Not Available for measurement

NP = No product observed

NAVD 88 = North American Vertical Datum of 1988

ft = feet

Table 6
Supplemental Investigation Groundwater Analytical Schedule
 Quiet Cove Property
 Anacortes, Washington

Sample Location ¹	Sample Identification	Sampling Date	Petroleum Hydrocarbons (TPH)			Volatile Organic Compounds (VOCs)	Geochemical Parameters					
			Gasoline-Range (NWTPH-Gx)	Diesel- and Heavy Oil-Range (NWTPH-Dx) - with silica gel cleanup	Diesel- and Heavy Oil-Range (NWTPH-Dx) - no silica gel cleanup	BETX ² (EPA 8260)	Total Alkalinity (SM 2420 B-97)	Ferrous Iron (SM3500-Fe B-97)	Nitrate (EPA 300.0)	Sulfate (EPA 300.0)	Dissolved Manganese (EPA 6020A)	Dissolved Methane (EPA RSK-175)
Existing Monitoring Well												
MW-1	MW-1_103118	10/31/2018		●	●		●	●	●	●	●	●
MW-2	MW-2_103118	10/31/2018		●	●		●	●	●	●	●	●
MW-3	MW-3_103018	10/30/2018		●	●		●	●	●	●	●	●
MW-4	MW-4_102918	10/29/2018		●	●		●	●	●	●	●	●
MW-5	MW-5_103118	10/31/2018		●	●		●	●	●	●	●	●
MW-6	MW-6_102918	10/29/2018		●	●		●	●	●	●	●	●
MW-7	MW-7_103018	10/30/2018		●	●		●	●	●	●	●	●
MW-8	MW-8_102918	10/29/2018	●	●	●	●	●	●	●	●	●	●
MW-10	MW-10_102918	10/29/2018		●	●		●	●	●	●	●	●
MW-11	MW-11_103118	10/31/2018	●	●	●	●	●	●	●	●	●	●
New Monitoring Well												
MW-12	MW-12_103018	10/30/2018		●	●		●	●	●	●	●	●

Notes:

¹ Sample locations are shown on Figure 1.

² BETX = Benzene, ethylbenzene, toluene, xylene

Table 7
Remedial Investigation and Supplemental Investigation Soil Analytical Results
Quiet Cove
Anacortes, Washington

Sample Location ¹	GEI-1		GEI-2			GEI-3	GEI-4			GEI-8		Preliminary Screening Level ²	
Sample Identification	GEI-1-3-033114	GEI-1-5-033114	GEI-2-1-033114	GEI-2-3-033114	GEI-2-5-033114	GEI-3-3-033114	GEI-4-1-040114	GEI-4-2-040114	GEI-4-3-040114	GEI-8-3-033114	GEI-8-5-033114		
Sample Date	3/31/2014	3/31/2014	3/31/2014	3/31/2014	3/31/2014	3/31/2014	4/1/2014	4/2/2014	4/1/2014	3/31/2014	3/31/2014		
Sample Interval (feet bgs)	4-6 ft	8-10 ft	0-2 ft	4-6 ft	8-10 ft	4-6 ft	0-2 ft	2-3 ft	4-6 ft	4-6 ft	8-10 ft		
Sample Type	Vadose	Saturated	Vadose	Saturated	Saturated	Vadose	Vadose	Saturated	Saturated	Vadose	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Fill	Native	Fill	Fill	Native	Fill	Fill	Fill/Native	Native	Fill/Native	Native		
Field Measured Parameters													
Sheen	HS	NS	NS	MS	NS	HS	NS	HS	NS	HS	NS	NE	NE
Headspace Vapors (ppm)	155	<1	<1	255	53	124	<1	7	<1	232	<1	NE	NE
Metals by EPA 6000/7000 Series (mg/kg)													
Arsenic	--	--	--	--	--	--	--	14 U	--	--	--	20	20
Cadmium	--	--	--	--	--	--	--	2.4	--	--	--	1.2	1
Chromium	--	--	--	--	--	--	--	13	--	--	--	1,000	50
Copper	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Lead	--	--	--	--	--	--	--	79	--	--	--	250	24
Silver	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Zinc	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Mercury	--	--	--	--	--	--	--	0.34 U	--	--	--	0.07	0.07
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)													
Gasoline-range hydrocarbons	7.4 U	7.8 U	3.4 U	7.7 U	3.8 U	7.6 U	3.3 U	6.9 U	9.3 U	260	3.3 U	30 ²	30 ²
Diesel-range hydrocarbons	5,800	540	48	2,400	510	750	170	18,000	730	1,200	29 U	2,000	2,000
Motor Oil-range hydrocarbons	940	97	210	190	77	73	1,200	21,000	940	810	58 U	2,000	2,000
BETX Compounds by EPA 8260 (mg/kg)													
Benzene	0.020 U	0.020 U	0.055	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.048	0.020 U	0.05	0.05
Toluene	0.074 U	0.078 U	0.039	0.077 U	0.038 U	0.076 U	0.033 U	0.069 U	0.093 U	0.11 U	0.033 U	3.8	0.22
Ethylbenzene	0.24	0.078 U	0.21	0.077 U	0.038 U	0.30	0.033 U	0.069 U	0.093 U	0.14	0.033 U	1.1	1.1
Total Xylenes	0.64	0.0780 U	0.31	0.0770 U	0.0380 U	0.91	0.0330 U	0.0690 U	0.0930 U	0.28	0.0330 U	2.8	0.16
Volatile Organic Compounds (VOCs) by EPA 8260 (mg/kg)													
1,1,1,2-Tetrachloroethane	--	--	--	--	--	--	--	0.065 U	--	--	--	0.044	0.003
1,1,1-Trichloroethane	--	--	--	--	--	--	--	0.065 U	--	--	--	42	2.2
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	0.065 U	--	--	--	0.017	0.002
1,1,2-Trichloroethane	--	--	--	--	--	--	--	0.065 U	--	--	--	0.025	0.002
1,1-Dichloroethane	--	--	--	--	--	--	--	0.065 U	--	--	--	0.061	0.0038
1,1-Dichloroethene	--	--	--	--	--	--	--	0.065 U	--	--	--	0.023	0.0011
1,1-Dichloropropene	--	--	--	--	--	--	--	0.065 U	--	--	--	NE	NE
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	0.065 U	--	--	--	NE	NE
1,2,3-Trichloropropane	--	--	--	--	--	--	--	0.065 U	--	--	--	0.033	0.033
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	0.065 U	--	--	--	0.019	0.005
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	0.33 U	--	--	--	1.3	1.3
1,2-Dibromoethane	--	--	--	--	--	--	--	0.065 U	--	--	--	0.002	0.001
1,2-Dichlorobenzene (o-Dichlorobenzene)	--	--	--	--	--	--	--	0.065 U	--	--	--	30	1.7
1,2-Dichloroethane	--	--	--	--	--	--	--	0.065 U	--	--	--	0.02	0.001
1,2-Dichloropropane	--	--	--	--	--	--	--	0.065 U	--	--	--	0.02	0.001
1,3-Dichlorobenzene (m-Dichlorobenzene)	--	--	--	--	--	--	--	0.065 U	--	--	--	NE	NE
1,3-Dichloropropane	--	--	--	--	--	--	--	0.065 U	--	--	--	NE	NE
1,4-Dichlorobenzene (p-Dichlorobenzene)	--	--	--	--	--	--	--	0.065 U	--	--	--	0.08	0.067
2,2-Dichloropropane	--	--	--	--	--	--	--	0.065 U	--	--	--	NE	NE
2-Chloroethyl vinyl ether	--	--	--	--	--	--	--	0.52 U	--	--	--	NE	NE
2-Chlorotoluene	--	--	--	--	--	--	--	0.065 U	--	--	--	1,600	1,600
4-Chlorotoluene	--	--	--	--	--	--	--	0.065 U	--	--	--	NE	NE

Sample Location ¹	GEI-1		GEI-2			GEI-3	GEI-4			GEI-8		Preliminary Screening Level ²	
Sample Identification	GEI-1-3-033114	GEI-1-5-033114	GEI-2-1-033114	GEI-2-3-033114	GEI-2-5-033114	GEI-3-3-033114	GEI-4-1-040114	GEI-4-2-040114	GEI-4-3-040114	GEI-8-3-033114	GEI-8-5-033114		
Sample Date	3/31/2014	3/31/2014	3/31/2014	3/31/2014	3/31/2014	3/31/2014	4/1/2014	4/2/2014	4/1/2014	3/31/2014	3/31/2014		
Sample Interval (feet bgs)	4-6 ft	8-10 ft	0-2 ft	4-6 ft	8-10 ft	4-6 ft	0-2 ft	2-3 ft	4-6 ft	4-6 ft	8-10 ft		
Sample Type	Vadose	Saturated	Vadose	Saturated	Saturated	Vadose	Vadose	Saturated	Saturated	Vadose	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Fill	Native	Fill	Fill	Native	Fill	Fill	Fill/Native	Native	Fill/Native	Native		
Bromobenzene	--	--	--	--	--	--	--	0.065 U	--	--	--	NE	NE
Bromochloromethane	--	--	--	--	--	--	--	0.065 U	--	--	--	NE	NE
Bromodichloromethane	--	--	--	--	--	--	--	0.065 U	--	--	--	NE	NE
Bromoform (Tribromomethane)	--	--	--	--	--	--	--	0.065 U	--	--	--	0.79	0.05
Bromomethane	--	--	--	--	--	--	--	0.065 U	--	--	--	0.06	0.0038
Carbon Tetrachloride	--	--	--	--	--	--	--	0.065 U	--	--	--	0.005	0.001
Chlorobenzene	--	--	--	--	--	--	--	0.065 U	--	--	--	2.5	0.15
Chloroethane	--	--	--	--	--	--	--	0.33 U	--	--	--	96	5.6
Chloroform	--	--	--	--	--	--	--	0.065 U	--	--	--	0.0064	0.001
Chloromethane	--	--	--	--	--	--	--	0.42 U	--	--	--	0.73	0.045
cis-1,2-Dichloroethene	--	--	--	--	--	--	--	0.065 U	--	--	--	160	160
cis-1,3-Dichloropropene	--	--	--	--	--	--	--	0.065 U	--	--	--	NE	NE
Dibromochloromethane	--	--	--	--	--	--	--	0.065 U	--	--	--	0.024	0.002
Dibromomethane	--	--	--	--	--	--	--	0.065 U	--	--	--	800	800
Dichlorodifluoromethane (CFC-12)	--	--	--	--	--	--	--	0.065 U	--	--	--	0.17	NE
Hexachlorobutadiene	--	--	--	--	--	--	--	0.33 U	--	--	--	NE	NE
Methyl Iodide (Iodomethane)	--	--	--	--	--	--	--	0.33 U	--	--	--	NE	NE
Methyl t-butyl ether	--	--	--	--	--	--	--	0.085 U	--	--	--	2.6	0.18
Methylene Chloride	--	--	--	--	--	--	--	0.33 U	--	--	--	NE	NE
n-Hexane	--	--	--	--	--	--	--	0.069 U	--	--	--	0.27	0.01
Tetrachloroethene	--	--	--	--	--	--	--	0.065 U	--	--	--	0.094	0.0049
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	0.065 U	--	--	--	22	1.3
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	0.065 U	--	--	--	NE	NE
Trichloroethene	--	--	--	--	--	--	--	0.065 U	--	--	--	0.01	0.001
Trichlorofluoromethane (CFC-11)	--	--	--	--	--	--	--	0.065 U	--	--	--	1.4	0.04
Vinyl Chloride	--	--	--	--	--	--	--	0.065 U	--	--	--	0.006	0.001
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270-SIM (mg/kg)													
1-Methylnaphthalene	--	--	--	--	--	--	--	11	--	--	--	35	35
2-Methylnaphthalene	--	--	--	--	--	--	--	14	--	--	--	0.77	0.04
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	0.32	0.02
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	NE	0.068
Anthracene	--	--	--	--	--	--	--	--	--	--	--	4.4	0.2
Benzo(a)anthracene	--	--	--	--	--	--	--	0.77	--	--	--	0.07	0.007
Benzo(a)pyrene	--	--	--	--	--	--	--	0.18	--	--	--	0.14	0.01
Benzo(b)fluoranthene	--	--	--	--	--	--	--	0.22	--	--	--	0.25	0.012
Benzo(g,h,i)perylene	--	--	--	--	--	--	--	--	--	--	--	NE	2
Benzo(k)fluoranthene	--	--	--	--	--	--	--	0.18 U	--	--	--	0.32	0.016
Chrysene	--	--	--	--	--	--	--	1.2	--	--	--	0.25	0.012
Dibenzo(a,h)anthracene	--	--	--	--	--	--	--	0.091 U	--	--	--	0.14	0.018
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	0.5	0.16
Fluorene	--	--	--	--	--	--	--	--	--	--	--	0.5	0.16
Indeno(1,2,3-c,d)pyrene	--	--	--	--	--	--	--	0.091 U	--	--	--	0.69	0.035
Naphthalene	--	--	--	--	--	--	--	2.4	--	--	--	0.25	0.013
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	NE	0.1
Pyrene	--	--	--	--	--	--	--	--	--	--	--	20	1
Total cPAH TEQ ³ (ND=0)	--	--	--	--	--	--	--	0.29	--	--	--	0.22	0.011
Total cPAH TEQ ³ (ND=0.5RL)	--	--	--	--	--	--	--	0.31	--	--	--	0.22	0.011
Polychlorinated Biphenyls (PCBs) by EPA 8082 (mg/kg)													

Sample Location ¹	GEI-1		GEI-2			GEI-3	GEI-4			GEI-8		Preliminary Screening Level ²	
Sample Identification	GEI-1-3-033114	GEI-1-5-033114	GEI-2-1-033114	GEI-2-3-033114	GEI-2-5-033114	GEI-3-3-033114	GEI-4-1-040114	GEI-4-2-040114	GEI-4-3-040114	GEI-8-3-033114	GEI-8-5-033114		
Sample Date	3/31/2014	3/31/2014	3/31/2014	3/31/2014	3/31/2014	3/31/2014	4/1/2014	4/2/2014	4/1/2014	3/31/2014	3/31/2014		
Sample Interval (feet bgs)	4-6 ft	8-10 ft	0-2 ft	4-6 ft	8-10 ft	4-6 ft	0-2 ft	2-3 ft	4-6 ft	4-6 ft	8-10 ft		
Sample Type	Vadose	Saturated	Vadose	Saturated	Saturated	Vadose	Vadose	Saturated	Saturated	Vadose	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Fill	Native	Fill	Fill	Native	Fill	Fill	Fill/Native	Native	Fill/Native	Native		
PCB-Aroclor 1016	--	--	--	--	--	--	--	0.068 U	--	--	--	NE	NE
PCB-Aroclor 1221	--	--	--	--	--	--	--	0.068 U	--	--	--	NE	NE
PCB-Aroclor 1232	--	--	--	--	--	--	--	0.068 U	--	--	--	NE	NE
PCB-Aroclor 1242	--	--	--	--	--	--	--	0.068 U	--	--	--	NE	NE
PCB-Aroclor 1248	--	--	--	--	--	--	--	0.068 U	--	--	--	NE	NE
PCB-Aroclor 1254	--	--	--	--	--	--	--	0.068 U	--	--	--	NE	NE
PCB-Aroclor 1260	--	--	--	--	--	--	--	0.068 U	--	--	--	NE	NE
Total PCB Aroclors	--	--	--	--	--	--	--	0.068 U	--	--	--	0.062	0.05

Notes:

¹ Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.

² Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

³ Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.

³ Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

ppm = parts per million

mg/kg = milligrams per kilogram

-- = not analyzed

NE = Not Established

ND = Not Detected

RL = Reporting Limit

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates that the identified concentration is greater than the preliminary screening level.

Blue shading indicates that the practical quantitation limit (PQL) is above screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 7
Remedial Investigation and Supplemental Investigation Soil Analytical Results
Quiet Cove
Anacortes, Washington

Sample Location ¹	GEI-9		GEI-10			GEI-12	GEI-13		GEI-14	GEI-16		Preliminary Screening Level ²	
Sample Identification	GEI-9-3-040114	GEI-9-5-040114	GEI-10-1-033114	GEI-10-3-033114	GEI-10-6-033114	GEI-12-3-04014	GEI-13-2-040114	GEI-13-4-040114	GEI-14-3-040114	GEI-16-3-033114	GEI-16-5-033114		
Sample Date	4/1/2014	4/1/2014	3/31/2014	3/31/2014	3/31/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	3/31/2014	3/31/2014		
Sample Interval (feet bgs)	5-7 ft	8-10 ft	0-2 ft	4-6 ft	10-12 ft	5-7 ft	2-3 ft	6-8 ft	4-6 ft	4-6 ft	8-10 ft		
Sample Type	Saturated	Vadose	Vadose	Saturated	Saturated	Vadose	Vadose	Saturated	Vadose	Vadose	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Native	Native	Fill	Fill	Native	Fill	Fill	Native	Native	Fill	Native		
Field Measured Parameters													
Sheen	HS	NS	NS	HS	NS	NS	HS	NS	NS	SS	NS	NE	NE
Headspace Vapors (ppm)	5	<1	<1	123	<1	<1	362	2	<1	196	<1	NE	NE
Metals by EPA 6000/7000 Series (mg/kg)													
Arsenic	--	--	--	12 U	--	--	--	--	--	--	--	20	20
Cadmium	--	--	--	0.62 U	--	--	--	--	--	--	--	1.2	1
Chromium	--	--	--	52	--	--	--	--	--	--	--	1,000	50
Copper	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Lead	--	--	--	17	--	--	--	--	--	--	--	250	24
Silver	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Zinc	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Mercury	--	--	--	0.31 U	--	--	--	--	--	--	--	0.07	0.07
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)													
Gasoline-range hydrocarbons	4.8 U	5.0 U	3.3 U	420	6.3 U	3.5 U	9.4 U	3.7 U	5.2 U	150	5.4 U	30 ²	30 ²
Diesel-range hydrocarbons	29 U	30 U	1,800	5,600	30 U	29 U	1,900	30 U	34 U	1,600	30 U	2,000	2,000
Motor Oil-range hydrocarbons	58 U	59 U	3,500	8,100	60 U	58 U	80	60 U	68 U	440	60 U	2,000	2,000
BETX Compounds by EPA 8260 (mg/kg)													
Benzene	0.020 U	0.020 U	0.020 U	0.043	0.020 U	0.020 U	0.023	0.020 U	0.020 U	0.11	0.020 U	0.05	0.05
Toluene	0.048 U	0.050 U	0.033 U	0.083 U	0.063 U	0.035 U	0.094 U	0.037 U	0.052 U	0.43 U	0.054 U	3.8	0.22
Ethylbenzene	0.048 U	0.050 U	0.033 U	0.21	0.063 U	0.035 U	0.99	0.037 U	0.052 U	0.85	0.054 U	1.1	1.1
Total Xylenes	0.0480 U	0.0500 U	0.0330 U	0.65	0.0630 U	0.0350 U	0.71	0.0370 U	0.0520 U	0.56	0.0540 U	2.8	0.16
Volatile Organic Compounds (VOCs) by EPA 8260 (mg/kg)													
1,1,1,2-Tetrachloroethane	--	--	--	0.045 U	--	--	--	--	--	--	--	0.044	0.003
1,1,1-Trichloroethane	--	--	--	0.045 U	--	--	--	--	--	--	--	42	2.2
1,1,2,2-Tetrachloroethane	--	--	--	0.045 U	--	--	--	--	--	--	--	0.017	0.002
1,1,2-Trichloroethane	--	--	--	0.045 U	--	--	--	--	--	--	--	0.025	0.002
1,1-Dichloroethane	--	--	--	0.045 U	--	--	--	--	--	--	--	0.061	0.0038
1,1-Dichloroethene	--	--	--	0.045 U	--	--	--	--	--	--	--	0.023	0.0011
1,1-Dichloropropene	--	--	--	0.045 U	--	--	--	--	--	--	--	NE	NE
1,2,3-Trichlorobenzene	--	--	--	0.045 U	--	--	--	--	--	--	--	NE	NE
1,2,3-Trichloropropane	--	--	--	0.045 U	--	--	--	--	--	--	--	0.033	0.033
1,2,4-Trichlorobenzene	--	--	--	0.045 U	--	--	--	--	--	--	--	0.019	0.005
1,2-Dibromo-3-Chloropropane	--	--	--	0.23 U	--	--	--	--	--	--	--	1.3	1.3
1,2-Dibromoethane	--	--	--	0.045 U	--	--	--	--	--	--	--	0.002	0.001
1,2-Dichlorobenzene (o-Dichlorobenzene)	--	--	--	0.045 U	--	--	--	--	--	--	--	30	1.7
1,2-Dichloroethane	--	--	--	0.045 U	--	--	--	--	--	--	--	0.02	0.001
1,2-Dichloropropane	--	--	--	0.045 U	--	--	--	--	--	--	--	0.02	0.001
1,3-Dichlorobenzene (m-Dichlorobenzene)	--	--	--	0.045 U	--	--	--	--	--	--	--	NE	NE
1,3-Dichloropropane	--	--	--	0.045 U	--	--	--	--	--	--	--	NE	NE
1,4-Dichlorobenzene (p-Dichlorobenzene)	--	--	--	0.045 U	--	--	--	--	--	--	--	0.08	0.067
2,2-Dichloropropane	--	--	--	0.045 U	--	--	--	--	--	--	--	NE	NE
2-Chloroethyl vinyl ether	--	--	--	0.36 U	--	--	--	--	--	--	--	NE	NE
2-Chlorotoluene	--	--	--	0.045 U	--	--	--	--	--	--	--	1,600	1,600
4-Chlorotoluene	--	--	--	0.045 U	--	--	--	--	--	--	--	NE	NE

Sample Location ¹	GEI-9		GEI-10			GEI-12	GEI-13		GEI-14	GEI-16		Preliminary Screening Level ²	
Sample Identification	GEI-9-3-040114	GEI-9-5-040114	GEI-10-1-033114	GEI-10-3-033114	GEI-10-6-033114	GEI-12-3-04014	GEI-13-2-040114	GEI-13-4-040114	GEI-14-3-040114	GEI-16-3-033114	GEI-16-5-033114		
Sample Date	4/1/2014	4/1/2014	3/31/2014	3/31/2014	3/31/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	3/31/2014	3/31/2014		
Sample Interval (feet bgs)	5-7 ft	8-10 ft	0-2 ft	4-6 ft	10-12 ft	5-7 ft	2-3 ft	6-8 ft	4-6 ft	4-6 ft	8-10 ft		
Sample Type	Saturated	Vadose	Vadose	Saturated	Saturated	Vadose	Vadose	Saturated	Vadose	Vadose	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Native	Native	Fill	Fill	Native	Fill	Fill	Native	Native	Fill	Native		
Bromobenzene	--	--	--	0.045 U	--	--	--	--	--	--	--	NE	NE
Bromochloromethane	--	--	--	0.045 U	--	--	--	--	--	--	--	NE	NE
Bromodichloromethane	--	--	--	0.045 U	--	--	--	--	--	--	--	NE	NE
Bromoform (Tribromomethane)	--	--	--	0.045 U	--	--	--	--	--	--	--	0.79	0.05
Bromomethane	--	--	--	0.045 U	--	--	--	--	--	--	--	0.06	0.0038
Carbon Tetrachloride	--	--	--	0.045 U	--	--	--	--	--	--	--	0.005	0.001
Chlorobenzene	--	--	--	0.045 U	--	--	--	--	--	--	--	2.5	0.15
Chloroethane	--	--	--	0.23 U	--	--	--	--	--	--	--	96	5.6
Chloroform	--	--	--	0.045 U	--	--	--	--	--	--	--	0.0064	0.001
Chloromethane	--	--	--	0.29 U	--	--	--	--	--	--	--	0.73	0.045
cis-1,2-Dichloroethene	--	--	--	0.045 U	--	--	--	--	--	--	--	160	160
cis-1,3-Dichloropropene	--	--	--	0.045 U	--	--	--	--	--	--	--	NE	NE
Dibromochloromethane	--	--	--	0.045 U	--	--	--	--	--	--	--	0.024	0.002
Dibromomethane	--	--	--	0.045 U	--	--	--	--	--	--	--	800	800
Dichlorodifluoromethane (CFC-12)	--	--	--	0.045 U	--	--	--	--	--	--	--	0.17	NE
Hexachlorobutadiene	--	--	--	0.23 U	--	--	--	--	--	--	--	NE	NE
Methyl Iodide (Iodomethane)	--	--	--	0.23 U	--	--	--	--	--	--	--	NE	NE
Methyl t-butyl ether	--	--	--	0.059 U	--	--	--	--	--	--	--	2.6	0.18
Methylene Chloride	--	--	--	0.23 U	--	--	--	--	--	--	--	NE	NE
n-Hexane	--	--	--	0.083 U	--	--	--	--	--	--	--	0.27	0.01
Tetrachloroethene	--	--	--	0.045 U	--	--	--	--	--	--	--	0.094	0.0049
Trans-1,2-Dichloroethene	--	--	--	0.045 U	--	--	--	--	--	--	--	22	1.3
Trans-1,3-Dichloropropene	--	--	--	0.045 U	--	--	--	--	--	--	--	NE	NE
Trichloroethene	--	--	--	0.045 U	--	--	--	--	--	--	--	0.01	0.001
Trichlorofluoromethane (CFC-11)	--	--	--	0.045 U	--	--	--	--	--	--	--	1.4	0.04
Vinyl Chloride	--	--	--	0.045 U	--	--	--	--	--	--	--	0.006	0.001
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270-SIM (mg/kg)													
1-Methylnaphthalene	--	--	--	4.7	--	--	--	--	--	--	--	35	35
2-Methylnaphthalene	--	--	--	7.6	--	--	--	--	--	--	--	0.77	0.04
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	0.32	0.02
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	NE	0.068
Anthracene	--	--	--	--	--	--	--	--	--	--	--	4.4	0.2
Benzo(a)anthracene	--	--	--	3.9	--	--	--	--	--	--	--	0.07	0.007
Benzo(a)pyrene	--	--	--	3	--	--	--	--	--	--	--	0.14	0.01
Benzo(b)fluoranthene	--	--	--	2.4	--	--	--	--	--	--	--	0.25	0.012
Benzo(g,h,i)perylene	--	--	--	--	--	--	--	--	--	--	--	NE	2
Benzo(k)fluoranthene	--	--	--	1.1	--	--	--	--	--	--	--	0.32	0.016
Chrysene	--	--	--	2.8	--	--	--	--	--	--	--	0.25	0.012
Dibenzo(a,h)anthracene	--	--	--	0.68	--	--	--	--	--	--	--	0.14	0.018
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	0.5	0.16
Fluorene	--	--	--	--	--	--	--	--	--	--	--	0.5	0.16
Indeno(1,2,3-c,d)pyrene	--	--	--	1.3	--	--	--	--	--	--	--	0.69	0.035
Naphthalene	--	--	--	6.2	--	--	--	--	--	--	--	0.25	0.013
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	NE	0.1
Pyrene	--	--	--	--	--	--	--	--	--	--	--	20	1
Total cPAH TEQ ³ (ND=0)	--	--	--	3.97	--	--	--	--	--	--	--	0.22	0.011
Total cPAH TEQ ³ (ND=0.5RL)	--	--	--	3.97	--	--	--	--	--	--	--	0.22	0.011
Polychlorinated Biphenyls (PCBs) by EPA 8082 (mg/kg)													

Sample Location ¹	GEI-9		GEI-10			GEI-12	GEI-13		GEI-14	GEI-16		Preliminary Screening Level ²	
Sample Identification	GEI-9-3-040114	GEI-9-5-040114	GEI-10-1-033114	GEI-10-3-033114	GEI-10-6-033114	GEI-12-3-04014	GEI-13-2-040114	GEI-13-4-040114	GEI-14-3-040114	GEI-16-3-033114	GEI-16-5-033114		
Sample Date	4/1/2014	4/1/2014	3/31/2014	3/31/2014	3/31/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	3/31/2014	3/31/2014		
Sample Interval (feet bgs)	5-7 ft	8-10 ft	0-2 ft	4-6 ft	10-12 ft	5-7 ft	2-3 ft	6-8 ft	4-6 ft	4-6 ft	8-10 ft		
Sample Type	Saturated	Vadose	Vadose	Saturated	Saturated	Vadose	Vadose	Saturated	Vadose	Vadose	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Native	Native	Fill	Fill	Native	Fill	Fill	Native	Native	Fill	Native		
PCB-Aroclor 1016	--	--	--	0.062 U	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1221	--	--	--	0.062 U	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1232	--	--	--	0.062 U	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1242	--	--	--	0.062 U	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1248	--	--	--	0.062 U	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1254	--	--	--	0.062 U	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1260	--	--	--	0.062 U	--	--	--	--	--	--	--	NE	NE
Total PCB Aroclors	--	--	--	0.062 U	--	--	--	--	--	--	--	0.062	0.05

Notes:

¹ Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.

² Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

³ Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.

³ Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

ppm = parts per million

mg/kg = milligrams per kilogram

-- = not analyzed

NE = Not Established

ND = Not Detected

RL = Reporting Limit

RL = Reporting Limit

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates that the identified concentration is greater than the preliminary screening level.

Blue shading indicates that the practical quantitation limit (PQL) is above screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 7
Remedial Investigation and Supplemental Investigation Soil Analytical Results
Quiet Cove
Anacortes, Washington

Sample Location ¹	GEI-17	GEI-18			GEI-19		GEI-20	GEI-21	GEI-25			Preliminary Screening Level ²	
Sample Identification	GEI-17-3-033114	GEI-18-1-033114	GEI-18-3-033114	GEI-18-5-033114	GEI-19-1-040114	GEI-19-3-040114	GEI-20-3-040114	GEI-21-3-040114	GEI-25-1-040114	GEI-25-3-040114	GEI-25-5-040114		
Sample Date	3/31/2014	3/31/2014	3/31/2014	3/31/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014		
Sample Interval (feet bgs)	4-6 ft	0-2 ft	4-6 ft	8-10 ft	0-2 ft	4-6 ft	4-6 ft	4-6 ft	0-2 ft	4-6 ft	8-10 ft		
Sample Type	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Vadose	Vadose	Vadose	Saturated	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Fill	Fill	Native	Native	Fill	Native	Native	Native	Fill	Fill	Native		
Field Measured Parameters													
Sheen	HS	NS	HS	NS	NS	NS	NS	NS	SS	HS	NS	NE	NE
Headspace Vapors (ppm)	>1,000	<1	24	<1	<1	<1	<1	<1	<1	32	<1	NE	NE
Metals by EPA 6000/7000 Series (mg/kg)													
Arsenic	--	--	--	--	--	--	--	--	--	12 U	--	20	20
Cadmium	--	--	--	--	--	--	--	--	--	0.59 U	--	1.2	1
Chromium	--	--	--	--	--	--	--	--	--	34	--	1,000	50
Copper	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Lead	--	--	--	--	--	--	--	--	--	13	--	250	24
Silver	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Zinc	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Mercury	--	--	--	--	--	--	--	--	--	0.29 U	--	0.07	0.07
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)													
Gasoline-range hydrocarbons	9,400	3.2 U	4.0 U	3.8 U	4.0 U	3.6 U	3.9 U	5.8 U	3.3 U	3.9 U	17 U	30 ²	30 ²
Diesel-range hydrocarbons	14,000	270	2,200	71	29 U	29 U	29 U	29 U	250	4,300	76	2,000	2,000
Motor Oil-range hydrocarbons	2,900	1,300	2,300	61 U	58 U	58 U	59 U	59 U	1,100	1,200	580	2,000	2,000
BETX Compounds by EPA 8260 (mg/kg)													
Benzene	62	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.033 U	0.05	0.05
Toluene	16	0.032 U	0.040 U	0.038 U	0.040 U	0.036 U	0.039 U	0.058 U	0.033 U	0.039 U	0.17 U	3.8	0.22
Ethylbenzene	180	0.032 U	0.11	0.038 U	0.040 U	0.036 U	0.039 U	0.058 U	0.033 U	0.26	0.17 U	1.1	1.1
Total Xylenes	361	0.0320 U	0.23	0.0380 U	0.0400 U	0.0360 U	0.0390 U	0.0580 U	0.042	0.16	0.170 U	2.8	0.16
Volatile Organic Compounds (VOCs) by EPA 8260 (mg/kg)													
1,1,1,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	0.037 U	--	0.044	0.003
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	0.037 U	--	42	2.2
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	0.037 U	--	0.017	0.002
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	0.037 U	--	0.025	0.002
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	0.037 U	--	0.061	0.0038
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	0.037 U	--	0.023	0.0011
1,1-Dichloropropene	--	--	--	--	--	--	--	--	--	0.037 U	--	NE	NE
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	0.037 U	--	NE	NE
1,2,3-Trichloropropane	--	--	--	--	--	--	--	--	--	0.037 U	--	0.033	0.033
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	0.037 U	--	0.019	0.005
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	0.19 U	--	1.3	1.3
1,2-Dibromoethane	--	--	--	--	--	--	--	--	--	0.037 U	--	0.002	0.001
1,2-Dichlorobenzene (o-Dichlorobenzene)	--	--	--	--	--	--	--	--	--	0.037 U	--	30	1.7
1,2-Dichloroethane	--	--	--	--	--	--	--	--	--	0.037 U	--	0.02	0.001
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	0.037 U	--	0.02	0.001
1,3-Dichlorobenzene (m-Dichlorobenzene)	--	--	--	--	--	--	--	--	--	0.037 U	--	NE	NE
1,3-Dichloropropane	--	--	--	--	--	--	--	--	--	0.037 U	--	NE	NE
1,4-Dichlorobenzene (p-Dichlorobenzene)	--	--	--	--	--	--	--	--	--	0.037 U	--	0.08	0.067
2,2-Dichloropropane	--	--	--	--	--	--	--	--	--	0.037 U	--	NE	NE
2-Chloroethyl vinyl ether	--	--	--	--	--	--	--	--	--	0.29 U	--	NE	NE
2-Chlorotoluene	--	--	--	--	--	--	--	--	--	0.037 U	--	1,600	1,600
4-Chlorotoluene	--	--	--	--	--	--	--	--	--	0.037 U	--	NE	NE

Sample Location ¹	GEI-17	GEI-18			GEI-19		GEI-20	GEI-21	GEI-25			Preliminary Screening Level ²	
Sample Identification	GEI-17-3-033114	GEI-18-1-033114	GEI-18-3-033114	GEI-18-5-033114	GEI-19-1-040114	GEI-19-3-040114	GEI-20-3-040114	GEI-21-3-040114	GEI-25-1-040114	GEI-25-3-040114	GEI-25-5-040114		
Sample Date	3/31/2014	3/31/2014	3/31/2014	3/31/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014		
Sample Interval (feet bgs)	4-6 ft	0-2 ft	4-6 ft	8-10 ft	0-2 ft	4-6 ft	4-6 ft	4-6 ft	0-2 ft	4-6 ft	8-10 ft		
Sample Type	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Vadose	Vadose	Vadose	Saturated	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Fill	Fill	Native	Native	Fill	Native	Native	Native	Fill	Fill	Native		
Bromobenzene	--	--	--	--	--	--	--	--	--	0.037 U	--	NE	NE
Bromochloromethane	--	--	--	--	--	--	--	--	--	0.037 U	--	NE	NE
Bromodichloromethane	--	--	--	--	--	--	--	--	--	0.037 U	--	NE	NE
Bromoform (Tribromomethane)	--	--	--	--	--	--	--	--	--	0.037 U	--	0.79	0.05
Bromomethane	--	--	--	--	--	--	--	--	--	0.037 U	--	0.06	0.0038
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	0.037 U	--	0.005	0.001
Chlorobenzene	--	--	--	--	--	--	--	--	--	0.037 U	--	2.5	0.15
Chloroethane	--	--	--	--	--	--	--	--	--	0.19 U	--	96	5.6
Chloroform	--	--	--	--	--	--	--	--	--	0.037 U	--	0.0064	0.001
Chloromethane	--	--	--	--	--	--	--	--	--	0.24 U	--	0.73	0.045
cis-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	0.037 U	--	160	160
cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	0.037 U	--	NE	NE
Dibromochloromethane	--	--	--	--	--	--	--	--	--	0.037 U	--	0.024	0.002
Dibromomethane	--	--	--	--	--	--	--	--	--	0.037 U	--	800	800
Dichlorodifluoromethane (CFC-12)	--	--	--	--	--	--	--	--	--	0.037 U	--	0.17	NE
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	0.19 U	--	NE	NE
Methyl Iodide (Iodomethane)	--	--	--	--	--	--	--	--	--	0.19 U	--	NE	NE
Methyl t-butyl ether	--	--	--	--	--	--	--	--	--	0.048 U	--	2.6	0.18
Methylene Chloride	--	--	--	--	--	--	--	--	--	0.19 U	--	NE	NE
n-Hexane	--	--	--	--	--	--	--	--	--	0.074	--	0.27	0.01
Tetrachloroethene	--	--	--	--	--	--	--	--	--	0.037 U	--	0.094	0.0049
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	0.037 U	--	22	1.3
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	0.037 U	--	NE	NE
Trichloroethene	--	--	--	--	--	--	--	--	--	0.037 U	--	0.01	0.001
Trichlorofluoromethane (CFC-11)	--	--	--	--	--	--	--	--	--	0.037 U	--	1.4	0.04
Vinyl Chloride	--	--	--	--	--	--	--	--	--	0.037 U	--	0.006	0.001
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270-SIM (mg/kg)													
1-Methylnaphthalene	--	--	--	--	--	--	--	--	--	6.9	--	35	35
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	1.3	--	0.77	0.04
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	0.32	0.02
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	NE	0.068
Anthracene	--	--	--	--	--	--	--	--	--	--	--	4.4	0.2
Benzo(a)anthracene	--	--	--	--	--	--	--	--	--	0.19	--	0.07	0.007
Benzo(a)pyrene	--	--	--	--	--	--	--	--	--	0.11	--	0.14	0.01
Benzo(b)fluoranthene	--	--	--	--	--	--	--	--	--	0.08	--	0.25	0.012
Benzo(g,h,i)perylene	--	--	--	--	--	--	--	--	--	--	--	NE	2
Benzo(k)fluoranthene	--	--	--	--	--	--	--	--	--	0.052	--	0.32	0.016
Chrysene	--	--	--	--	--	--	--	--	--	0.2	--	0.25	0.012
Dibenzo(a,h)anthracene	--	--	--	--	--	--	--	--	--	0.039 U	--	0.14	0.018
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	0.5	0.16
Fluorene	--	--	--	--	--	--	--	--	--	--	--	0.5	0.16
Indeno(1,2,3-c,d)pyrene	--	--	--	--	--	--	--	--	--	0.048	--	0.69	0.035
Naphthalene	--	--	--	--	--	--	--	--	--	1.1	--	0.25	0.013
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	NE	0.1
Pyrene	--	--	--	--	--	--	--	--	--	--	--	20	1
Total cPAH TEQ ³ (ND=0)	--	--	--	--	--	--	--	--	--	0.149	--	0.22	0.011
Total cPAH TEQ ³ (ND=0.5RL)	--	--	--	--	--	--	--	--	--	0.151	--	0.22	0.011
Polychlorinated Biphenyls (PCBs) by EPA 8082 (mg/kg)													

Sample Location ¹	GEI-17	GEI-18			GEI-19		GEI-20	GEI-21	GEI-25			Preliminary Screening Level ²	
Sample Identification	GEI-17-3-033114	GEI-18-1-033114	GEI-18-3-033114	GEI-18-5-033114	GEI-19-1-040114	GEI-19-3-040114	GEI-20-3-040114	GEI-21-3-040114	GEI-25-1-040114	GEI-25-3-040114	GEI-25-5-040114		
Sample Date	3/31/2014	3/31/2014	3/31/2014	3/31/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014	4/1/2014		
Sample Interval (feet bgs)	4-6 ft	0-2 ft	4-6 ft	8-10 ft	0-2 ft	4-6 ft	4-6 ft	4-6 ft	0-2 ft	4-6 ft	8-10 ft		
Sample Type	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Vadose	Vadose	Vadose	Saturated	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Fill	Fill	Native	Native	Fill	Native	Native	Native	Fill	Fill	Native		
PCB-Aroclor 1016	--	--	--	--	--	--	--	--	--	0.059 U	--	NE	NE
PCB-Aroclor 1221	--	--	--	--	--	--	--	--	--	0.059 U	--	NE	NE
PCB-Aroclor 1232	--	--	--	--	--	--	--	--	--	0.059 U	--	NE	NE
PCB-Aroclor 1242	--	--	--	--	--	--	--	--	--	0.059 U	--	NE	NE
PCB-Aroclor 1248	--	--	--	--	--	--	--	--	--	0.059 U	--	NE	NE
PCB-Aroclor 1254	--	--	--	--	--	--	--	--	--	0.059 U	--	NE	NE
PCB-Aroclor 1260	--	--	--	--	--	--	--	--	--	0.059 U	--	NE	NE
Total PCB Aroclors	--	--	--	--	--	--	--	--	--	0.059 U	--	0.062	0.05

Notes:

¹ Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.

² Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

³ Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.

³ Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

ppm = parts per million

mg/kg = milligrams per kilogram

-- = not analyzed

NE = Not Established

ND = Not Detected

RL = Reporting Limit

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates that the identified concentration is greater than the preliminary screening level.

Blue shading indicates that the practical quantitation limit (PQL) is above screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 7
Remedial Investigation and Supplemental Investigation Soil Analytical Results
Quiet Cove
Anacortes, Washington

Sample Location ¹	GEI-27	GEI-28	GEI-29			GEI-30			GEI-31			Preliminary Screening Level ²	
Sample Identification	GEI-27-3-040214	GEI-28-4-040214	GEI-29-5-7_091217	GEI-29-10-12_091217	GEI-29-13-15_091217	GEI-30-2-4_091217	GEI-30-6-8_091217	GEI-30-9-11_091217	GEI-31-3-5_091117	GEI-31-6-8_091117	GEI-31-13-15_091117		
Sample Date	4/2/2014	4/2/2014	9/12/2017	9/12/2017	9/12/2017	9/12/2017	9/12/2017	9/12/2017	9/11/2017	9/11/2017	9/11/2017		
Sample Interval (feet bgs)	6-7.5 ft	6-8 ft	5-7 ft	10-12 ft	13-15 ft	2-4 ft	6-8 ft	9-11 ft	3-5 ft	6-8 ft	13-15 ft		
Sample Type	Vadose	Vadose	Vadose	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Fill	Native	Fill	Native	Native	Fill	Fill/Native	Native	Fill	Fill/Native	Native		
Field Measured Parameters													
Sheen	NS	NS	NS	NS	NS	NS	SS	NS	NS	NS	NS	NE	NE
Headspace Vapors (ppm)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE
Metals by EPA 6000/7000 Series (mg/kg)													
Arsenic	--	--	3.18	4.47	5.76	2.24	2.16	1.23	1.32	1.5	1.15	20	20
Cadmium	--	--	0.06 J	0.15	0.06 J	0.06 J	0.05 J	0.13	0.19	0.02 J	0.03 J	1.2	1
Chromium	--	--	23.7	31.4	34.5	25.3	29	18.8	12.9	14.5	30.6	1,000	50
Copper	--	--	12.6	19.1	34.3	18.4	14.6	3.52	8.39	3.56	5.7	NE	NE
Lead	--	--	18	3.59	4.31	3.36	25.7	1.17	1.7	1.04	1.13	250	24
Silver	--	--	0.03 J	0.06 J	0.06 J	0.04 J	0.02 J	0.03 J	0.07 J	0.02 J	0.02 J	NE	NE
Zinc	--	--	42.5	38.9	57.6	34.3	51.6	19.7	58.4	21.2	26.8	NE	NE
Mercury	--	--	0.02854 U	0.02750 U	0.02525 U	0.02407	0.02899 U	0.02235 U	0.02671 U	0.02754 U	0.02614 U	0.07	0.07
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)													
Gasoline-range hydrocarbons	4.9 U	4.0 U	7.53 U	6.51 U	7.03 U	6.26 U	14.7 U	7.59 U	6.28 U	6.19 U	5.74 U	30 ²	30 ²
Diesel-range hydrocarbons	32 U	29 U	9.79	5.85 U	5.97 U	15.4	105	6.07 U	5.51 U	5.88 U	5.53 U	2,000	2,000
Motor Oil-range hydrocarbons	70	58 U	70.1	11.7 U	11.9 U	27.3	259	17.5	11.0 U	11.8 U	11.1 U	2,000	2,000
BETX Compounds by EPA 8260 (mg/kg)													
Benzene	0.020 U	0.020 U	0.00112 U	0.00123 U	0.00122 U	0.00044 J	0.00141 U	0.00116 U	0.00266	0.00093 J	0.00100 U	0.05	0.05
Toluene	0.049 U	0.040 U	0.00112 U	0.00123 U	0.00122 U	0.00104 U	0.00040 J	0.00034 J	0.00070 J	0.00066 J	0.00100 U	3.8	0.22
Ethylbenzene	0.049 U	0.040 U	0.00112 U	0.00123 U	0.00122 U	0.00104 U	0.00141 U	0.00116 U	0.00144 U	0.00124 U	0.00100 U	1.1	1.1
Total Xylenes	0.0490 U	0.0400 U	0.00224 U	0.00246 U	0.00245 U	0.00209 U	0.00283 U	0.00233 U	0.00288 U	0.00249 U	0.00199 U	2.8	0.16
Volatile Organic Compounds (VOCs) by EPA 8260 (mg/kg)													
1,1,1,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	0.044	0.003
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	42	2.2
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	0.017	0.002
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	0.025	0.002
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	0.061	0.0038
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	0.023	0.0011
1,1-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
1,2,3-Trichloropropane	--	--	--	--	--	--	--	--	--	--	--	0.033	0.033
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.019	0.005
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	1.3	1.3
1,2-Dibromoethane	--	--	0.00112 U	0.00123 U	0.00122 U	0.00104 U	0.00141 U	0.00116 U	0.00144 U	0.00124 U	0.00100 U	0.002	0.001
1,2-Dichlorobenzene (o-Dichlorobenzene)	--	--	--	--	--	--	--	--	--	--	--	30	1.7
1,2-Dichloroethane	--	--	0.00112 U	0.00123 U	0.00122 U	0.00104 U	0.00141 U	0.00116 U	0.00144 U	0.00124 U	0.00100 U	0.02	0.001
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	0.02	0.001
1,3-Dichlorobenzene (m-Dichlorobenzene)	--	--	--	--	--	--	--	--	--	--	--	NE	NE
1,3-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	NE	NE
1,4-Dichlorobenzene (p-Dichlorobenzene)	--	--	--	--	--	--	--	--	--	--	--	0.08	0.067
2,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	NE	NE
2-Chloroethyl vinyl ether	--	--	--	--	--	--	--	--	--	--	--	NE	NE
2-Chlorotoluene	--	--	--	--	--	--	--	--	--	--	--	1,600	1,600
4-Chlorotoluene	--	--	--	--	--	--	--	--	--	--	--	NE	NE

Sample Location ¹	GEI-27	GEI-28	GEI-29			GEI-30			GEI-31			Preliminary Screening Level ²	
Sample Identification	GEI-27-3-040214	GEI-28-4-040214	GEI-29-5-7_091217	GEI-29-10-12_091217	GEI-29-13-15_091217	GEI-30-2-4_091217	GEI-30-6-8_091217	GEI-30-9-11_091217	GEI-31-3-5_091117	GEI-31-6-8_091117	GEI-31-13-15_091117		
Sample Date	4/2/2014	4/2/2014	9/12/2017	9/12/2017	9/12/2017	9/12/2017	9/12/2017	9/12/2017	9/11/2017	9/11/2017	9/11/2017		
Sample Interval (feet bgs)	6-7.5 ft	6-8 ft	5-7 ft	10-12 ft	13-15 ft	2-4 ft	6-8 ft	9-11 ft	3-5 ft	6-8 ft	13-15 ft		
Sample Type	Vadose	Vadose	Vadose	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Fill	Native	Fill	Native	Native	Fill	Fill/Native	Native	Fill	Fill/Native	Native		
Bromobenzene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Bromoform (Tribromomethane)	--	--	--	--	--	--	--	--	--	--	--	0.79	0.05
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	0.06	0.0038
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	0.005	0.001
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	2.5	0.15
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	96	5.6
Chloroform	--	--	--	--	--	--	--	--	--	--	--	0.0064	0.001
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	0.73	0.045
cis-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	160	160
cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	0.024	0.002
Dibromomethane	--	--	--	--	--	--	--	--	--	--	--	800	800
Dichlorodifluoromethane (CFC-12)	--	--	--	--	--	--	--	--	--	--	--	0.17	NE
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Methyl Iodide (Iodomethane)	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Methyl t-butyl ether	--	--	0.00112 U	0.00123 U	0.00122 U	0.00104 U	0.00141 U	0.00116 U	0.00144 U	0.00124 U	0.00100 U	2.6	0.18
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	NE	NE
n-Hexane	--	--	0.00112 U	0.00123 U	0.00122 U	0.00104 U	0.00141 U	0.00116 U	0.00144 U	0.00152	0.00106	0.27	0.01
Tetrachloroethene	--	--	--	--	--	--	--	--	--	--	--	0.094	0.0049
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	22	1.3
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Trichloroethene	--	--	--	--	--	--	--	--	--	--	--	0.01	0.001
Trichlorofluoromethane (CFC-11)	--	--	--	--	--	--	--	--	--	--	--	1.4	0.04
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	0.006	0.001
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270-SIM (mg/kg)													
1-Methylnaphthalene	--	--	0.0116	0.00478 U	0.00491 U	0.00492 U	0.0339	0.00491 U	0.00497 U	0.00492 U	0.00492 U	35	35
2-Methylnaphthalene	--	--	0.0182	0.00478 U	0.00491 U	0.00257 J	0.0667	0.00491 U	0.00497 U	0.00492 U	0.00492 U	0.77	0.04
Acenaphthene	--	--	0.00644	0.00478 U	0.00491 U	0.00492 U	0.0162	0.00491 U	0.00497 U	0.00492 U	0.00492 U	0.32	0.02
Acenaphthylene	--	--	0.00902	0.00478 U	0.00491 U	0.00492 U	0.376	0.00491 U	0.00497 U	0.00492 U	0.00492 U	NE	0.068
Anthracene	--	--	0.0212	0.00478 U	0.00491 U	0.00492 U	1.03	0.00433 J	0.00497 U	0.00492 U	0.00492 U	4.4	0.2
Benzo(a)anthracene	--	--	0.058	0.00478 U	0.00491 U	0.00492 U	2.32	0.0107	0.00497 U	0.00492 U	0.00492 U	0.07	0.007
Benzo(a)pyrene	--	--	0.0666	0.00286 J	0.00491 U	0.00492 U	2.39	0.0117	0.00497 U	0.00492 U	0.00492 U	0.14	0.01
Benzo(b)fluoranthene	--	--	0.0427	0.00478 U	0.00491 U	0.00492 U	1.35	0.00613	0.00497 U	0.00492 U	0.00492 U	0.25	0.012
Benzo(g,h,i)perylene	--	--	0.0595	0.00478 U	0.00491 U	0.00492 U	1.58	0.00787	0.00497 U	0.00492 U	0.00492 U	NE	2
Benzo(k)fluoranthene	--	--	0.021	0.00478 U	0.00491 U	0.00492 U	0.792	0.00427 J	0.00497 U	0.00492 U	0.00492 U	0.32	0.016
Chrysene	--	--	0.0776	0.00478 U	0.00491 U	0.00492 U	2.27	0.0117	0.00497 U	0.00492 U	0.00492 U	0.25	0.012
Dibenzo(a,h)anthracene	--	--	0.0104	0.00478 U	0.00491 U	0.00492 U	0.338	0.00491 U	0.00497 U	0.00492 U	0.00492 U	0.14	0.018
Fluoranthene	--	--	0.104	0.00344 J	0.00491 U	0.00380 J	4.21	0.0207	0.00267 J	0.00492 U	0.00492 U	0.5	0.16
Fluorene	--	--	0.00841	0.00478 U	0.00491 U	0.00492 U	0.0883	0.00491 U	0.00497 U	0.00492 U	0.00492 U	0.5	0.16
Indeno(1,2,3-c,d)pyrene	--	--	0.0419	0.00478 U	0.00491 U	0.00492 U	1.38	0.00626	0.00497 U	0.00492 U	0.00492 U	0.69	0.035
Naphthalene	--	--	0.00834	0.00478 U	0.00491 U	0.00286 J	0.143	0.00491 U	0.00497 U	0.00492 U	0.00492 U	0.25	0.013
Phenanthrene	--	--	0.0792	0.00478 U	0.00491 U	0.00463 J	1.38	0.00553	0.00220 J	0.00492 U	0.00492 U	NE	0.1
Pyrene	--	--	0.118	0.00449 J	0.00491 U	0.00576	4.71	0.025	0.00264 J	0.00492 U	0.00492 U	20	1
Total cPAH TEQ ³ (ND=0)	--	--	0.0848	0.00286	0 U	0 U	3.03	0.0148	0 U	0 U	0 U	0.22	0.011
Total cPAH TEQ ³ (ND=0.5RL)	--	--	0.0848	0.00408	0.00371 U	0.00371 U	3.03	0.0146	0.00375 U	0.00371 U	0.00371 U	0.22	0.011
Polychlorinated Biphenyls (PCBs) by EPA 8082 (mg/kg)													

Sample Location ¹	GEI-27	GEI-28	GEI-29			GEI-30			GEI-31			Preliminary Screening Level ²	
Sample Identification	GEI-27-3-040214	GEI-28-4-040214	GEI-29-5-7_091217	GEI-29-10-12_091217	GEI-29-13-15_091217	GEI-30-2-4_091217	GEI-30-6-8_091217	GEI-30-9-11_091217	GEI-31-3-5_091117	GEI-31-6-8_091117	GEI-31-13-15_091117		
Sample Date	4/2/2014	4/2/2014	9/12/2017	9/12/2017	9/12/2017	9/12/2017	9/12/2017	9/12/2017	9/11/2017	9/11/2017	9/11/2017		
Sample Interval (feet bgs)	6-7.5 ft	6-8 ft	5-7 ft	10-12 ft	13-15 ft	2-4 ft	6-8 ft	9-11 ft	3-5 ft	6-8 ft	13-15 ft		
Sample Type	Vadose	Vadose	Vadose	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Fill	Native	Fill	Native	Native	Fill	Fill/Native	Native	Fill	Fill/Native	Native		
PCB-Aroclor 1016	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1221	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1232	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1242	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1254	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1260	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Total PCB Aroclors	--	--	--	--	--	--	--	--	--	--	--	0.062	0.05

Notes:

¹ Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.

² Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

³ Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.

³ Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

ppm = parts per million

mg/kg = milligrams per kilogram

-- = not analyzed

NE = Not Established

ND = Not Detected

RL = Reporting Limit

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates that the identified concentration is greater than the preliminary screening level.

Blue shading indicates that the practical quantitation limit (PQL) is above screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 7
Remedial Investigation and Supplemental Investigation Soil Analytical Results
Quiet Cove
Anacortes, Washington

Sample Location ¹	GEI-32			GEI-38			GEI-39			GEI-40		Preliminary Screening Level ²	
Sample Identification	GEI-32-3-4.5_ 091117	GEI-32-7-9_ 091117	GEI-32-10-12_ 091117	GEI-38-2-4_ 091917	GEI-38-5-7_ 091917	GEI-38-12-14_ 091917	GEI-39-1-3_ 091517	GEI-39-5-7_ 091517	GEI-39-8-10_ 091517	GEI-40-2-4_ 091917	GEI-40-5-7_ 091917		
Sample Date	9/11/2017	9/11/2017	9/11/2017	9/19/2017	9/19/2017	9/19/2017	9/15/2017	9/15/2017	9/15/2017	9/19/2017	9/19/2017		
Sample Interval (feet bgs)	3-4.5 ft	7-9 ft	10-12 ft	2-4 ft	5-7 ft	12-14 ft	1-3 ft	5-7 ft	8-10 ft	2-4 ft	5-7 ft		
Sample Type	Vadose	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Fill	Native	Native	Fill	Fill	Native	Fill	Fill	Fill/Native	Fill	Fill		
Field Measured Parameters													
Sheen	NS	NS	NS	NS	NS	NS	NS	SS	NS	NS	SS	NE	NE
Headspace Vapors (ppm)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	18	NE	NE
Metals by EPA 6000/7000 Series (mg/kg)													
Arsenic	1.58	1.41	1.4	3.49	1.33	2.82	3.52	5.92	1.48	5.18	2.35	20	20
Cadmium	0.08 J	0.05 J	0.10 J	0.15	0.04 J	0.06 J	0.1	0.49	0.04 J	0.13	0.61	1.2	1
Chromium	16.7	13.4	24.4	24.9	33.7	77.7	19	34.2	17.4	19.3	22.1	1,000	50
Copper	9.43	6.15	6.55	66	6.4	25.2	43.1	55.4	7.62	75	21.9	NE	NE
Lead	5.45	0.96	1.27	195	2.84	3.28	129	121	10.9	267	60.1	250	24
Silver	0.04 J	0.02 J	0.04 J	0.07 J	0.03 J	0.05 J	0.03 J	0.10 J	0.02 J	0.52	0.04 J	NE	NE
Zinc	27.3	24.3	39.7	110	25.5	42.9	91.3	119	39.7	99.2	56	NE	NE
Mercury	0.02711 U	0.02509 U	0.02399 U	0.115	0.0259 U	0.0307	0.05142	0.1407	0.02027 U	0.0583	0.0587	0.07	0.07
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)													
Gasoline-range hydrocarbons	6.38 U	7.04 U	5.44 U	5.11 U	6.16 U	6.08 U	6.34 U	426	6.28 U	28.5	20.1	30 ²	30 ²
Diesel-range hydrocarbons	5.37 U	6.08 U	5.62 U	68.9	5.75 U	5.77 U	19.5	1030	11.5	69.1	11.5	2,000	2,000
Motor Oil-range hydrocarbons	13.2	12.2 U	11.2 U	189	11.5 U	11.5 U	92.9	2,340	26.3	150	19.3	2,000	2,000
BETX Compounds by EPA 8260 (mg/kg)													
Benzene	0.00080 J	0.00033 J	0.00032 J	0.00125	0.00060 J	0.00105 U	0.00114 U	0.00174	0.00141	0.00120 U	0.00237	0.05	0.05
Toluene	0.00028 J	0.00045 J	0.00042 J	0.00257	0.00106 U	0.00105 U	0.00114 U	0.00179	0.00099 U	0.00049 J	0.00095 J	3.8	0.22
Ethylbenzene	0.00101 U	0.00103 U	0.00100 U	0.00094 U	0.00106 U	0.00105 U	0.00114 U	0.00129 U	0.00099 U	0.00120 U	0.00028 J	1.1	1.1
Total Xylenes	0.00202 U	0.00205 U	0.00201 U	0.00137	0.00213 U	0.00209 U	0.00229 U	0.00519	0.00198 U	0.00239 U	0.00062	2.8	0.16
Volatile Organic Compounds (VOCs) by EPA 8260 (mg/kg)													
1,1,1,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	0.044	0.003
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	42	2.2
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	0.017	0.002
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	0.025	0.002
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	0.061	0.0038
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	0.023	0.0011
1,1-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
1,2,3-Trichloropropane	--	--	--	--	--	--	--	--	--	--	--	0.033	0.033
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	0.019	0.005
1,2-Dibromo-3-Chloropropane	--	--	--	--	--	--	--	--	--	--	--	1.3	1.3
1,2-Dibromoethane	0.00101 U	0.00103 U	0.00100 U	0.00094 U	0.00106 U	0.00105 U	0.00114 U	0.00129 U	0.00099 U	0.00120 U	0.00106 U	0.002	0.001
1,2-Dichlorobenzene (o-Dichlorobenzene)	--	--	--	--	--	--	--	--	--	--	--	30	1.7
1,2-Dichloroethane	0.00101 U	0.00103 U	0.00100 U	0.00094 U	0.00106 U	0.00105 U	0.00114 U	0.00129 U	0.00099 U	0.00120 U	0.00106 U	0.02	0.001
1,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	0.02	0.001
1,3-Dichlorobenzene (m-Dichlorobenzene)	--	--	--	--	--	--	--	--	--	--	--	NE	NE
1,3-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	NE	NE
1,4-Dichlorobenzene (p-Dichlorobenzene)	--	--	--	--	--	--	--	--	--	--	--	0.08	0.067
2,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	NE	NE
2-Chloroethyl vinyl ether	--	--	--	--	--	--	--	--	--	--	--	NE	NE
2-Chlorotoluene	--	--	--	--	--	--	--	--	--	--	--	1,600	1,600
4-Chlorotoluene	--	--	--	--	--	--	--	--	--	--	--	NE	NE

Sample Location ¹	GEI-32			GEI-38			GEI-39			GEI-40		Preliminary Screening Level ²	
Sample Identification	GEI-32-3-4.5_091117	GEI-32-7-9_091117	GEI-32-10-12_091117	GEI-38-2-4_091917	GEI-38-5-7_091917	GEI-38-12-14_091917	GEI-39-1-3_091517	GEI-39-5-7_091517	GEI-39-8-10_091517	GEI-40-2-4_091917	GEI-40-5-7_091917		
Sample Date	9/11/2017	9/11/2017	9/11/2017	9/19/2017	9/19/2017	9/19/2017	9/15/2017	9/15/2017	9/15/2017	9/19/2017	9/19/2017		
Sample Interval (feet bgs)	3-4.5 ft	7-9 ft	10-12 ft	2-4 ft	5-7 ft	12-14 ft	1-3 ft	5-7 ft	8-10 ft	2-4 ft	5-7 ft		
Sample Type	Vadose	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Fill	Native	Native	Fill	Fill	Native	Fill	Fill	Fill/Native	Fill	Fill		
Bromobenzene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Bromoform (Tribromomethane)	--	--	--	--	--	--	--	--	--	--	--	0.79	0.05
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	0.06	0.0038
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	0.005	0.001
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	2.5	0.15
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	96	5.6
Chloroform	--	--	--	--	--	--	--	--	--	--	--	0.0064	0.001
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	0.73	0.045
cis-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	160	160
cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	0.024	0.002
Dibromomethane	--	--	--	--	--	--	--	--	--	--	--	800	800
Dichlorodifluoromethane (CFC-12)	--	--	--	--	--	--	--	--	--	--	--	0.17	NE
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Methyl Iodide (Iodomethane)	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Methyl t-butyl ether	0.00101 U	0.00103 U	0.00100 U	0.00094 U	0.00106 U	0.00105 U	0.00114 U	0.00129 U	0.00099 U	0.00120 U	0.00106 U	2.6	0.18
Methylene Chloride												NE	NE
n-Hexane	0.00101 U	0.00103 U	0.00100 U	0.00094 U	0.00106 U	0.00105 U	0.00114 U	0.00129 U	0.00099 U	0.00120 U	0.00106 U	0.27	0.01
Tetrachloroethene	--	--	--	--	--	--	--	--	--	--	--	0.094	0.0049
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	22	1.3
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Trichloroethene	--	--	--	--	--	--	--	--	--	--	--	0.01	0.001
Trichlorofluoromethane (CFC-11)	--	--	--	--	--	--	--	--	--	--	--	1.4	0.04
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	0.006	0.001
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270-SIM (mg/kg)													
1-Methylnaphthalene	0.00490 U	0.00495 U	0.00467 U	0.00898	0.00481 U	0.00479 U	0.00436 J	1.97	0.00422 J	0.0135	0.0115	35	35
2-Methylnaphthalene	0.00257 J	0.00495 U	0.00467 U	0.0131	0.00481 U	0.00479 U	0.00404 J	1.3	0.00441 J	0.0149	0.0129	0.77	0.04
Acenaphthene	0.00490 U	0.00495 U	0.00467 U	0.00551	0.00247 J	0.00479 U	0.00466 U	0.327	0.00359 J	0.00411 J	0.00532	0.32	0.02
Acenaphthylene	0.00490 U	0.00495 U	0.00467 U	0.0305	0.00481 U	0.00479 U	0.00812	0.717	0.00471 J	0.0395	0.0191	NE	0.068
Anthracene	0.00490 U	0.00495 U	0.00467 U	0.0516	0.00481 U	0.00479 U	0.00974	1.14	0.00447 J	0.0672	0.0364	4.4	0.2
Benzo(a)anthracene	0.00490 U	0.00495 U	0.00467 U	0.169	0.00313 J	0.00479 U	0.0371	3.82	0.0112	0.141	0.094	0.07	0.007
Benzo(a)pyrene	0.00490 U	0.00495 U	0.00467 U	0.183	0.00302 J	0.00479 U	0.0378	3.29	0.00879	0.147	0.0898	0.14	0.01
Benzo(b)fluoranthene	0.00490 U	0.00495 U	0.00467 U	0.12	0.00188 J	0.00479 U	0.0303	2.25	0.00586	0.126	0.0664	0.25	0.012
Benzo(g,h,i)perylene	0.00490 U	0.00495 U	0.00467 U	0.155	0.00306 J	0.00479 U	0.035	2.21	0.00573	0.151	0.0655	NE	2
Benzo(k)fluoranthene	0.00490 U	0.00495 U	0.00467 U	0.0737	0.00159 J	0.00479 U	0.0162	1.32	0.00358 J	0.0744	0.038	0.32	0.016
Chrysene	0.00490 U	0.00495 U	0.00467 U	0.168	0.00312 J	0.00479 U	0.0428	3.66	0.00993	0.171	0.113	0.25	0.012
Dibenzo(a,h)anthracene	0.00490 U	0.00495 U	0.00467 U	0.0372	0.00481 U	0.00479 U	0.00847	0.734	0.00495 U	0.0322	0.016	0.14	0.018
Fluoranthene	0.00490 U	0.00495 U	0.00467 U	0.323	0.0138	0.00479 U	0.0676	6.78	0.0345	0.274	0.318	0.5	0.16
Fluorene	0.00490 U	0.00495 U	0.00467 U	0.016	0.00481 U	0.00479 U	0.00460 J	0.397	0.00397 J	0.0227	0.0217	0.5	0.16
Indeno(1,2,3-c,d)pyrene	0.00490 U	0.00495 U	0.00467 U	0.12	0.00481 U	0.00479 U	0.0273	1.82	0.0051	0.107	0.0475	0.69	0.035
Naphthalene	0.00490 U	0.00495 U	0.00467 U	0.0159	0.00287 J	0.00479 U	0.00557	1.2	0.00703	0.0186	0.0159	0.25	0.013
Phenanthrene	0.00490 U	0.00495 U	0.00467 U	0.174	0.00755	0.00479 U	0.04	1.82	0.0134	0.238	0.212	NE	0.1
Pyrene	0.00490 U	0.00495 U	0.00467 U	0.342	0.00986	0.00479 U	0.0765	7.23	0.0442	0.313	0.27	20	1
Total cPAH TEQ ³ (ND=0)	0 U	0 U	0 U	0.237	0.00371	0 U	0.0502	4.32	0.0115	0.197	0.117	0.22	0.011
Total cPAH TEQ ³ (ND=0.5RL)	0.00370 U	0.00374 U	0.00353 U	0.237	0.00419	0.00362 U	0.0502	4.32	0.0117	0.197	0.117	0.22	0.011
Polychlorinated Biphenyls (PCBs) by EPA 8082 (mg/kg)													

Sample Location ¹	GEI-32			GEI-38			GEI-39			GEI-40		Preliminary Screening Level ²	
Sample Identification	GEI-32-3-4.5_091117	GEI-32-7-9_091117	GEI-32-10-12_091117	GEI-38-2-4_091917	GEI-38-5-7_091917	GEI-38-12-14_091917	GEI-39-1-3_091517	GEI-39-5-7_091517	GEI-39-8-10_091517	GEI-40-2-4_091917	GEI-40-5-7_091917		
Sample Date	9/11/2017	9/11/2017	9/11/2017	9/19/2017	9/19/2017	9/19/2017	9/15/2017	9/15/2017	9/15/2017	9/19/2017	9/19/2017		
Sample Interval (feet bgs)	3-4.5 ft	7-9 ft	10-12 ft	2-4 ft	5-7 ft	12-14 ft	1-3 ft	5-7 ft	8-10 ft	2-4 ft	5-7 ft		
Sample Type	Vadose	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Fill	Native	Native	Fill	Fill	Native	Fill	Fill	Fill/Native	Fill	Fill		
PCB-Aroclor 1016	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1221	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1232	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1242	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1254	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1260	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Total PCB Aroclors	--	--	--	--	--	--	--	--	--	--	--	0.062	0.05

Notes:

¹ Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.

² Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

³ Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.

³ Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

ppm = parts per million

mg/kg = milligrams per kilogram

-- = not analyzed

NE = Not Established

ND = Not Detected

RL = Reporting Limit

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates that the identified concentration is greater than the preliminary screening level.

Blue shading indicates that the practical quantitation limit (PQL) is above screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 7
Remedial Investigation and Supplemental Investigation Soil Analytical Results
Quiet Cove
Anacortes, Washington

Sample Location ¹	GEI-40	GEI-41	GEI-42		GEI-43		GEI-44			MW-8		Preliminary Screening Level ²	
Sample Identification	GEI-40-12-14_091917	GEI-41-5-7_091317	GEI-42-1-3_091317	GEI-42-6-8_091317	GEI-43-3-5_091317	GEI-43-5-7_091317	GEI-44-2-4_091317	GEI-44-7-9_091317	GEI-44-10-12_091317	MW-8-2-4_091917	MW-8-5-7_091917		
Sample Date	9/19/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/19/2017	9/19/2017		
Sample Interval (feet bgs)	12-14 ft	5-7 ft	1-3 ft	6-8 ft	3-5 ft	5-7 ft	2-4 ft	7-9 ft	10-12 ft	2-4 ft	5-7 ft		
Sample Type	Saturated	Vadose	Vadose	Saturated	Vadose	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Native	Natvie	Fill	Native	Fill/Native	Native	Fill	Fill/Native	Native	Fill	Fill		
Field Measured Parameters													
Sheen	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NE	NE
Headspace Vapors (ppm)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE
Metals by EPA 6000/7000 Series (mg/kg)													
Arsenic	1.32	5.32	4.24	3.39	4.01	5.74	4.73	1.53	1.34	–	–	20	20
Cadmium	0.02 J	0.12	0.08 J	0.06 J	0.13	0.09 J	0.24	0.07 J	0.02 J	–	–	1.2	1
Chromium	19.7	37	55.6	15.8	36.7	34.6	25.1	16.3	19.3	–	–	1,000	50
Copper	10.2	37	22.4	12.8	20.8	32	22.4	4.48	4.76	–	–	NE	NE
Lead	1.59	4.96	4.91	1.88	8.21	4.12	28.7	0.94	1.08	–	–	250	24
Silver	0.02 J	0.07 J	0.04 J	0.03 J	0.04 J	0.06 J	0.07 J	0.01 J	0.005 J	–	–	NE	NE
Zinc	28.6	66.1	37.8	27.1	48.1	57	72.2	28.9	25.4	–	–	NE	NE
Mercury	0.0244 U	0.04057	0.02987	0.02543 U	0.04283	0.03611	0.03667	0.02592 U	0.02461 U	–	–	0.07	0.07
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)													
Gasoline-range hydrocarbons	4.61 U	7.3 U	5.59 U	5.97 U	6.11 U	6.57 U	6.23 U	6.86 U	6.4 U	6.67 U	6.32 U	30 ²	30 ²
Diesel-range hydrocarbons	5.49 U	5.64 U	5.32 U	5.86 U	5.51 U	5.83 U	57	5.93 U	5.75 U	14.6	9.52	2,000	2,000
Motor Oil-range hydrocarbons	11.0 U	11.3 U	10.6 U	11.7 U	11.0 U	11.7 U	247	11.9 U	11.5 U	30.9	44.1	2,000	2,000
BETX Compounds by EPA 8260 (mg/kg)													
Benzene	0.00090 U	0.00102 U	0.00105 U	0.00099 U	0.00099 U	0.00115 U	0.00098 J	0.00109 U	0.00110 U	0.00097 U	0.00474	0.05	0.05
Toluene	0.00090 U	0.00102 U	0.00105 U	0.00099 U	0.00099 U	0.00115 U	0.00041 J	0.00109 U	0.00110 U	0.00030 J	0.00188	3.8	0.22
Ethylbenzene	0.00090 U	0.00102 U	0.00105 U	0.00099 U	0.00099 U	0.00115 U	0.00107 U	0.00109 U	0.00110 U	0.00097 U	0.00088 J	1.1	1.1
Total Xylenes	0.00180 U	0.00205 U	0.00211 U	0.00197 U	0.00197 U	0.00231 U	0.00213 U	0.00219 U	0.00220 U	0.00194 U	0.00304	2.8	0.16
Volatile Organic Compounds (VOCs) by EPA 8260 (mg/kg)													
1,1,1,2-Tetrachloroethane	–	–	–	–	–	–	–	–	–	–	–	0.044	0.003
1,1,1-Trichloroethane	–	–	–	–	–	–	–	–	–	–	–	42	2.2
1,1,2,2-Tetrachloroethane	–	–	–	–	–	–	–	–	–	–	–	0.017	0.002
1,1,2-Trichloroethane	–	–	–	–	–	–	–	–	–	–	–	0.025	0.002
1,1-Dichloroethane	–	–	–	–	–	–	–	–	–	–	–	0.061	0.0038
1,1-Dichloroethene	–	–	–	–	–	–	–	–	–	–	–	0.023	0.0011
1,1-Dichloropropene	–	–	–	–	–	–	–	–	–	–	–	NE	NE
1,2,3-Trichlorobenzene	–	–	–	–	–	–	–	–	–	–	–	NE	NE
1,2,3-Trichloropropane	–	–	–	–	–	–	–	–	–	–	–	0.033	0.033
1,2,4-Trichlorobenzene	–	–	–	–	–	–	–	–	–	–	–	0.019	0.005
1,2-Dibromo-3-Chloropropane	–	–	–	–	–	–	–	–	–	–	–	1.3	1.3
1,2-Dibromoethane	0.00090 U	0.00102 U	0.00105 U	0.00099 U	0.00099 U	0.00115 U	0.00107 U	0.00109 U	0.00110 U	0.00097 U	0.00107 U	0.002	0.001
1,2-Dichlorobenzene (o-Dichlorobenzene)	–	–	–	–	–	–	–	–	–	–	–	30	1.7
1,2-Dichloroethane	0.00090 U	0.00102 U	0.00105 U	0.00099 U	0.00099 U	0.00115 U	0.00107 U	0.00109 U	0.00110 U	0.00097 U	0.00107 U	0.02	0.001
1,2-Dichloropropane	–	–	–	–	–	–	–	–	–	–	–	0.02	0.001
1,3-Dichlorobenzene (m-Dichlorobenzene)	–	–	–	–	–	–	–	–	–	–	–	NE	NE
1,3-Dichloropropane	–	–	–	–	–	–	–	–	–	–	–	NE	NE
1,4-Dichlorobenzene (p-Dichlorobenzene)	–	–	–	–	–	–	–	–	–	–	–	0.08	0.067
2,2-Dichloropropane	–	–	–	–	–	–	–	–	–	–	–	NE	NE
2-Chloroethyl vinyl ether	–	–	–	–	–	–	–	–	–	–	–	NE	NE
2-Chlorotoluene	–	–	–	–	–	–	–	–	–	–	–	1,600	1,600
4-Chlorotoluene	–	–	–	–	–	–	–	–	–	–	–	NE	NE

Sample Location ¹	GEI-40	GEI-41	GEI-42		GEI-43		GEI-44			MW-8		Preliminary Screening Level ²	
Sample Identification	GEI-40-12-14_ 091917	GEI-41-5-7_ 091317	GEI-42-1-3_ 091317	GEI-42-6-8_ 091317	GEI-43-3-5_ 091317	GEI-43-5-7_ 091317	GEI-44-2-4_ 091317	GEI-44-7-9_ 091317	GEI-44-10-12_ 091317	MW-8-2-4_ 091917	MW-8-5-7_ 091917		
Sample Date	9/19/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/19/2017	9/19/2017		
Sample Interval (feet bgs)	12-14 ft	5-7 ft	1-3 ft	6-8 ft	3-5 ft	5-7 ft	2-4 ft	7-9 ft	10-12 ft	2-4 ft	5-7 ft		
Sample Type	Saturated	Vadose	Vadose	Saturated	Vadose	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Native	Natvie	Fill	Native	Fill/Native	Native	Fill	Fill/Native	Native	Fill	Fill		
Bromobenzene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Bromoform (Tribromomethane)	--	--	--	--	--	--	--	--	--	--	--	0.79	0.05
Bromomethane	--	--	--	--	--	--	--	--	--	--	--	0.06	0.0038
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	--	0.005	0.001
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	2.5	0.15
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	96	5.6
Chloroform	--	--	--	--	--	--	--	--	--	--	--	0.0064	0.001
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	0.73	0.045
cis-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	160	160
cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Dibromochloromethane	--	--	--	--	--	--	--	--	--	--	--	0.024	0.002
Dibromomethane	--	--	--	--	--	--	--	--	--	--	--	800	800
Dichlorodifluoromethane (CFC-12)	--	--	--	--	--	--	--	--	--	--	--	0.17	NE
Hexachlorobutadiene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Methyl Iodide (Iodomethane)	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Methyl t-butyl ether	0.00090 U	0.00102 U	0.00105 U	0.00099 U	0.00099 U	0.00115 U	0.00107 U	0.00109 U	0.00110 U	0.00097 U	0.00107 U	2.6	0.18
Methylene Chloride												NE	NE
n-Hexane	0.00090 U	0.00102 U	0.00105 U	0.00099 U	0.00099 U	0.00115 U	0.00107 U	0.00109 U	0.00110 U	0.00097 U	0.0038	0.27	0.01
Tetrachloroethene	--	--	--	--	--	--	--	--	--	--	--	0.094	0.0049
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	22	1.3
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Trichloroethene	--	--	--	--	--	--	--	--	--	--	--	0.01	0.001
Trichlorofluoromethane (CFC-11)	--	--	--	--	--	--	--	--	--	--	--	1.4	0.04
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	0.006	0.001
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270-SIM (mg/kg)													
1-Methylnaphthalene	0.00495 U	0.00473 U	0.00481 U	0.00491 U	0.00461 U	0.00486 U	0.0685	0.00494 U	0.00479 U	--	--	35	35
2-Methylnaphthalene	0.00495 U	0.00473 U	0.00481 U	0.00491 U	0.00461 U	0.00486 U	0.104	0.00494 U	0.00479 U	--	--	0.77	0.04
Acenaphthene	0.00495 U	0.00473 U	0.00481 U	0.00491 U	0.00461 U	0.00486 U	0.00479 U	0.00494 U	0.00479 U	--	--	0.32	0.02
Acenaphthylene	0.00495 U	0.00473 U	0.00198 J	0.00491 U	0.00285 J	0.00486 U	0.0138	0.00494 U	0.00479 U	--	--	NE	0.068
Anthracene	0.00495 U	0.00473 U	0.00143 J	0.00491 U	0.00845	0.00486 U	0.0242	0.00494 U	0.00479 U	--	--	4.4	0.2
Benzo(a)anthracene	0.00495 U	0.00473 U	0.00616	0.00491 U	0.0323	0.00486 U	0.0477	0.00494 U	0.00479 U	--	--	0.07	0.007
Benzo(a)pyrene	0.00495 U	0.00473 U	0.00701	0.00491 U	0.0336	0.00486 U	0.0515	0.00494 U	0.00479 U	--	--	0.14	0.01
Benzo(b)fluoranthene	0.00495 U	0.00473 U	0.00449 J	0.00491 U	0.0238	0.00486 U	0.0469	0.00494 U	0.00479 U	--	--	0.25	0.012
Benzo(g,h,i)perylene	0.00495 U	0.00473 U	0.00646	0.00491 U	0.0265	0.00486 U	0.1	0.00494 U	0.00479 U	--	--	NE	2
Benzo(k)fluoranthene	0.00495 U	0.00473 U	0.00481 U	0.00491 U	0.0149	0.00486 U	0.0248	0.00494 U	0.00479 U	--	--	0.32	0.016
Chrysene	0.00495 U	0.00473 U	0.00664	0.00491 U	0.0311	0.00486 U	0.0605	0.00494 U	0.00479 U	--	--	0.25	0.012
Dibenzo(a,h)anthracene	0.00495 U	0.00473 U	0.00481 U	0.00491 U	0.00563	0.00486 U	0.0129	0.00494 U	0.00479 U	--	--	0.14	0.018
Fluoranthene	0.00495 U	0.00473 U	0.00949	0.00491 U	0.0622	0.00486 U	0.0937	0.00494 U	0.00479 U	--	--	0.5	0.16
Fluorene	0.00495 U	0.00473 U	0.00481 U	0.00491 U	0.00461 U	0.00486 U	0.00363 J	0.00494 U	0.00479 U	--	--	0.5	0.16
Indeno(1,2,3-c,d)pyrene	0.00495 U	0.00473 U	0.00454 J	0.00491 U	0.0203	0.00486 U	0.0536	0.00494 U	0.00479 U	--	--	0.69	0.035
Naphthalene	0.00495 U	0.00473 U	0.00481 U	0.00491 U	0.00461 U	0.00486 U	0.162	0.00494 U	0.00479 U	--	--	0.25	0.013
Phenanthrene	0.00495 U	0.00473 U	0.00436 J	0.00491 U	0.0109	0.00486 U	0.0843	0.00494 U	0.00479 U	--	--	NE	0.1
Pyrene	0.00495 U	0.00473 U	0.0127	0.00491 U	0.0674	0.00486 U	0.102	0.00494 U	0.00479 U	--	--	20	1
Total cPAH TEQ ³ (ND=0)	0 U	0 U	0.0086	0 U	0.0436	0 U	0.0707	0 U	0 U	--	--	0.22	0.011
Total cPAH TEQ ³ (ND=0.5RL)	0.00374 U	0.00357 U	0.00908	0.00371 U	0.0436	0.00367 U	0.0707	0.00373 U	0.00362 U	--	--	0.22	0.011
Polychlorinated Biphenyls (PCBs) by EPA 8082 (mg/kg)													

Sample Location ¹	GEI-40	GEI-41	GEI-42		GEI-43		GEI-44			MW-8		Preliminary Screening Level ²	
Sample Identification	GEI-40-12-14_ 091917	GEI-41-5-7_ 091317	GEI-42-1-3_ 091317	GEI-42-6-8_ 091317	GEI-43-3-5_ 091317	GEI-43-5-7_ 091317	GEI-44-2-4_ 091317	GEI-44-7-9_ 091317	GEI-44-10-12_ 091317	MW-8-2-4_ 091917	MW-8-5-7_ 091917		
Sample Date	9/19/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/13/2017	9/19/2017	9/19/2017		
Sample Interval (feet bgs)	12-14 ft	5-7 ft	1-3 ft	6-8 ft	3-5 ft	5-7 ft	2-4 ft	7-9 ft	10-12 ft	2-4 ft	5-7 ft		
Sample Type	Saturated	Vadose	Vadose	Saturated	Vadose	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated	Vadose Zone	Saturated Zode
Sample Horizon	Native	Natvie	Fill	Native	Fill/Native	Native	Fill	Fill/Native	Native	Fill	Fill		
PCB-Aroclor 1016	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1221	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1232	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1242	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1248	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1254	--	--	--	--	--	--	--	--	--	--	--	NE	NE
PCB-Aroclor 1260	--	--	--	--	--	--	--	--	--	--	--	NE	NE
Total PCB Aroclors	--	--	--	--	--	--	--	--	--	--	--	0.062	0.05

Notes:

¹ Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.

² Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

³ Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.

³ Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

ppm = parts per million

mg/kg = milligrams per kilogram

-- = not analyzed

NE = Not Established

ND = Not Detected

RL = Reporting Limit

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates that the identified concentration is greater than the preliminary screening level.

Blue shading indicates that the practical quantitation limit (PQL) is above screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 7
Remedial Investigation and Supplemental Investigation Soil Analytical Results
Quiet Cove
Anacortes, Washington

SD-01				SD-02				SD-03			Preliminary Screening Level ²	
SD-1-2-4	SD-1-5-6.5	SD-1-10-12	SD-1-17-19	SD-2-2-3	SD-2-6-8	SD-2-11-12	SD-2-14-15	SD-3-2.5-3.5	SD-3-7-8.5	SD-3-12-13		
10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18		
2-4 ft	5-6.5 ft	10-12 ft	17-19 ft	2-3 ft	6-8 ft	11-12 ft	14-15 ft	2.5-3.5 ft	7-8.5 ft	12-13 ft		
Vadose	Vadose	Saturated	Saturated	VADOSE	VADOSE	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose Zone	Saturated Zode
Fill	Fill	Fill	Native	Fill	Fill	Fill	Native	Fill	Fill	Native		
SS	HS	HS	NS	SS	MS	NS	NS	SS	HS	NS	NE	NE
<1	315	121	<1	9	226	<1	<1	30	428	<1	NE	NE
-	-	-	-	-	-	-	-	-	-	-	20	20
-	-	-	-	-	-	-	-	-	-	-	1.2	1
-	-	-	-	-	-	-	-	-	-	-	1,000	50
-	-	-	-	-	-	-	-	-	-	-	NE	NE
-	-	-	-	-	-	-	-	-	-	-	250	24
-	-	-	-	-	-	-	-	-	-	-	NE	NE
-	-	-	-	-	-	-	-	-	-	-	NE	NE
-	-	-	-	-	-	-	-	-	-	-	0.07	0.07
6.16	3,050	1,880	4.92 U	52.3	382	4.69 U	4.73 U	356	3,880	225	30 ²	30 ²
218	6,180	2,860	5.71 U	855	1,820	5.72 U	5.71 U	639	6,120	291	2,000	2,000
1,770	2,310	1,830	11.4 U	251	198	11.4 U	11.4 U	472	1,290	54.5	2,000	2,000
0.00104	0.0320 J	0.0505 U	0.00108 U	0.00425	0.0101	0.00081	0.00058 J	0.00336	0.984	0.00091	0.05	0.05
0.00075	0.0459 U	0.0505 U	0.00131	0.00288	0.00418	0.00044 J	0.00072 U	0.0488	0.674	0.00048 J	3.8	0.22
0.00074 U	0.0465	0.0505 U	0.00108 U	0.00065 J	0.00831	0.00072 U	0.00072 U	0.00084	0.906	0.00128	1.1	1.1
0.000930	0.148	0.101 U	0.00217 U	0.00300	0.0109	0.00145 U	0.00144 U	0.00592	0.916	0.000570	2.8	0.16
-	-	-	-	-	-	-	-	-	-	-	0.044	0.003
-	-	-	-	-	-	-	-	-	-	-	42	2.2
-	-	-	-	-	-	-	-	-	-	-	0.017	0.002
-	-	-	-	-	-	-	-	-	-	-	0.025	0.002
-	-	-	-	-	-	-	-	-	-	-	0.061	0.0038
-	-	-	-	-	-	-	-	-	-	-	0.023	0.0011
-	-	-	-	-	-	-	-	-	-	-	NE	NE
-	-	-	-	-	-	-	-	-	-	-	NE	NE
-	-	-	-	-	-	-	-	-	-	-	0.033	0.033
-	-	-	-	-	-	-	-	-	-	-	0.019	0.005
-	-	-	-	-	-	-	-	-	-	-	1.3	1.3
-	-	-	-	-	-	-	-	-	-	-	0.002	0.001
-	-	-	-	-	-	-	-	-	-	-	30	1.7
-	-	-	-	-	-	-	-	-	-	-	0.02	0.001
-	-	-	-	-	-	-	-	-	-	-	0.02	0.001
-	-	-	-	-	-	-	-	-	-	-	NE	NE
-	-	-	-	-	-	-	-	-	-	-	NE	NE
-	-	-	-	-	-	-	-	-	-	-	0.08	0.067
-	-	-	-	-	-	-	-	-	-	-	NE	NE
-	-	-	-	-	-	-	-	-	-	-	NE	NE
-	-	-	-	-	-	-	-	-	-	-	1,600	1,600
-	-	-	-	-	-	-	-	-	-	-	NE	NE

SD-01				SD-02				SD-03			Preliminary Screening Level ²	
SD-1-2-4	SD-1-5-6.5	SD-1-10-12	SD-1-17-19	SD-2-2-3	SD-2-6-8	SD-2-11-12	SD-2-14-15	SD-3-2.5-3.5	SD-3-7-8.5	SD-3-12-13		
10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18		
2-4 ft	5-6.5 ft	10-12 ft	17-19 ft	2-3 ft	6-8 ft	11-12 ft	14-15 ft	2.5-3.5 ft	7-8.5 ft	12-13 ft		
Vadose	Vadose	Saturated	Saturated	VADOSE	VADOSE	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose Zone	Saturated Zode
Fill	Fill	Fill	Native	Fill	Fill	Fill	Native	Fill	Fill	Native		
-	-	-	-	-	-	-	-	-	-	-	NE	NE
-	-	-	-	-	-	-	-	-	-	-	NE	NE
-	-	-	-	-	-	-	-	-	-	-	NE	NE
-	-	-	-	-	-	-	-	-	-	-	0.79	0.05
-	-	-	-	-	-	-	-	-	-	-	0.06	0.0038
-	-	-	-	-	-	-	-	-	-	-	0.005	0.001
-	-	-	-	-	-	-	-	-	-	-	2.5	0.15
-	-	-	-	-	-	-	-	-	-	-	96	5.6
-	-	-	-	-	-	-	-	-	-	-	0.0064	0.001
-	-	-	-	-	-	-	-	-	-	-	0.73	0.045
-	-	-	-	-	-	-	-	-	-	-	160	160
-	-	-	-	-	-	-	-	-	-	-	NE	NE
-	-	-	-	-	-	-	-	-	-	-	0.024	0.002
-	-	-	-	-	-	-	-	-	-	-	800	800
-	-	-	-	-	-	-	-	-	-	-	0.17	NE
-	-	-	-	-	-	-	-	-	-	-	NE	NE
-	-	-	-	-	-	-	-	-	-	-	NE	NE
-	-	-	-	-	-	-	-	-	-	-	2.6	0.18
-	-	-	-	-	-	-	-	-	-	-	NE	NE
-	-	-	-	-	-	-	-	-	-	-	0.27	0.01
-	-	-	-	-	-	-	-	-	-	-	0.094	0.0049
-	-	-	-	-	-	-	-	-	-	-	22	1.3
-	-	-	-	-	-	-	-	-	-	-	NE	NE
-	-	-	-	-	-	-	-	-	-	-	0.01	0.001
-	-	-	-	-	-	-	-	-	-	-	1.4	0.04
-	-	-	-	-	-	-	-	-	-	-	0.006	0.001
-	-	-	-	-	-	-	-	-	-	-	35	35
-	-	-	-	-	-	-	-	-	-	-	0.77	0.04
-	-	-	-	-	-	-	-	-	-	-	0.32	0.02
-	-	-	-	-	-	-	-	-	-	-	NE	0.068
-	-	-	-	-	-	-	-	-	-	-	4.4	0.2
-	-	-	-	-	-	-	-	-	-	-	0.07	0.007
-	-	-	-	-	-	-	-	-	-	-	0.14	0.01
-	-	-	-	-	-	-	-	-	-	-	0.25	0.012
-	-	-	-	-	-	-	-	-	-	-	NE	2
-	-	-	-	-	-	-	-	-	-	-	0.32	0.016
-	-	-	-	-	-	-	-	-	-	-	0.25	0.012
-	-	-	-	-	-	-	-	-	-	-	0.14	0.018
-	-	-	-	-	-	-	-	-	-	-	0.5	0.16
-	-	-	-	-	-	-	-	-	-	-	0.5	0.16
-	-	-	-	-	-	-	-	-	-	-	0.69	0.035
-	-	-	-	-	-	-	-	-	-	-	0.25	0.013
-	-	-	-	-	-	-	-	-	-	-	NE	0.1
-	-	-	-	-	-	-	-	-	-	-	20	1
-	-	-	-	-	-	-	-	-	-	-	0.22	0.011
-	-	-	-	-	-	-	-	-	-	-	0.22	0.011

SD-01				SD-02				SD-03			Preliminary Screening Level ²	
SD-1-2-4	SD-1-5-6.5	SD-1-10-12	SD-1-17-19	SD-2-2-3	SD-2-6-8	SD-2-11-12	SD-2-14-15	SD-3-2.5-3.5	SD-3-7-8.5	SD-3-12-13		
10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18		
2-4 ft	5-6.5 ft	10-12 ft	17-19 ft	2-3 ft	6-8 ft	11-12 ft	14-15 ft	2.5-3.5 ft	7-8.5 ft	12-13 ft		
Vadose	Vadose	Saturated	Saturated	VADOSE	VADOSE	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose Zone	Saturated Zode
Fill	Fill	Fill	Native	Fill	Fill	Fill	Native	Fill	Fill	Native		
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	--	0.062	0.05

Notes:

¹ Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.

² Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

³ Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.

³ Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

ppm = parts per million

mg/kg = milligrams per kilogram

-- = not analyzed

NE = Not Established

ND = Not Detected

RL = Reporting Limit

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates that the identified concentration is greater than the preliminary screening level.

Blue shading indicates that the practical quantitation limit (PQL) is above screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 7
Remedial Investigation and Supplemental Investigation Soil Analytical Results
Quiet Cove
Anacortes, Washington

SD-04			SD-05			SD-06				Preliminary Screening Level ²	
SD-4-2.5-3.5	SD-4-6.5-7.5	SD-4-12-13	SD-5-0.5-2	SD-5-5-6	SD-5-9-10	SD-6-1-2	SD-6-4-5	SD-6-6-7	SD-6-9-10		
10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18		
2.5-3.5 ft	6.5-7.5 ft	12-13 ft	0.5-2 ft	5-6 ft	9-10 ft	1-2 ft	4-5 ft	6-7 ft	9-10 ft		
Vadose	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose	Vadose	Saturated	Saturated	Vadose Zone	Saturated Zode
Fill	Fill	Native	Fill	Fill	Native	Fill	Fill	Fill	Native		
MS	HS	NS	NS	SS	NS	NS	NS	NS	NS	NE	NE
74	290	<1	<1	<1	<1	<1	<1	<1	<1	NE	NE
--	--	--	--	--	--	--	--	--	--	20	20
--	--	--	--	--	--	--	--	--	--	1.2	1
--	--	--	--	--	--	--	--	--	--	1,000	50
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	250	24
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.07	0.07
723	3,040	20.7	5.04 U	8.61	4.45 U	5.6 U	7.22 U	6.42 U	10	30 ²	30 ²
974	5,150	17.9	14.4	31.2	5.59 U	15.5	5.61 U	6.42 U	138	2,000	2,000
4,280	4,210	12.5	22.5	27.5	11.2 U	58.1	11.2 U	12.8 U	289	2,000	2,000
0.0522 U	0.0692 U	0.00081 U	0.00076 J	0.00067 J	0.00088 U	0.00260	0.00088 J	0.00064 J	0.00092 U	0.05	0.05
8.57	7.32	0.00059 J	0.00068 J	0.00080 J	0.00088 U	0.00204	0.00119 U	0.00092 U	0.00092 U	3.8	0.22
0.0907	0.0943	0.00081 U	0.00097 U	0.00112 U	0.00088 U	0.00096 U	0.00119 U	0.00092 U	0.00092 U	1.1	1.1
0.493	0.492	0.00161 U	0.00194 U	0.00224 U	0.00176 U	0.00105	0.00238 U	0.00184 U	0.00183 U	2.8	0.16
--	--	--	--	--	--	--	--	--	--	0.044	0.003
--	--	--	--	--	--	--	--	--	--	42	2.2
--	--	--	--	--	--	--	--	--	--	0.017	0.002
--	--	--	--	--	--	--	--	--	--	0.025	0.002
--	--	--	--	--	--	--	--	--	--	0.061	0.0038
--	--	--	--	--	--	--	--	--	--	0.023	0.0011
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.033	0.033
--	--	--	--	--	--	--	--	--	--	0.019	0.005
--	--	--	--	--	--	--	--	--	--	1.3	1.3
--	--	--	--	--	--	--	--	--	--	0.002	0.001
--	--	--	--	--	--	--	--	--	--	30	1.7
--	--	--	--	--	--	--	--	--	--	0.02	0.001
--	--	--	--	--	--	--	--	--	--	0.02	0.001
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.08	0.067
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	1,600	1,600
--	--	--	--	--	--	--	--	--	--	NE	NE

SD-04			SD-05			SD-06				Preliminary Screening Level ²	
SD-4-2.5-3.5	SD-4-6.5-7.5	SD-4-12-13	SD-5-0.5-2	SD-5-5-6	SD-5-9-10	SD-6-1-2	SD-6-4-5	SD-6-6-7	SD-6-9-10		
10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18		
2.5-3.5 ft	6.5-7.5 ft	12-13 ft	0.5-2 ft	5-6 ft	9-10 ft	1-2 ft	4-5 ft	6-7 ft	9-10 ft		
Vadose	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose	Vadose	Saturated	Saturated	Vadose Zone	Saturated Zode
Fill	Fill	Native	Fill	Fill	Native	Fill	Fill	Fill	Native		
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.79	0.05
--	--	--	--	--	--	--	--	--	--	0.06	0.0038
--	--	--	--	--	--	--	--	--	--	0.005	0.001
--	--	--	--	--	--	--	--	--	--	2.5	0.15
--	--	--	--	--	--	--	--	--	--	96	5.6
--	--	--	--	--	--	--	--	--	--	0.0064	0.001
--	--	--	--	--	--	--	--	--	--	0.73	0.045
--	--	--	--	--	--	--	--	--	--	160	160
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.024	0.002
--	--	--	--	--	--	--	--	--	--	800	800
--	--	--	--	--	--	--	--	--	--	0.17	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	2.6	0.18
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.27	0.01
--	--	--	--	--	--	--	--	--	--	0.094	0.0049
--	--	--	--	--	--	--	--	--	--	22	1.3
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.01	0.001
--	--	--	--	--	--	--	--	--	--	1.4	0.04
--	--	--	--	--	--	--	--	--	--	0.006	0.001
--	--	--	--	--	--	--	--	--	--	35	35
--	--	--	--	--	--	--	--	--	--	0.77	0.04
--	--	--	--	--	--	--	--	--	--	0.32	0.02
--	--	--	--	--	--	--	--	--	--	NE	0.068
--	--	--	--	--	--	--	--	--	--	4.4	0.2
--	--	--	--	--	--	--	--	--	--	0.07	0.007
--	--	--	--	--	--	--	--	--	--	0.14	0.01
--	--	--	--	--	--	--	--	--	--	0.25	0.012
--	--	--	--	--	--	--	--	--	--	NE	2
--	--	--	--	--	--	--	--	--	--	0.32	0.016
--	--	--	--	--	--	--	--	--	--	0.25	0.012
--	--	--	--	--	--	--	--	--	--	0.14	0.018
--	--	--	--	--	--	--	--	--	--	0.5	0.16
--	--	--	--	--	--	--	--	--	--	0.5	0.16
--	--	--	--	--	--	--	--	--	--	0.69	0.035
--	--	--	--	--	--	--	--	--	--	0.25	0.013
--	--	--	--	--	--	--	--	--	--	NE	0.1
--	--	--	--	--	--	--	--	--	--	20	1
--	--	--	--	--	--	--	--	--	--	0.22	0.011
--	--	--	--	--	--	--	--	--	--	0.22	0.011

SD-04			SD-05			SD-06				Preliminary Screening Level ²	
SD-4-2.5-3.5	SD-4-6.5-7.5	SD-4-12-13	SD-5-0.5-2	SD-5-5-6	SD-5-9-10	SD-6-1-2	SD-6-4-5	SD-6-6-7	SD-6-9-10		
10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18	10/18/18		
2.5-3.5 ft	6.5-7.5 ft	12-13 ft	0.5-2 ft	5-6 ft	9-10 ft	1-2 ft	4-5 ft	6-7 ft	9-10 ft		
Vadose	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose	Vadose	Saturated	Saturated	Vadose Zone	Saturated Zode
Fill	Fill	Native	Fill	Fill	Native	Fill	Fill	Fill	Native		
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.062	0.05

Notes:

- ¹ Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.
- ² Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).
- ³ Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.
- ³ Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).
- ppm = parts per million
- mg/kg = milligrams per kilogram
- = not analyzed
- NE = Not Established
- ND = Not Detected
- RL = Reporting Limit
- U = The analyte was not detected at a concentration greater than the value identified.
- J = The analyte was detected and the detected concentration is considered an estimate.
- Yellow shading indicates that the identified concentration is greater than the preliminary screening level.
- Blue shading indicates that the practical quantitation limit (PQL) is above screening level.
- Bold** font type indicates the analyte was detected at the reported concentration.

Table 7
Remedial Investigation and Supplemental Investigation Soil Analytical Results
Quiet Cove
Anacortes, Washington

SD-07				SD-08				SD-09	SD-10	Preliminary Screening Level ²	
SD-7-1-2	SD-7-2-3.5	SD-7-9-10	SD-7-18.5-20	SD-8-2-4	SD-8-6-8	SD-8-9-11	SD-8-13-15	SD-9-2.5-4	SD-10-4-5		
10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/18/18	10/18/18		
1-2 ft	2-3.5 ft	9-10 ft	18.5-20 ft	2-4 ft	6-8 ft	9-11 ft	13-15 ft	2.5-4 ft	4-5 ft		
Vadose	Vadose	Saturated	Saturated	Vadose	Vadose	Saturated	Saturated	Vadose	Vadose	Vadose	Saturated
Fill	Fill	Fill	Native	Fill	Fill	Fill	Native	Fill	Fill	Zone	Zode
SS	SS	NS	NS	HS	HS	NS	NS	MS	HS	NE	NE
<1	<1	<1	<1	336	98	30	<1	4	293	NE	NE
--	--	--	--	--	--	--	--	2.96	5.53	20	20
--	--	--	--	--	--	--	--	0.75	6.62	1.2	1
--	--	--	--	--	--	--	--	24.3	30.3	1,000	50
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	154	2,050	250	24
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	0.0529	3.25	0.07	0.07
81.7	23.4	8.9 U	33.7	5,350	1,430	95.5	46.6	142	1,820	30 ²	30 ²
315	349	6.32 U	5.86 U	6,760	681	58.3	33.2	1,780	5,730	2,000	2,000
760	531	12.6 U	11.7 U	423	87.1	11.6 U	11.5 U	1,950	433	2,000	2,000
0.00121	0.00168	0.00133 U	0.00112 U	0.0454 U	0.0401 U	0.00066 U	0.00073 U	0.00118	0.0305	0.05	0.05
0.00105 J	0.00091 J	0.00080 J	0.00112 U	0.0454 U	0.0401 U	0.00066 U	0.00073 U	0.00144	0.0403	3.8	0.22
0.00106 U	0.00135 U	0.00133 U	0.00112 U	0.0454 U	0.0401 U	0.00066 U	0.00073 U	0.00031 J	0.107	1.1	1.1
0.00179	0.00142	0.00140	0.00225 U	0.0908 U	0.0803 U	0.00131 U	0.00145 U	0.00117	0.526	2.8	0.16
--	--	--	--	--	--	--	--	--	--	0.044	0.003
--	--	--	--	--	--	--	--	--	--	42	2.2
--	--	--	--	--	--	--	--	--	--	0.017	0.002
--	--	--	--	--	--	--	--	--	--	0.025	0.002
--	--	--	--	--	--	--	--	--	--	0.061	0.0038
--	--	--	--	--	--	--	--	--	--	0.023	0.0011
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.033	0.033
--	--	--	--	--	--	--	--	--	--	0.019	0.005
--	--	--	--	--	--	--	--	--	--	1.3	1.3
--	--	--	--	--	--	--	--	0.00094 U	0.00111 U	0.002	0.001
--	--	--	--	--	--	--	--	--	--	30	1.7
--	--	--	--	--	--	--	--	0.00094 U	0.00111 U	0.02	0.001
--	--	--	--	--	--	--	--	--	--	0.02	0.001
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.08	0.067
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	1,600	1,600
--	--	--	--	--	--	--	--	--	--	NE	NE

SD-07				SD-08				SD-09	SD-10	Preliminary Screening Level ²	
SD-7-1-2	SD-7-2-3.5	SD-7-9-10	SD-7-18.5-20	SD-8-2-4	SD-8-6-8	SD-8-9-11	SD-8-13-15	SD-9-2.5-4	SD-10-4-5		
10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/18/18	10/18/18		
1-2 ft	2-3.5 ft	9-10 ft	18.5-20 ft	2-4 ft	6-8 ft	9-11 ft	13-15 ft	2.5-4 ft	4-5 ft		
Vadose	Vadose	Saturated	Saturated	Vadose	Vadose	Saturated	Saturated	Vadose	Vadose	Vadose Zone	Saturated Zode
Fill	Fill	Fill	Native	Fill	Fill	Fill	Native	Fill	Fill		
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.79	0.05
--	--	--	--	--	--	--	--	--	--	0.06	0.0038
--	--	--	--	--	--	--	--	--	--	0.005	0.001
--	--	--	--	--	--	--	--	--	--	2.5	0.15
--	--	--	--	--	--	--	--	--	--	96	5.6
--	--	--	--	--	--	--	--	--	--	0.0064	0.001
--	--	--	--	--	--	--	--	--	--	0.73	0.045
--	--	--	--	--	--	--	--	--	--	160	160
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.024	0.002
--	--	--	--	--	--	--	--	--	--	800	800
--	--	--	--	--	--	--	--	--	--	0.17	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	0.00094 U	0.00111 U	2.6	0.18
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.27	0.01
--	--	--	--	--	--	--	--	--	--	0.094	0.0049
--	--	--	--	--	--	--	--	--	--	22	1.3
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.01	0.001
--	--	--	--	--	--	--	--	--	--	1.4	0.04
--	--	--	--	--	--	--	--	--	--	0.006	0.001
0.659	0.234	0.0126	0.00128 J	--	--	--	--	0.0856	2.24	35	35
0.911	0.526	0.00729	0.00129 J	--	--	--	--	0.0603	3.23	0.77	0.04
0.1	0.0215	0.00498 U	0.00498 U	--	--	--	--	0.0483 U	0.0518 U	0.32	0.02
0.706	0.272	0.0177	0.00165 J	--	--	--	--	0.0268	0.655	NE	0.068
0.106	0.0134	0.00121 J	0.00167	--	--	--	--	0.0483 U	0.164	4.4	0.2
0.209	0.0247	0.00498 U	0.00498 U	--	--	--	--	0.0193	0.0793	0.07	0.007
0.2	0.0300	0.00498 U	0.00498 U	--	--	--	--	0.0551	0.0486	0.14	0.01
0.202	0.0356	0.00498 U	0.00498 U	--	--	--	--	0.0409	0.0457	0.25	0.012
0.459	0.0354	0.00498 U	0.00498 U	--	--	--	--	0.0378	0.0397	NE	2
0.188	0.0465	0.00498 U	0.00498 U	--	--	--	--	0.0968	0.0472	0.32	0.016
0.141	0.0133	0.00498 U	0.00498 U	--	--	--	--	0.0175	0.0185	0.25	0.012
0.376	0.0531	0.00498 U	0.00498 U	--	--	--	--	0.137	0.104	0.14	0.018
0.0449	0.00605	0.00498 U	0.00498 U	--	--	--	--	0.0483 U	0.0518 U	0.5	0.16
0.617	0.0648	0.00151 J	0.00143 J	--	--	--	--	0.0797	0.211	0.5	0.16
0.0257	0.00871	0.00297 J	0.00498 U	--	--	--	--	0.103	0.582	0.69	0.035
0.171	0.0349	0.00498 U	0.00498 U	--	--	--	--	0.0211	0.0254	0.25	0.013
0.852	0.195	0.00267 J	0.00124 J	--	--	--	--	0.267	1.21	NE	0.1
0.423	0.0687	0.00177 J	0.00110 J	--	--	--	--	0.212	0.31	20	1
0.307	0.0481	0 U	0 U	--	--	--	--	0.0554	0.0600	0.22	0.011
0.307	0.0481	0.00376 U	0.00376 U	--	--	--	--	0.0578	0.0626	0.22	0.011

SD-07				SD-08				SD-09	SD-10	Preliminary Screening Level ²	
SD-7-1-2	SD-7-2-3.5	SD-7-9-10	SD-7-18.5-20	SD-8-2-4	SD-8-6-8	SD-8-9-11	SD-8-13-15	SD-9-2.5-4	SD-10-4-5		
10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/17/18	10/18/18	10/18/18		
1-2 ft	2-3.5 ft	9-10 ft	18.5-20 ft	2-4 ft	6-8 ft	9-11 ft	13-15 ft	2.5-4 ft	4-5 ft		
Vadose	Vadose	Saturated	Saturated	Vadose	Vadose	Saturated	Saturated	Vadose	Vadose	Vadose Zone	Saturated Zode
Fill	Fill	Fill	Native	Fill	Fill	Fill	Native	Fill	Fill		
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	NE	NE
--	--	--	--	--	--	--	--	--	--	0.062	0.05

Notes:

¹ Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.

² Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).

³ Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.

³ Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

ppm = parts per million

mg/kg = milligrams per kilogram

-- = not analyzed

NE = Not Established

ND = Not Detected

RL = Reporting Limit

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates that the identified concentration is greater than the preliminary screening level.

Blue shading indicates that the practical quantitation limit (PQL) is above screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 7
Remedial Investigation and Supplemental Investigation Soil Analytical Results
Quiet Cove
Anacortes, Washington

MW_12				Preliminary Screening Level ²	
MW-12-3-4	MW-12-7.5-9.5	MW-12-11-12	MW-12-14-15		
10/18/18	10/18/18	10/18/18	10/18/18		
3-4 ft	7.5-9.5 ft	11-12 ft	14-15 ft		
Vadose	Saturated	Saturated	Saturated		
Fill	Fill	Fill	Native	Vadose Zone	Saturated Zode
NS	HS	SS	NS	NE	NE
<1	125	243	<1	NE	NE
-	-	-	-	20	20
-	-	-	-	1.2	1
-	-	-	-	1,000	50
-	-	-	-	NE	NE
-	-	-	-	250	24
-	-	-	-	NE	NE
-	-	-	-	NE	NE
-	-	-	-	0.07	0.07
5.23 U	3,010	762	6.08 U	30 ²	30 ²
36.4	1,300	220	5.75 U	2,000	2,000
69.9	200	57.6	11.5 U	2,000	2,000
0.00057 J	0.0475 U	0.00134	0.00086 U	0.05	0.05
0.00246	0.0475 U	0.00391	0.00086 U	3.8	0.22
0.00075 U	0.0475 U	0.00098 U	0.00086 U	1.1	1.1
0.000380	0.0362	0.00161	0.00172 U	2.8	0.16
-	-	-	-	0.044	0.003
-	-	-	-	42	2.2
-	-	-	-	0.017	0.002
-	-	-	-	0.025	0.002
-	-	-	-	0.061	0.0038
-	-	-	-	0.023	0.0011
-	-	-	-	NE	NE
-	-	-	-	NE	NE
-	-	-	-	0.033	0.033
-	-	-	-	0.019	0.005
-	-	-	-	1.3	1.3
-	-	-	-	0.002	0.001
-	-	-	-	30	1.7
-	-	-	-	0.02	0.001
-	-	-	-	0.02	0.001
-	-	-	-	NE	NE
-	-	-	-	NE	NE
-	-	-	-	0.08	0.067
-	-	-	-	NE	NE
-	-	-	-	NE	NE
-	-	-	-	1,600	1,600
-	-	-	-	NE	NE

MW_12				Preliminary Screening Level ²	
MW-12-3-4	MW-12-7.5-9.5	MW-12-11-12	MW-12-14-15		
10/18/18	10/18/18	10/18/18	10/18/18		
3-4 ft	7.5-9.5 ft	11-12 ft	14-15 ft		
Vadose	Saturated	Saturated	Saturated	Vadose Zone	Saturated Zode
Fill	Fill	Fill	Native		
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	0.79	0.05
--	--	--	--	0.06	0.0038
--	--	--	--	0.005	0.001
--	--	--	--	2.5	0.15
--	--	--	--	96	5.6
--	--	--	--	0.0064	0.001
--	--	--	--	0.73	0.045
--	--	--	--	160	160
--	--	--	--	NE	NE
--	--	--	--	0.024	0.002
--	--	--	--	800	800
--	--	--	--	0.17	NE
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	2.6	0.18
--	--	--	--	NE	NE
--	--	--	--	0.27	0.01
--	--	--	--	0.094	0.0049
--	--	--	--	22	1.3
--	--	--	--	NE	NE
--	--	--	--	0.01	0.001
--	--	--	--	1.4	0.04
--	--	--	--	0.006	0.001
0.0110	1.77	0.223	0.00307 J	35	35
0.0205	1.89	0.134	0.00180 J	0.77	0.04
0.00566	0.0737	0.0118	0.00481 U	0.32	0.02
0.0154	0.146	0.0190	0.00481 U	NE	0.068
0.00208 J	--	--	--	4.4	0.2
0.00998	--	--	--	0.07	0.007
0.0140	--	--	--	0.14	0.01
0.0161	--	--	--	0.25	0.012
0.0170	--	--	--	NE	2
0.0204	--	--	--	0.32	0.016
0.00844	--	--	--	0.25	0.012
0.0231	--	--	--	0.14	0.018
0.00268 J	--	--	--	0.5	0.16
0.0378	--	--	--	0.5	0.16
0.0112	--	--	--	0.69	0.035
0.0124	--	--	--	0.25	0.013
0.0286	--	--	--	NE	0.1
0.0390	--	--	--	20	1
0.0218	--	--	--	0.22	0.011
0.0218	--	--	--	0.22	0.011

MW_12				Preliminary Screening Level ²	
MW-12-3-4	MW-12-7.5-9.5	MW-12-11-12	MW-12-14-15		
10/18/18	10/18/18	10/18/18	10/18/18		
3-4 ft	7.5-9.5 ft	11-12 ft	14-15 ft		
Vadose	Saturated	Saturated	Saturated	Vadose Zone	Saturated Zode
Fill	Fill	Fill	Native		
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	NE	NE
--	--	--	--	0.062	0.05

Notes:

- ¹ Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.
- ² Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).
- ³ Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.
- ³ Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Tabl
- ppm = parts per million
- mg/kg = milligrams per kilogram
- = not analyzed
- NE = Not Established
- ND = Not Detected
- RL = Reporting Limit
- U = The analyte was not detected at a concentration greater than the value identified.
- J = The analyte was detected and the detected concentration is considered an estimate.
- Yellow shading indicates that the identified concentration is greater than the preliminary screening level.
- Blue shading indicates that the practical quantitation limit (PQL) is above screening level.
- Bold** font type indicates the analyte was detected at the reported concentration.

Table 8
Remedial Investigation Groundwater Analytical Results
Quiet Cove
Anacortes, Washington

Sample Location ¹	Preliminary Screening Level ²	MW_1		MW_2		MW_3		MW_4		MW_5	
Sample Identification		MW-1-110917	MW-1-031918	MW-2-110917	MW-2-032018	MW-3-101817	MW-3-032018	MW-4-101817	MW-4-031918	MW-5-101817	MW-5-032018
Date Sampled		11/09/17	03/19/18	11/09/17	03/20/18	10/18/17	03/20/18	10/18/17	03/19/18	10/18/17	03/20/18
Well Location		Shoreline	Shoreline	Shoreline	Shoreline	Shoreline	Shoreline	Shoreline	Upland	Upland	Upland
Field Measured Parameters											
Top of Casing Elevation ³ (feet)	NE	11.91	11.91	12.01	12.01	12.42	12.42	12.43	12.43	14.96	14.96
Depth to Groundwater (feet)	NE	3.93	4.56	5.12	5.48	6.32	5.82	5.68	5.62	5.54	4.82
Groundwater Elevation (feet)	NE	7.98	7.35	6.89	6.53	6.10	6.60	6.75	6.81	9.42	10.14
pH	NE	7.46	5.89	7.41	6.21	6.36	6.21	6.15	6.05	6.14	5.79
Conductivity (µS/cm)	NE	195	132	493	362	740	520	860	367	384	141
Turbidity ⁵ (NTU)	NE	4.0	3.3	3.8	4.8	9.3	6.8	5.0	8.5	17.8	21.4
Dissolved Oxygen (mg/l)	NE	1.27	1.53	0.28	2.02	0.40	0.11	0.06	0.16	0.10	0.89
Temperature (°C)	NE	11.5	8.0	13.5	9.8	15.0	10.9	15.4	11.1	15.4	9.7
Total Dissolved Solids (mg/l)	NE	171.0	126.7	411.5	332.8	591.5	468.0	682.5	324.6	298.9	128.1
Oxidation Reduction Potential (mV)	NE	113.9	39.2	93.2	70.1	75.6	64.9	66.5	76.9	72.1	79.6
Salinity (ppt)	NE	0.13	0.09	0.31	0.24	0.45	0.35	0.52	0.24	0.23	0.09
Total Metals by EPA 200.8/1631 (µg/L)											
Arsenic	5	2.42 J	0.86	7.69	5.69	1.84	2.51	1.5	1.97	4.55	2.13
Cadmium	8.8	0.0420 J	0.100 U	0.0410 J	0.0350 J	0.0710 J	0.0470 J	0.500 U	0.118	0.200 U	0.104
Chromium	50	0.520 J	0.323 J	2.23	1.28	7.32	4.9	3.29	0.394 J	1.6	6.22
Copper	NE	1.63 J	1.24	2.46	2.15	1.92	1.36	2.50 U	1.42	1.85	6.23
Lead	2.1	0.403 J	0.361	0.261	0.204	0.227	0.276	3.75	0.0850 J	0.408	1.66
Silver	NE	0.200 UJ	0.200 U	0.200 UJ	0.200 U	0.200 UJ	0.200 U	1.00 UJ	0.200 U	0.400 UJ	0.0260 J
Zinc	NE	4.56 J	2.80 J	2.56 J	2.42 J	27.7	5.66	78.5	3.01 J	2.37 J	10.2
Mercury	0.025	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Dissolved Metals by EPA 200.8/1631 (µg/L)											
Arsenic	5	1.2	0.614	7.57	4.66	1.13	1.42	1.53	1.71	4.6	0.648
Cadmium	8.8	0.0360 J	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.200 U	0.0660 J	0.0620 J	0.0450 J
Chromium	50	0.228 J	0.333 J	1.58	0.99	6.28	4.55	4.45	0.355 J	0.606 J	0.375 J
Copper	NE	1.1	0.931	1.75	1.7	0.719	0.525	0.948 J	1.21	0.980 J	1.23
Lead	2.1	0.100 U	0.209	0.100 U	0.0860 J	0.0950 J	0.113	0.200 U	0.100 U	0.200 U	0.100 U
Silver	NE	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.400 U	0.200 U	0.400 U	0.200 U
Zinc	NE	4.43	2.14 J	2.86 J	5.29	15.9	2.41 J	2.01 J	2.90 J	8.00 U	0.835 J
Mercury	0.025	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Petroleum Hydrocarbons by NWTPH-G/Dx (µg/L)											
Gasoline-range hydrocarbons	800 ⁴	100 U	100 U	100 U	100 U	234	100 U	447	100 U	112	100 U
Diesel-range hydrocarbons	500	665 J	388	3,530	1,600	1,940	1,270	1,460	293	637	100 U
Motor Oil-range hydrocarbons	500	200 UJ	200 U	1,080	700	461	279	285	200 U	200 U	200 U

Sample Location ¹	Preliminary Screening Level ²	MW_1		MW_2		MW_3		MW_4		MW_5	
Sample Identification		MW-1-110917	MW-1-031918	MW-2-110917	MW-2-032018	MW-3-101817	MW-3-032018	MW-4-101817	MW-4-031918	MW-5-101817	MW-5-032018
Date Sampled		11/09/17	03/19/18	11/09/17	03/20/18	10/18/17	03/20/18	10/18/17	03/19/18	10/18/17	03/20/18
Well Location		Shoreline	Shoreline	Shoreline	Shoreline	Shoreline	Shoreline	Shoreline	Upland	Upland	Upland
Volatile Organic Compounds (VOCs) by EPA 8360 (µg/L)											
Benzene	2.4	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.11 J	0.20 U	0.20 U	0.20 U
Toluene	520	0.20 U	0.20 U	0.20 U	0.20 U	0.04 J	0.20 U	0.09 J	0.20 U	0.20 U	0.20 U
Ethylbenzene	130	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Total Xylenes	310	0.40 U	0.40 U	0.40 U	0.40 U	0.25	0.40 U	0.21	0.40 U	0.07	0.40 U
1,2-Dibromoethane (EDB)	0.01	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,2-Dichloroethane (EDC)	5	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Methyl t-butyl ether (MTBE)	610	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
n-Hexane	7.8	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270 SIM (µg/L)											
Benzo(a)anthracene	0.01	0.010 U	0.010 U	0.010 U	0.010 U	0.001 J	0.010 U	0.006 J	0.002 J	0.0009 J	0.001 J
Benzo(a)pyrene	0.01	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.030 U	0.003 J	0.010 U	0.010 U
Benzo(b)fluoranthene	0.01	0.0007 J	0.010 U	0.0008 J	0.010 U	0.001 J	0.010 U	0.004 J	0.002 J	0.010 U	0.002 J
Benzo(k)fluoranthene	0.013	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.030 U	0.010 U	0.010 U	0.010 U
Chrysene	0.031	0.002 J	0.010 U	0.010 U	0.010 U	0.003 J	0.010 U	0.012 J	0.003 J	0.0009 J	0.004 J
Dibenzo(a,h)anthracene	0.01	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.030 U	0.010 U	0.010 U	0.010 U
Indeno(1,2,3-c,d)pyrene	0.01	0.001 J	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.030 U	0.008 J	0.010 U	0.010 U
Total cPAH TEQ ⁵ (ND = 0)	0.011	0.0002 J	0 U	0.0001 J	0 U	0.0002 J	0 U	0.0074 J	0.0042 J	0.0001 J	0.0003 J
Total cPAH TEQ ⁵ (ND = 0.5 RL)	0.011	0.0067 J	0.0076 U	0.0071 J	0.0076 U	0.0067 J	0.0076 U	0.0084 J	0.0052 J	0.0071 J	0.0068 J

Notes:

- ¹ Sample locations and summary of remedial investigation results are shown on Figure 12 through 17.
- ² Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).
- ³ Sample elevations referenced to North American Vertical Datum 1988 (NAVD88) from Sound Development Group October 2017 Survey.
- ⁴ Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 1,000 µg/l.
- ⁵ Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).
- µS/cm = microsiemens per centimeter
- NTU = Nephelometric Turbidity Unit
- mV = millivolt
- C = Celsius
- ppt = parts per thousand
- mg/L = milligram per liter
- µg/L = microgram per liter
- = not analyzed
- NE = Not Established
- ND = Not Detected
- U = The analyte was not detected at a concentration greater than the value identified.
- J = The analyte was detected and the detected concentration is considered an estimate.
- Yellow shading indicates that the identified concentration is greater than the preliminary screening level.
- Blue shading indicates that the practical quantitation limit (PQL) is above screening level.
- Bold** font type indicates the analyte was detected at the reported concentration.

Table 8
Remedial Investigation Groundwater Analytical Results
Quiet Cove
Anacortes, Washington

Sample Location ¹	Preliminary Screening Level ²	MW_6		MW_7		MW_8		MW_10		MW_11	
Sample Identification		MW-6-101817	MW-6-032018	MW-7-101817	MW-7-032018	MW-8-110917	MW-8-031918	MW-10-110917	MW-10-031918	MW-11-110917	MW-11-032018
Date Sampled		10/18/17	03/20/18	10/18/17	03/20/18	11/09/17	03/19/18	11/09/17	03/19/18	11/09/17	03/20/18
Well Location		Upland	Upland	Shoreline	Shoreline	Shoreline	Shoreline	Upland	Upland	Upland	Upland
Field Measured Parameters											
Top of Casing Elevation ³ (feet)	NE	15.43	15.43	12.62	12.62	13.13	13.13	14.17	14.17	12.28	12.28
Depth to Groundwater (feet)	NE	5.68	4.54	6.69	6.38	4.60	4.89	4.49	3.46	3.58	
Groundwater Elevation (feet)	NE	9.75	10.89	5.93	6.24	8.53	8.24	9.68	10.71	8.70	12.28
pH	NE	7.08	6.39	6.20	6.01	7.26	6.49	6.90	6.96	6.24	–
Conductivity (µS/cm)	NE	314	229	1470	710	567	283	406	301	830	–
Turbidity ⁵ (NTU)	NE	5.8	3.0	5.0	0.0	5.7	2.7	4.4	0.4	8.4	–
Dissolved Oxygen (mg/l)	NE	5.47	6.31	1.66	5.67	0.28	0.22	3.83	0.37	0.10	–
Temperature (°C)	NE	14.3	9.6	15.9	10.0	15.0	10.3	16.1	8.9	15.5	–
Total Dissolved Solids (mg/l)	NE	256.8	211.2	1168.0	637.0	294.5	260.0	318.5	282.7	656.5	–
Oxidation Reduction Potential (mV)	NE	78.0	114.1	86.5	69.5	30.8	19.4	77.2	251.1	65.4	–
Salinity (ppt)	NE	0.19	0.16	0.91	0.48	0.22	0.19	0.25	0.21	0.50	–
Total Metals by EPA 200.8/1631 (µg/L)											
Arsenic	5	1.59	0.705	4.16	0.974	5.96	6.75	1.71	1.33	10.4	7.01
Cadmium	8.8	0.0510 J	0.100 U	0.500 U	0.100 U	0.100 U	0.100 U	0.0360 J	0.0340 J	0.0820 J	0.100 U
Chromium	50	0.483 J	1.17	2.04 J	0.398 J	1.92	1.09	0.265 J	0.500 U	1.12	0.932
Copper	NE	1.2	2.73	2.50 U	0.692	0.805	0.884	1.25	0.879	0.500 U	0.500 U
Lead	2.1	0.526	0.339	0.500 U	0.0830 J	0.164	0.143	0.231	0.100 U	0.278	0.0780 J
Silver	NE	0.200 UJ	0.200 U	1.00 UJ	0.200 U	0.200 UJ	0.200 U	0.200 UJ	0.200 U	0.200 UJ	0.200 U
Zinc	NE	1.55 J	5.41	20.0 U	2.69 J	2.09 J	2.71 J	2.11 J	2.31 J	4.45	0.978 J
Mercury	0.025	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Dissolved Metals by EPA 200.8/1631 (µg/L)											
Arsenic	5	1.47	0.64	1.71	0.989	6.29	3.91	1.67	1.32	11.6	6.74
Cadmium	8.8	0.100 U	0.100 U	0.500 U	0.100 U	0.100 U	0.100 U	0.0320 J	0.0730 J	0.100 U	0.100 U
Chromium	50	0.402 J	1.07	1.42 J	0.356 J	1.41	1.13	0.500 U	0.500 U	1.18	1.05
Copper	NE	0.931	2.91	2.50 U	1.29	0.500 U	0.500 U	0.96	0.963	0.500 U	0.500 U
Lead	2.1	0.100 U	0.100 U	0.500 U	0.251	0.100 U	0.100 U	0.100 U	0.100 U	0.111	0.133
Silver	NE	0.200 U	0.200 U	1.00 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U
Zinc	NE	1.01 J	1.58 J	20.0 U	3.08 J	1.90 J	1.42 J	2.51 J	2.18 J	3.99 J	4.00 U
Mercury	0.025	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Petroleum Hydrocarbons by NWTPH-G/Dx (µg/L)											
Gasoline-range hydrocarbons	800 ⁴	100 U	100 U	100 U	100 U	251	109	100 U	100 U	2,030	3,120
Diesel-range hydrocarbons	500	100 U	100 U	100 U	100 U	828	455	100 U	100 U	4,780	5,440
Motor Oil-range hydrocarbons	500	200 U	200 U	200 U	200 U	342	200 U	200 U	200 U	723	739

Sample Location ¹	Preliminary Screening Level ²	MW_6		MW_7		MW_8		MW_10		MW_11	
Sample Identification		MW-6-101817	MW-6-032018	MW-7-101817	MW-7-032018	MW-8-110917	MW-8-031918	MW-10-110917	MW-10-031918	MW-11-110917	MW-11-032018
Date Sampled		10/18/17	03/20/18	10/18/17	03/20/18	11/09/17	03/19/18	11/09/17	03/19/18	11/09/17	03/20/18
Well Location		Upland	Upland	Shoreline	Shoreline	Shoreline	Shoreline	Upland	Upland	Upland	Upland
Volatile Organic Compounds (VOCs) by EPA 8360 (µg/L)											
Benzene	2.4	0.20 U	0.20 U	0.20 U	0.20 U	5.83	3.03	0.20 U	0.20 U	30.5	25.1
Toluene	520	0.20 U	0.20 U	0.20 U	0.20 U	0.54	0.12 J	0.20 U	0.20 U	2.29	2.05
Ethylbenzene	130	0.20 U	0.20 U	0.20 U	0.20 U	0.24	0.20 U	0.20 U	0.20 U	1.17	1.21
Total Xylenes	310	0.40 U	0.40 U	0.40 U	0.40 U	0.64	0.11	0.40 U	0.40 U	2.8	3.2
1,2-Dibromoethane (EDB)	0.01	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.08 J
1,2-Dichloroethane (EDC)	5	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.15 J	0.20 U	0.20 U	0.20 U	0.20 U
Methyl t-butyl ether (MTBE)	610	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
n-Hexane	7.8	0.20 U	0.20 U	0.20 U	0.20 U	4.4	1.32	0.20 U	0.20 U	0.20 U	5.86
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270 SIM (µg/L)											
Benzo(a)anthracene	0.01	0.001 J	0.002 J	0.0009 J	0.002 J	0.010 U	0.010 U	0.010 U	0.010 U	0.001 J	0.002 J
Benzo(a)pyrene	0.01	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Benzo(b)fluoranthene	0.01	0.0008 J	0.001 J	0.0008 J	0.001 J	0.010 U	0.010 U	0.0006 J	0.010 U	0.001 J	0.010 U
Benzo(k)fluoranthene	0.013	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Chrysene	0.031	0.002 J	0.002 J	0.001 J	0.002 J	0.010 U	0.010 U	0.001 J	0.010 U	0.004 J	0.005 J
Dibenzo(a,h)anthracene	0.01	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Indeno(1,2,3-c,d)pyrene	0.01	0.010 U	0.001 J	0.010 U	0.001 J	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Total cPAH TEQ ⁵ (ND = 0)	0.011	0.0002 J	0.0004 J	0.0002 J	0.0004 J	0 U	0 U	0.0001 J	0 U	0.0002 J	0.0003 J
Total cPAH TEQ ⁵ (ND = 0.5 RL)	0.011	0.0067 J	0.0064 J	0.0067 J	0.0064 J	0.0076 U	0.0076 U	0.0071 J	0.0076 U	0.0067 J	0.0073 J

Notes:

- ¹ Sample locations and summary of remedial investigation results are shown on Figure 12 through 17.
- ² Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).
- ³ Sample elevations referenced to North American Vertical Datum 1988 (NAVD88) from Sound Development Group October 2017 Survey.
- ⁴ Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 1,000 µg/l.
- ⁵ Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).
- µS/cm = microsiemens per centimeter
- NTU = Nephelometric Turbidity Unit
- mV = millivolt
- C = Celsius
- ppt = parts per thousand
- mg/L = milligram per liter
- µg/L = microgram per liter
- = not analyzed
- NE = Not Established
- ND = Not Detected
- U = The analyte was not detected at a concentration greater than the value identified.
- J = The analyte was detected and the detected concentration is considered an estimate.
- Yellow shading indicates exceedance of the preliminary groundwater screening level.
- Blue shading indicated non-detect result exceedance of the preliminary groundwater screening level.
- Bold font type indicates the analyte was detected at the reported concentration.

Table 9
Supplemental Investigation Groundwater Analytical Results
Quiet Cove
Anacortes, Washington

Monitoring Well Location ¹	Preliminary Screening Level ²	MW_1	MW_2	MW_3	MW_4	MW_5	MW_6	MW_7	MW_8	MW_10	MW_11	MW_12	MW_12
Sample Identification		MW-1_103118	MW-2_103118	MW-3_103018	MW-4_102918	MW-5_103118	MW-6_102918	MW-7_103018	MW-8_102918	MW-10_102918	MW-11_103118	MW-12_103018	DUP-1_103018
Date Sampled		10/31/18	10/31/18	10/30/18	10/29/18	10/31/18	10/29/18	10/30/18	10/29/18	10/29/18	10/31/18	10/30/18	10/30/18
Field Measured Parameters													
Top of Casing Elevation ³ (feet)	NE	11.91	12.01	12.42	12.43	14.96	15.43	12.62	13.13	14.17	12.28	11.17	--
Depth to Groundwater (feet)	NE	4.35	5.7	6.21	5.71	6.59	5.31	6.47	5.97	6.72	6.12	2.85	--
Groundwater Elevation (feet)	NE	7.56	6.31	6.21	6.72	8.37	10.12	6.15	7.16	7.45	6.16	8.32	--
pH	NE	6.33	6.55	6.61	6.04	6.41	6.92	6.4	6.78	7.03	6.48	6.23	--
Conductivity (mS/cm)	NE	162.9	452.7	1457	528	320.8	278.9	1583	324.6	347.4	789	436.1	--
Turbidity ³ (NTU)	NE	10.03	7.63	8.54	10.54	10.47	6.72	9.47	120.61	27.33	5.43	9.78	--
Dissolved Oxygen (mg/L)	NE	2.99	1.07	0.76	0.9	1.03	1.17	1.4	0.87	1.02	0.76	0.86	--
Temperature (°C)	NE	13.3	14.1	15.3	15.2	15.1	14	15.5	16	14.2	15	14.8	--
Total Dissolved Solids (mg/L)	NE	136	367	1170	423	257	227	1256	259	277	627	352	--
Oxidation Reduction Potential (mV)	NE	31.4	-22.4	-78.7	-82.6	17.7	139	100.9	-65	161.9	-80.3	-75.5	--
Salinity (%)	NE	0.1	0.27	0.92	0.32	0.19	0.17	0.99	0.19	0.2	0.48	0.26	--
Geochemical Parameters ⁴													
Methane (µg/L)	NE	264	2,830	9,880	7,560	794	0.65 U	14.7	1,000	0.65 U	14,000	16,900	17,500
Nitrate (mg/L)	NE	0.501	1.73	0.100 U	0.454	0.100 U	0.199	2.74	0.242	0.100 U	0.100 U	0.100 U	0.100 U
Sulfate (mg/L)	NE	25.8	20.7	24.2	72.2	1.01	15.8	22.4	10.5	19.2	0.100 U	7.93	9.98
Total Alkalinity (mg/L)	NE	69.0	253	406	168	187	150	249	185	184	426	233	242
Iron, Ferrous, Fe+2 (mg/L)	NE	0.598	4.21	3.05	16.7	1.49	0.040 U	5.61	0.040 U	32.0	25.5	25.6	
Dissolved Manganese (µg/L)	NE	48.1	156	292	2,570	1,240	8.36	203	1,130	573	3,350	3,010	2,950
Petroleum Hydrocarbons by NWTPH-Gx (µg/L)													
Gasoline-range hydrocarbons	800 ⁵	--	--	--	--	--	--	--	117	--	3,220	--	--
Petroleum Hydrocarbons by NWTPH-Dx (µg/L) without silica gel cleanup													
Diesel-range hydrocarbons	500	1,090	1,210	1,420	584	454	100 U	100 U	415	100 U	5,850	1,750	1,890
Motor Oil	500	359	616	200 U	200 U	200 U	200 U	200 U	200 U	200 U	977	200 U	200 U
Petroleum Hydrocarbons by NWTPH-Dx (µg/L) with silica gel cleanup													
Diesel-range hydrocarbons	500	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	1,110	188	202
Motor Oil	500	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Volatile Organic Compounds (VOCs) by EPA 8360 (µg/L)													
Benzene	2.4	--	--	--	--	--	--	--	2.19	--	29.1	--	--
Toluene	520	--	--	--	--	--	--	--	0.16 J	--	2.45	--	--
Ethylbenzene	130	--	--	--	--	--	--	--	0.06 J	--	1.39	--	--
Total Xylenes	310	--	--	--	--	--	--	--	0.190	--	3.30	--	--

Notes:

- ¹ Sample locations are shown on Figure 1.
- ² Preliminary screening levels are from the RI/FS Work Plan (GeoEngineers, 2017).
- ³ Sample elevations referenced to North American Vertical Datum 1988 (NAVD88) from Sound Development Group October 2017 Survey.
- ⁴ Geochemical methods include: Methane by EPA RSK-175; Nitrate and Sulfate by EPA 300.0; Total Alkalinity by SM2420 B-97; Ferrous Iron by SM 3500-Fe; and Manganese by EPA 6020A
- ⁵ Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 1,000 µg/l.

µS/cm = microsiemens per centimeter
mg/L = milligram per liter
NTU = Nephelometric Turbidity Unit
µg/L = microgram per liter
mV = millivolt
-- = not analyzed
C = Celsius
NE = Not Established
ppt = parts per thousand
ND = Not Detected

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates exceedance of the preliminary groundwater screening level.

Blue shading indicated non-detect result exceedance of the preliminary groundwater screening level.

Bold font type indicates the analyte was detected at the reported concentration.

Table 10
Remedial Investigation Sediment Analytical Results for Protection of Benthic Organisms
Quiet Cove
Anacortes, Washington

Sample Location ¹	Preliminary Screening		GEI-SED-1 ²			GEI-SED-2		GEI-SED-3		GEI-SED-4	
Sample Identification	Level ³		SED-COMP-1_091517	SED1-1-3_091517	SED1-4-6_091517	SED-2-0-2	SED-2-2-4	SED-3-0-2	SED-3-2-3.5	SED-4-0-1.5	SED-4-1.5-3
Sample Date	SCO/ LAET ⁴	CSL/ 2LAET ⁴	9/15/2017	9/15/2017	9/15/2017	7/17/2018	07/17/18	7/17/2018	07/17/18	7/16/2018	7/16/2018
Sample Interval (feet bgs)			0-10 cm	1 - 3 ft	4 - 6 ft	0-2 ft	2-4 ft	0-2 ft	2-3.5 ft	0-1.5 ft	1.5-3 ft
Field Measured Parameters											
Sheen	NE	NE	NS	NS	NS	NS	NS	NS	NS	NS	NS
Headspace Vapors (ppm)	NE	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1
Conventionals											
Total Organic Carbon (TOC)	NE	NE	0.14 J	0.85 J	0.39 J	--	--	--	--	--	--
Total Volatile Solids (TVS)	NE	NE	0.803	1.44	2.21	--	--	--	--	--	--
Total Solids (TS)	NE	NE	87.8	93.01	87.29	--	--	--	--	--	--
Sulfide	NE	NE	1.05 U	0.910 U	99.6	--	--	--	--	--	--
Ammonia (Total as N)	NE	NE	0.44 U	0.40 U	1.13	--	--	--	--	--	--
Grain Size (Percent)											
Gravel	NE	NE	34.6	40.5	35.2	--	--	--	--	--	--
Very coarse sand	NE	NE	8.9	11.8	7.7	--	--	--	--	--	--
Coarse sand	NE	NE	19	15.1	7.8	--	--	--	--	--	--
Medium sand	NE	NE	18.3	16.9	9.6	--	--	--	--	--	--
Fine sand	NE	NE	18.8	12.4	27.2	--	--	--	--	--	--
Very fine sand	NE	NE	0.4	1.3	7.8	--	--	--	--	--	--
Coarse silt	NE	NE	0.1 U	2.1 U	1.4	--	--	--	--	--	--
Medium silt	NE	NE	0.1 U	2.1 U	1.2	--	--	--	--	--	--
Fine silt	NE	NE	0.1 U	2.1 U	0.8	--	--	--	--	--	--
Very fine silt	NE	NE	0.1 U	2.1 U	0.4	--	--	--	--	--	--
Coarse clay	NE	NE	0.1 U	2.1 U	0.2	--	--	--	--	--	--
Medium clay	NE	NE	0.1 U	2.1 U	0.5	--	--	--	--	--	--
Total Fines	NE	NE	0.1	2.1	4.7	--	--	--	--	--	--
Metals by EPA 6000/7000 Series (mg/kg)											
Arsenic	57	93	3.45	3.62	6.83	--	--	--	--	--	--
Cadmium	5.1	6.7	0.03 UJ	0.08 UJ	0.56 J	--	--	--	--	--	--
Chromium	260	270	16.3	17	18.1	--	--	--	--	--	--
Copper	390	390	21.2 J	30.4 J	58.6 J	--	--	--	--	--	--
Lead	450	530	56.4 J	60.8 J	97.1 J	69.9	--	19.8	--	125	55.8
Silver	6.1	6.1	0.02 J	0.02 J	0.14 J	--	--	--	--	--	--
Zinc	410	960	166	68.2	98.7	--	--	--	--	--	--
Mercury	0.41	0.59	0.0212 UJ	0.0334 J	0.235 J	--	--	--	--	--	--
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)											
Gasoline-range hydrocarbons	30 ⁵	NE	5.95 U	5.36 U	8.59 U	--	--	--	--	--	--
Diesel-range hydrocarbons	2,000	NE	8.58	17.6	580	107	41.1	8.08	5.65 U	78	40
Motor Oil-range hydrocarbons	2,000	NE	46.9	69.4	688	171	76.6	13.8	11.3 U	129	67.9
Volatile Organic Compounds (VOCs) by EPA 8360 (µg/kg)											
Benzene	370	780	1.34 J	1.17	1.20 U	--	--	--	--	--	--
Toluene	38	64	1.82	1.77	1.20 U	--	--	--	--	--	--
Ethylbenzene	16	57	1.63 U	1.03 U	1.20 U	--	--	--	--	--	--
Total Xylenes	66	66	3.26 U	1.63	2.40 U	--	--	--	--	--	--
1,2-Dibromoethane (EDB)	220	1200	1.63 U	1.03 U	1.20 UJ	--	--	--	--	--	--
1,2-Dichloroethane (EDC)	23	79	1.63 U	1.03 U	1.20 U	--	--	--	--	--	--
Methyl t-butyl ether (MTBE)	99	170	1.63 U	1.03 U	1.20 U	--	--	--	--	--	--
n-Hexane	100	480	1.63 U	1.03 U	1.20 U	--	--	--	--	--	--

Sample Location ¹	Preliminary Screening Level ³		GEI-SED-1 ²			GEI-SED-2		GEI-SED-3		GEI-SED-4	
Sample Identification			SED-COMP-1_091517	SED1-1-3_091517	SED1-4-6_091517	SED-2-0-2	SED-2-2-4	SED-3-0-2	SED-3-2-3.5	SED-4-0-1.5	SED-4-1.5-3
Sample Date	SCO/ LAET ⁴	CSL/ 2LAET ⁴	9/15/2017	9/15/2017	9/15/2017	7/17/2018	07/17/18	7/17/2018	07/17/18	7/16/2018	7/16/2018
Sample Interval (feet bgs)			0-10 cm	1 - 3 ft	4 - 6 ft	0-2 ft	2-4 ft	0-2 ft	2-3.5 ft	0-1.5 ft	1.5-3 ft
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; OC Normalized) by EPA 8270 SIM (mg/kg OC)											
Sum of LPAHs ⁶	370	780	221	146	4,050	--	--	--	--	--	--
2-Methylnaphthalene	38	64	2.42	1.66	23.8	--	--	--	--	--	--
Acenaphthene	16	57	2.51	0.733	38	--	--	--	--	--	--
Acenaphthylene	66	66	11.1	2.98	54.1	--	--	--	--	--	--
Anthracene	220	1200	17	6.59	196	--	--	--	--	--	--
Fluorene	23	79	9.79	2.72	58.2	--	--	--	--	--	--
Naphthalene	99	170	3.48	2.12	90.8	--	--	--	--	--	--
Phenanthrene	100	480	137	25.2	554	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) by EPA 8270 SIM (µg/kg)											
Sum of LPAHs ⁶	5,200	5,200	309	1,240	15,800	--	--	--	--	--	--
2-Methylnaphthalene	670	670	3.39 J	14.1	93	--	--	--	--	--	--
Acenaphthene	500	500	3.52 J	6.23	150	--	--	--	--	--	--
Acenaphthylene	1,300	1,300	15.5	25.3	211	--	--	--	--	--	--
Anthracene	960	960	23.8	56	765	--	--	--	--	--	--
Fluorene	540	540	13.7	23.1	227	--	--	--	--	--	--
Naphthalene	2,100	2,100	4.87 J	18	354	--	--	--	--	--	--
Phenanthrene	1,500	1,500	192	214	2,160	--	--	--	--	--	--
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; OC Normalized) by EPA 8270 SIM (mg/kg OC)											
Sum of HPAHs ⁷	960	5,300	930	514	14,700	--	--	--	--	--	--
Benzo(a)anthracene	110	270	55.1	19.8	451	--	--	--	--	--	--
Benzo(a)pyrene	99	210	57.3	17.3	372	--	--	--	--	--	--
Benzofluoranthenes (Total) ⁸	230	450	69.6	24.4	300	--	--	--	--	--	--
Benzo(g,h,i)perylene	31	78	51.5	13.4	236	--	--	--	--	--	--
Chrysene	110	460	65.6	22.8	441	--	--	--	--	--	--
Dibenzo(a,h)anthracene	12	33	8.5	3.49	49	--	--	--	--	--	--
Fluoranthene	160	1,200	148	41	910	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	34	88	37.8	10.7	202	--	--	--	--	--	--
Pyrene	1,000	1,400	161	42.6	1,100	--	--	--	--	--	--
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs) by EPA 8270 SIM (µg/kg)											
Sum of HPAHs ⁷	12,000	17,000	1,300	4,370	57,500	--	--	--	--	--	--
Benzo(a)anthracene	1,300	1,600	77.1	168	1,760	0.449	--	0.0368	--	0.617	0.164
Benzo(a)pyrene	1,600	1,600	80.2	147	1,450	0.515	--	0.0386	--	0.701	0.186
Benzo(g,h,i)perylene	3,200	3,600	97.4	207	1,170	0.815	--	0.0611	--	1.09	0.295
Benzofluoranthenes (Total) ⁸	670	720	72.1	114	921	--	--	--	--	--	--
Chrysene	1,400	2,800	91.9	194	1,720	0.48	--	0.0379	--	0.683	0.175
Dibenzo(a,h)anthracene	230	230	11.9	29.7	190	0.078	--	0.00984	--	0.101	0.0293
Fluoranthene	1,700	2,500	207	350	3,550	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	600	690	52.9	91.2	789	0.308	--	0.0195	--	0.381	0.114
Pyrene	2,600	3,300	225	362	4,100	--	--	--	--	--	--
Chlorinated Hydrocarbons (OC Normalized ³) by EPA 8270 SIM (mg/kg OC)											
1,2,4-Trichlorobenzene	0.81	1.8	3.50 U	0.550 U	1.30 U	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	2.3	2.3	3.50 U	0.550 U	1.30 U	--	--	--	--	--	--
1,3-Dichlorobenzene (m-Dichlorobenzene)	NE	NE	3.50 U	0.550 U	1.30 U	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	3.1	9	3.50 U	0.34	2.1	--	--	--	--	--	--
Hexachlorobenzene	0.38	2.3	3.50 U	0.550 U	1.30 U	--	--	--	--	--	--
Chlorinated Hydrocarbons by EPA 8270 (µg/kg)											
1,2,4-Trichlorobenzene	31	51	4.9 U	4.7 U	5.0 U	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	35	50	4.9 U	4.7 U	5.0 U	--	--	--	--	--	--
1,3-Dichlorobenzene (m-Dichlorobenzene)	NA	NA	4.9 U	4.7 U	5.0 U	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	110	110	4.9 U	2.9 J	8	--	--	--	--	--	--
Hexachlorobenzene	22	70	4.9 U	4.7 U	5.0 U	--	--	--	--	--	--

Sample Location ¹	Preliminary Screening Level ³		GEI-SED-1 ²			GEI-SED-2		GEI-SED-3		GEI-SED-4	
Sample Identification			SED-COMP-1_091517	SED1-1-3_091517	SED1-4-6_091517	SED-2-0-2	SED-2-2-4	SED-3-0-2	SED-3-2-3.5	SED-4-0-1.5	SED-4-1.5-3
Sample Date	SCO/ LAET ⁴	CSL/ 2LAET ⁴	9/15/2017	9/15/2017	9/15/2017	7/17/2018	07/17/18	7/17/2018	07/17/18	7/16/2018	7/16/2018
Sample Interval (feet bgs)			0-10 cm	1 - 3 ft	4 - 6 ft	0-2 ft	2-4 ft	0-2 ft	2-3.5 ft	0-1.5 ft	1.5-3 ft
Phthalates (OC Normalized ²) by EPA 8270 SIM (mg/kg OC)											
Bis(2-Ethylhexyl) Phthalate	47	78	22.4	5.51 U	12.7 U	--	--	--	--	--	--
Butyl benzyl Phthalate	4.9	64	3.50 U	4.69	1.30 U	--	--	--	--	--	--
Dibutyl Phthalate	220	1,700	14.0 U	1.1	5.10 U	--	--	--	--	--	--
Diethyl Phthalate	61	110	14.0 U	2.20 U	5.10 U	--	--	--	--	--	--
Dimethyl Phthalate	53	53	3.50 U	0.550 U	1.30 U	--	--	--	--	--	--
Di-N-Octyl Phthalate	58	4,500	14.0 U	2.20 U	5.10 U	--	--	--	--	--	--
Phthalates by EPA 8270 (µg/kg)											
Bis(2-Ethylhexyl) Phthalate	1,300	1,900	31.3 J	46.8 U	49.7 U	--	--	--	--	--	--
Butyl benzyl Phthalate	63	900	4.9 U	39.9	5.0 U	--	--	--	--	--	--
Dibutyl Phthalate	1,400	1,400	19.6 U	9.4 J	19.9 U	--	--	--	--	--	--
Diethyl Phthalate	200	200	14.0 U	2.20 U	5.10 U	--	--	--	--	--	--
Dimethyl Phthalate	71	160	3.50 U	0.550 U	1.30 U	--	--	--	--	--	--
Di-N-Octyl Phthalate	6,200	6,200	19.6 U	18.7 U	19.9 U	--	--	--	--	--	--
Phenols by EPA 8270 (µg/kg)											
2,4-Dimethylphenol	29	29	24.4 U	23.4 U	23.6 J	--	--	--	--	--	--
2-methylphenol (o-Cresol)	63	63	19.6 U	18.7 U	15.8 J	--	--	--	--	--	--
4-methylphenol (p-Cresol)	670	670	19.6 U	18.7 U	187	--	--	--	--	--	--
Pentachlorophenol	360	690	97.8 U	93.5 U	1,110	--	--	--	--	--	--
Phenol	420	1,200	19.6 U	18.7 U	42.6	--	--	--	--	--	--
Miscellaneous Extractables (OC Normalized ²) by EPA 8270 SIM (mg/kg OC)											
Dibenzofuran	15	58	6.08	1.21	35.6	--	--	--	--	--	--
Hexachlorobutadiene	3.9	6.2	3.50 U	0.550 U	1.30 U	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	11	11	3.50 U	0.550 U	1.30 U	--	--	--	--	--	--
Miscellaneous Extractables by EPA 8270 (mg/kg)											
Dibenzofuran	540	540	8.51	10.3	139	--	--	--	--	--	--
Hexachlorobutadiene	11	120	4.9 U	4.7 U	5.0 U	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	28	40	4.9 U	4.7 U	5.0 U	--	--	--	--	--	--
Benzoic Acid	650	650	97.8 U	93.5 U	99.4 U	--	--	--	--	--	--
Benzyl Alcohol	57	730	19.6 U	18.7 U	19.9 U	--	--	--	--	--	--

Table 10 (Continued)
Remedial Investigation Sediment Analytical Results for Protection of Benthic Organisms
Quiet Cove
Anacortes, Washington

Sample Location ¹	Preliminary Screening		GEI-SED-5		GEI-SED-6		GEI-SED-7		GEI-SED-8	
Sample Identification	Level ³		SED-5-0-0.5	SED-5-2-4	SED-6-0-0.5	SED-6-1-3	SED-7-0-0.5	SED-7-0-1	SED-8-0-0.5	SED-8-3.2-4.5
Sample Date	SCO/ LAET ⁴	CSL/ 2LAET ⁴	07/16/18	07/16/18	07/16/18	07/17/18	07/16/18	07/17/18	07/16/18	07/16/18
Sample Interval (feet bgs)			0-0.5 ft	2-4 ft	0-0.5 ft	1-3 ft	0-0.5 ft	0-1 ft	0-0.5 ft	3.2-4.5 ft
Field Measured Parameters										
Sheen	NE	NE	NS	NS	NS	NS	NS	NS	NS	NS
Headspace Vapors (ppm)	NE	NE	<1	<1	<1	<1	<1	<1	3.3	1.8
Conventional										
Total Organic Carbon (TOC)	NE	NE	0.33	0.20	0.25	0.22	0.12	0.12	0.18	0.74
Total Volatile Solids (TVS)	NE	NE	1.00	0.88	1.10	0.80	0.91	0.72	1.14	1.75
Total Solids (TS)	NE	NE	94.18	90.57	96.05	94.72	97.04	97.11	81.80	82.13
Sulfide	NE	NE	1.04 U	8.28	0.990 U	0.962 U	1.06 U	1.01 U	1.14 U	2.31
Ammonia (Total as N)	NE	NE	1.36	0.40 U	0.39 U	0.38 U	0.40 U	0.39 U	3.97	2.00
Grain Size (Percent)										
Gravel	NE	NE	79.9	69.8	49.3	46.2	52.5	43.7	60.1	75.4
Very coarse sand	NE	NE	9.2	12.1	16.7	12.2	9.3	7.8	6.7	3.9
Coarse sand	NE	NE	4.5	6.5	18.6	17.6	22.1	21.8	5.0	3.5
Medium sand	NE	NE	2.9	4.2	8.7	13.9	11.3	20.7	11.6	5.3
Fine sand	NE	NE	3.1	5.2	5.9	8.2	4.3	5.5	14.7	10.0
Very fine sand	NE	NE	0.2	0.4	0.1	0.4	0.1	0.1	0.5	1.7
Coarse silt	NE	NE	0.2 U	1.8 U	0.7 U	1.5 U	0.4 U	0.3 U	1.4 U	0.2 U
Medium silt	NE	NE	0.2 U	1.8 U	0.7 U	1.5 U	0.4 U	0.3 U	1.4 U	0.2 U
Fine silt	NE	NE	0.2 U	1.8 U	0.7 U	1.5 U	0.4 U	0.3 U	1.4 U	0.2 U
Very fine silt	NE	NE	0.2 U	1.8 U	0.7 U	1.5 U	0.4 U	0.3 U	1.4 U	0.2 U
Coarse clay	NE	NE	0.2 U	1.8 U	0.7 U	1.5 U	0.4 U	0.3 U	1.4 U	0.2 U
Medium clay	NE	NE	0.2 U	1.8 U	0.7 U	1.5 U	0.4 U	0.3 U	1.4 U	0.2 U
Total Fines	NE	NE	0.2	1.8	0.7	1.5	0.4	0.3	1.4	0.2
Metals by EPA 6000/7000 Series (mg/kg)										
Arsenic	57	93	3.73	3.30	7.16	5.55	3.05	3.20	3.72	3.57
Cadmium	5.1	6.7	0.08 J	0.12	0.07 J	0.09 J	0.06 J	0.06 J	0.04 J	0.42
Chromium	260	270	19.5	14.5	13.6	27.2	17.8	14.3	15.2	15.3
Copper	390	390	21.0	38.6	14.5	43.4	187	165	22.2	47.8
Lead	450	530	31.3	70.1	34.8	78.8	53.3	40.8	44.4	240
Silver	6.1	6.1	0.03 J	0.06 J	0.05 J	0.05 J	0.04 J	0.04 J	0.05 J	0.11 J
Zinc	410	960	51.2	81.8	108	75.7	112	53.8	41.6	132
Mercury	0.41	0.59	0.0219 U	0.0427	0.0238 U	0.0234 U	0.0200 U	0.0230 U	0.0244 U	0.168
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)										
Gasoline-range hydrocarbons	30 ⁵	NE	--	--	--	--	--	--	--	--
Diesel-range hydrocarbons	2,000	NE	--	--	--	--	--	--	--	--
Motor Oil-range hydrocarbons	2,000	NE	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs) by EPA 8360 (µg/kg)										
Benzene	370	780	1.21	0.93 J	0.43 J	2.05	0.80 J	0.28 J	1.13 U	1.69
Toluene	38	64	1.47	0.41 J	1.22 U	1.62	0.52 J	0.23 J	1.13 U	0.49 J
Ethylbenzene	16	57	1.06 U	1.05 U	1.22 U	0.95 U	1.14 U	0.91 U	1.13 U	0.95 U
Total Xylenes	66	66	0.810	2.10 U	2.43 U	0.440	2.28 U	1.82 U	2.25 U	1.91 U
1,2-Dibromoethane (EDB)	220	1200	1.06 U	1.05 U	1.22 U	0.95 U	1.14 U	0.91 U	1.13 U	0.95 U
1,2-Dichloroethane (EDC)	23	79	0.47 J	1.05 U	1.22 U	0.95 U	1.14 U	0.91 U	1.13 U	0.54 J
Methyl t-butyl ether (MTBE)	99	170	1.06 U	1.05 U	1.22 U	0.95 U	1.14 U	0.91 U	1.13 U	0.95 U
n-Hexane	100	480	1.06 U	1.05 U	1.22 U	0.95 U	1.14 U	0.91 U	1.13 U	0.95 U

Sample Location ¹	Preliminary Screening Level ³		GEI-SED-5		GEI-SED-6		GEI-SED-7		GEI-SED-8	
Sample Identification			SED-5-0-0.5	SED-5-2-4	SED-6-0-0.5	SED-6-1-3	SED-7-0-0.5	SED-7-0-1	SED-8-0-0.5	SED-8-3.2-4.5
Sample Date	SCO/ LAET ⁴	CSL/ 2LAET ⁴	07/16/18	07/16/18	07/16/18	07/17/18	07/16/18	07/17/18	07/16/18	07/16/18
Sample Interval (feet bgs)			0-0.5 ft	2-4 ft	0-0.5 ft	1-3 ft	0-0.5 ft	0-1 ft	0-0.5 ft	3.2-4.5 ft
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; OC Normalized) by EPA 8270 SIM (mg/kg OC)										
Sum of LPAHs ⁶	370	780	98.2	71.0	12.8	34.9	9.42	60.8	107	99.0
2-Methylnaphthalene	38	64	2.83	1.73	1.00	1.81	3.87 U	3.45	2.27	3.97
Acenaphthene	16	57	2.19	1.39	1.87 U	2.16 U	3.87 U	3.89 U	3.51	5.27
Acenaphthylene	66	66	7.76	4.99	0.936	8.95	3.87 U	5.39	5.89	8.04
Anthracene	220	1200	15.3	13.4	2.31	9.18	2.25	7.09	19.3	15.9
Fluorene	23	79	8.06	5.35	1.87 U	1.51	3.87 U	3.38	7.17	7.54
Naphthalene	99	170	9.76	2.49	2.10	1.52	1.98	4.68	4.80	10.0
Phenanthrene	100	480	55.2	43.6	7.44	13.7	5.18	40.3	66.1	51.8
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) by EPA 8270 SIM (µg/kg)										
Sum of LPAHs ⁶	5,200	5,200	324	142	32.0	76.8	11.3	73.0	192	730
2-Methylnaphthalene	670	670	9.35	3.45 J	2.50 J	3.99 J	4.64 U	4.14 J	4.09 J	29.4
Acenaphthene	500	500	7.23	2.77 J	4.67 U	4.76 U	4.64 U	4.67 U	6.31	39.0
Acenaphthylene	1,300	1,300	25.6	9.97	2.34 J	19.7	4.64 U	6.47	10.6	59.5
Anthracene	960	960	50.5	26.7	5.78	20.2	2.70 J	8.51	34.8	118
Fluorene	540	540	26.6	10.7	4.67 U	3.32 J	4.64 U	4.06 J	12.9	55.8
Naphthalene	2,100	2,100	32.2	4.97	5.26	3.35 J	2.38 J	5.61	8.64	74.2
Phenanthrene	1,500	1,500	182	87.1	18.6	30.2	6.22	48.4	119	383
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; OC Normalized) by EPA 8270 SIM (mg/kg OC)										
Sum of HPAHs ⁷	960	5,300	409	280	116	326	102	370	487	509
Benzo(a)anthracene	110	270	36.0	22.8	10.9	25.0	7.03	29.0	40.1	43.9
Benzo(a)pyrene	99	210	34.2	25.4	10.3	24.2	6.78	32.8	48.3	45.7
Benzo(a)fluoranthene (Total) ⁸	230	450	62.1	36.4	18.3	75.0	17.9	27.2	37.1	34.1
Benzo(g,h,i)perylene	31	78	23.7	19.5	8.04	23.8	6.55	58.0	67.0	68.2
Chrysene	110	460	64.2	27.4	12.0	43.3	10.3	38.3	47.3	43.9
Dibenzo(a,h)anthracene	12	33	8.24	8.30	5.72	8.59	10.1	13.3	11.4	8.23
Fluoranthene	160	1,200	83.6	58.0	19.4	51.8	13.7	68.3	95.6	110
Indeno(1,2,3-c,d)pyrene	34	88	20.2	17.4	9.36	20.9	12.3	25.7	29.5	25.0
Pyrene	1,000	1,400	75.2	65.0	21.6	53.6	16.8	73.8	100	127
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs) by EPA 8270 SIM (µg/kg)										
Sum of HPAHs ⁷	12,000	17,000	1,350	560	289	718	122	440	877	3,770
Benzo(a)anthracene	1,300	1,600	120	45.5	27.2	55.0	8.44	34.8	72.2	325
Benzo(a)pyrene	1,600	1,600	113	50.7	25.7	53.3	8.13	39.3	86.9	338
Benzo(g,h,i)perylene	3,200	3,600	205	72.7	45.8	165	21.5	32.6	66.8	252
Benzo(a)fluoranthene (Total) ⁸	670	720	78.3	38.9	20.1	52.4	7.86	69.6	120	505
Chrysene	1,400	2,800	212	54.8	30.0	95.2	12.3	45.9	85.1	325
Dibenzo(a,h)anthracene	230	230	27.2	16.6	14.3	18.9	12.1	15.9	20.6	60.9
Fluoranthene	1,700	2,500	276	116	48.5	114	16.4	82.0	172	840
Indeno(1,2,3-c,d)pyrene	600	690	66.8	34.8	23.4	46.0	14.7	30.8	53.1	185
Pyrene	2,600	3,300	248	130	53.9	118	20.1	88.6	200	938
Chlorinated Hydrocarbons (OC Normalized ²) by EPA 8270 SIM (mg/kg OC)										
1,2,4-Trichlorobenzene	0.81	1.8	1.40 U	2.40 U	1.90 U	2.10 U	3.90 U	3.90 U	2.70 U	0.680 U
1,2-Dichlorobenzene (o-Dichlorobenzene)	2.3	2.3	1.40 U	2.40 U	1.90 U	2.10 U	3.90 U	3.90 U	2.70 U	0.680 U
1,3-Dichlorobenzene (m-Dichlorobenzene)	NE	NE	1.40 U	2.40 U	1.90 U	2.10 U	3.90 U	3.90 U	2.70 U	0.680 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	3.1	9	1.40 U	2.40 U	1.90 U	2.10 U	3.90 U	3.90 U	2.70 U	0.540
Hexachlorobenzene	0.38	2.3	1.40 U	2.40 U	1.90 U	2.10 U	3.90 U	3.90 U	2.70 U	0.680 U
Chlorinated Hydrocarbons by EPA 8270 (µg/kg)										
1,2,4-Trichlorobenzene	31	51	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U	5.0 U
1,2-Dichlorobenzene (o-Dichlorobenzene)	35	50	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U	5.0 U
1,3-Dichlorobenzene (m-Dichlorobenzene)	NA	NA	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U	5.0 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	110	110	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U	4.0 J
Hexachlorobenzene	22	70	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U	5.0 U

Sample Location ¹	Preliminary Screening Level ³		GEI-SED-5		GEI-SED-6		GEI-SED-7		GEI-SED-8	
Sample Identification			SED-5-0-0.5	SED-5-2-4	SED-6-0-0.5	SED-6-1-3	SED-7-0-0.5	SED-7-0-1	SED-8-0-0.5	SED-8-3.2-4.5
Sample Date	SCO/ LAET ⁴	CSL/ 2LAET ⁴	07/16/18	07/16/18	07/16/18	07/17/18	07/16/18	07/17/18	07/16/18	07/16/18
Sample Interval (feet bgs)			0-0.5 ft	2-4 ft	0-0.5 ft	1-3 ft	0-0.5 ft	0-1 ft	0-0.5 ft	3.2-4.5 ft
Phthalates (OC Normalized ²) by EPA 8270 SIM (mg/kg OC)										
Bis(2-Ethylhexyl) Phthalate	47	78	14.2 U	23.8 U	18.6 U	21.6	38.8 U	39.0 U	26.6 U	6.74 U
Butyl benzyl Phthalate	4.9	64	1.40 U	2.40 U	1.90 U	2.10 U	3.90 U	3.90 U	2.70 U	0.680 U
Dibutyl Phthalate	220	1,700	5.67 U	9.50 U	7.44 U	8.59 U	15.5 U	15.6 U	10.7 U	2.69 U
Diethyl Phthalate	61	110	3.70	6.35	4.08	9.32	11.6	15.0	6.56	2.54
Dimethyl Phthalate	53	53	1.40 U	2.40 U	1.90 U	2.10 U	3.90 U	3.90 U	2.70 U	0.680 U
Di-N-Octyl Phthalate	58	4,500	5.67 U	9.50 U	7.44 U	8.59 U	15.5 U	15.6 U	10.7 U	2.69 U
Phthalates by EPA 8270 (µg/kg)										
Bis(2-Ethylhexyl) Phthalate	1,300	1,900	46.9 U	47.6 U	46.6 U	47.5	46.6 U	46.8 U	47.9 U	49.9 U
Butyl benzyl Phthalate	63	900	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U	5.0 U
Dibutyl Phthalate	1,400	1,400	18.7 U	19.0 U	18.6 U	18.9 U	18.6 U	18.7 U	19.2 U	19.9 U
Diethyl Phthalate	200	200	12.2 J	12.7 J	10.2 J	20.5	13.9 J	18.0 J	11.8 J	18.8 J
Dimethyl Phthalate	71	160	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U	5.0 U
Di-N-Octyl Phthalate	6,200	6,200	18.7 U	19.0 U	18.6 U	18.9 U	18.6 U	18.7 U	19.2 U	19.9 U
Phenols by EPA 8270 (µg/kg)										
2,4-Dimethylphenol	29	29	23.4 U	23.8 U	23.3 U	23.7 U	23.3 U	23.4 U	24.0 U	3.1 J
2-methylphenol (o-Cresol)	63	63	18.7 U	19.0 U	18.6 U	18.9 U	18.6 U	18.7 U	19.2 U	19.9 U
4-methylphenol (p-Cresol)	670	670	18.7 U	19.0 U	18.6 U	18.9 U	18.6 U	18.7 U	19.2 U	47.9
Pentachlorophenol	360	690	93.7 U	95.2 U	93.2 U	94.6 U	93.2 U	93.5 U	95.8 U	57.4 J
Phenol	420	1,200	18.7 U	19.0 U	18.6 U	18.9 U	18.6 U	18.7 U	19.2 U	19.9 U
Miscellaneous Extractables (OC Normalized ²) by EPA 8270 SIM (mg/kg OC)										
Dibenzofuran	15	58	3.42	2.83	1.87 U	2.16 U	3.87 U	3.89 U	3.28	4.24
Hexachlorobutadiene	3.9	6.2	1.40 U	2.40 U	1.90 U	2.10 U	3.90 U	3.90 U	2.70 U	0.680 U
N-Nitrosodiphenylamine (as diphenylamine)	11	11	1.40 U	2.40 U	1.90 U	2.10 U	3.90 U	3.90 U	2.70 U	2.61
Miscellaneous Extractables by EPA 8270 (mg/kg)										
Dibenzofuran	540	540	11.3	5.65	4.67 U	4.76 U	4.64 U	4.67 U	5.90	31.4
Hexachlorobutadiene	11	120	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U	5.0 U
N-Nitrosodiphenylamine (as diphenylamine)	28	40	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U	19.3
Benzoic Acid	650	650	93.7 U	95.2 U	28.2 J	94.6 U	93.2 U	21.0 J	95.8 U	39.6 J
Benzyl Alcohol	57	730	18.7 U	19.0 U	18.6 U	18.9 U	18.6 U	18.7 U	19.2 U	19.9 U

Table 10 (Continued)
Remedial Investigation Sediment Analytical Results for Protection of Benthic Organisms
Quiet Cove
Anacortes, Washington

Sample Location ¹	Preliminary Screening		GEI-SED-9		GEI-SED-10	
Sample Identification	Level ³		SED-9-0-0.5	SED-9-1.7-2.3	SED-10-0-0.5	SED-10-2-4
Sample Date	SCO/ LAET ⁴	CSL/ 2LAET ⁴	07/16/18	07/17/18	07/18/18	07/17/18
Sample Interval (feet bgs)			0-0.5 ft	1.7-2.3 ft	0-0.5 ft	2-4 ft
Field Measured Parameters						
Sheen	NE	NE	NS	NS	NS	NS
Headspace Vapors (ppm)	NE	NE	<1	2.2	<1	<1
Conventional						
Total Organic Carbon (TOC)	NE	NE	0.42	0.19	0.19	0.62
Total Volatile Solids (TVS)	NE	NE	1.10	0.39	0.84	1.05
Total Solids (TS)	NE	NE	87.58	89.60	82.88	77.21
Sulfide	NE	NE	1.07 U	1.09 U	1.05 U	1.62
Ammonia (Total as N)	NE	NE	0.89	0.42 U	0.36 U	1.46
Grain Size (Percent)						
Gravel	NE	NE	60.7	60.2	38.7	30.0
Very coarse sand	NE	NE	6.1	4.3	17.9	3.4
Coarse sand	NE	NE	6.4	8.9	23.1	2.0
Medium sand	NE	NE	15.1	16.2	8.9	6.1
Fine sand	NE	NE	9.8	8.3	8.6	32.4
Very fine sand	NE	NE	0.7	0.2	0.4	22.3
Coarse silt	NE	NE	1.2 U	1.8 U	2.3 U	3.8 U
Medium silt	NE	NE	1.2 U	1.8 U	2.3 U	3.8 U
Fine silt	NE	NE	1.2 U	1.8 U	2.3 U	3.8 U
Very fine silt	NE	NE	1.2 U	1.8 U	2.3 U	3.8 U
Coarse clay	NE	NE	1.2 U	1.8 U	2.3 U	3.8 U
Medium clay	NE	NE	1.2 U	1.8 U	2.3 U	3.8 U
Total Fines	NE	NE	1.2	1.8	2.3	3.8
Metals by EPA 6000/7000 Series (mg/kg)						
Arsenic	57	93	3.93	0.75	2.71	4.01
Cadmium	5.1	6.7	0.06 J	0.009 J	0.05 J	0.37
Chromium	260	270	15.4	15.9	21.6	15.2
Copper	390	390	47.9	4.49	16.0	17.1
Lead	450	530	101	0.87	24.5	23.5
Silver	6.1	6.1	0.05 J	0.03 J	0.04 J	0.07 J
Zinc	410	960	68.4	20.0	47.7	54.3
Mercury	0.41	0.59	0.0353	0.0253 U	0.0291 U	0.0844
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)						
Gasoline-range hydrocarbons	30 ⁵	NE	--	--	--	--
Diesel-range hydrocarbons	2,000	NE	--	--	--	--
Motor Oil-range hydrocarbons	2,000	NE	--	--	--	--
Volatile Organic Compounds (VOCs) by EPA 8360 (µg/kg)						
Benzene	370	780	0.65 J	0.73 J	1.09 U	0.42 J
Toluene	38	64	0.53 J	0.34 J	1.09 U	0.46 J
Ethylbenzene	16	57	1.04 U	1.05 U	1.09 U	1.23 U
Total Xylenes	66	66	2.08 U	2.11 U	2.18 U	2.47 U
1,2-Dibromoethane (EDB)	220	1200	1.04 U	1.05 U	1.09 U	1.23 U
1,2-Dichloroethane (EDC)	23	79	1.04 U	1.05 U	1.09 U	1.23 U
Methyl t-butyl ether (MTBE)	99	170	1.04 U	1.05 U	1.09 U	1.23 U
n-Hexane	100	480	1.04 U	1.05 U	1.09 U	1.23 U

Sample Location ¹	Preliminary Screening Level ³		GEI-SED-9		GEI-SED-10	
Sample Identification			SED-9-0-0.5	SED-9-1.7-2.3	SED-10-0-0.5	SED-10-2-4
Sample Date	SCO/ LAET ⁴	CSL/ 2LAET ⁴	07/16/18	07/17/18	07/18/18	07/17/18
Sample Interval (feet bgs)			0-0.5 ft	1.7-2.3 ft	0-0.5 ft	2-4 ft
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; OC Normalized) by EPA 8270 SIM (mg/kg OC)						
Sum of LPAHs ⁶	370	780	165	2.48 U	13.6	63.9
2-Methylnaphthalene	38	64	2.71	2.48 U	5.94 U	2.39
Acenaphthene	16	57	3.86	2.48 U	5.94 U	2.40
Acenaphthylene	66	66	8.67	2.48 U	3.65	5.66
Anthracene	220	1200	29.0	2.48 U	5.94 U	10.4
Fluorene	23	79	9.79	2.48 U	5.94 U	4.87
Naphthalene	99	170	6.79	2.48 U	5.94 U	6.65
Phenanthrene	100	480	108	2.48 U	9.98	34.0
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) by EPA 8270 SIM (µg/kg)						
Sum of LPAHs ⁶	5,200	5,200	694	4.72 U	10.9	396
2-Methylnaphthalene	670	670	11.4	4.72 U	4.75 U	14.8
Acenaphthene	500	500	16.2	4.72 U	4.75 U	14.9
Acenaphthylene	1,300	1,300	36.4	4.72 U	2.92 J	35.1
Anthracene	960	960	120	4.72 U	4.75 U	64.7
Fluorene	540	540	41.1	4.72 U	4.75 U	30.2
Naphthalene	2,100	2,100	28.5	4.72 U	4.75 U	41.2
Phenanthrene	1,500	1,500	452	4.72 U	7.98	210
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; OC Normalized) by EPA 8270 SIM (mg/kg OC)						
Sum of HPAHs ⁷	960	5,300	745	4.97 U	129	250
Benzo(a)anthracene	110	270	51.9	2.48 U	8.80	19.7
Benzo(a)pyrene	99	210	57.9	2.48 U	11.4	23.2
Benzo(a)fluoranthenes (Total) ⁸	230	450	41.2	2.48 U	9.21	18.1
Benzo(g,h,i)perylene	31	78	93.6	4.97 U	22.4	33.2
Chrysene	110	460	70.5	2.48 U	11.2	21.8
Dibenzo(a,h)anthracene	12	33	9.21	2.48 U	14.5	7.68
Fluoranthene	160	1,200	207	2.48 U	15.8	46.9
Indeno(1,2,3-c,d)pyrene	34	88	31.0	2.48 U	17.5	15.7
Pyrene	1,000	1,400	184	2.48 U	17.6	63.2
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs) by EPA 8270 SIM (µg/kg)						
Sum of HPAHs ⁷	12,000	17,000	3,130	9.44 U	103	1,550
Benzo(a)anthracene	1,300	1,600	218	4.72 U	7.04	122
Benzo(a)pyrene	1,600	1,600	243	4.72 U	9.08	144
Benzo(g,h,i)perylene	3,200	3,600	173	4.72 U	7.37	112
Benzo(a)fluoranthenes (Total) ⁸	670	720	393	9.44 U	17.9	206
Chrysene	1,400	2,800	296	4.72 U	8.96	135
Dibenzo(a,h)anthracene	230	230	38.7	4.72 U	11.6	47.6
Fluoranthene	1,700	2,500	871	4.72 U	12.6	291
Indeno(1,2,3-c,d)pyrene	600	690	130	4.72 U	14.0	97.1
Pyrene	2,600	3,300	771	4.72 U	14.1	392
Chlorinated Hydrocarbons (OC Normalized ²) by EPA 8270 SIM (mg/kg OC)						
1,2,4-Trichlorobenzene	0.81	1.8	1.10 U	2.50 U	5.90 U	0.770 U
1,2-Dichlorobenzene (o-Dichlorobenzene)	2.3	2.3	1.10 U	2.50 U	5.90 U	0.770 U
1,3-Dichlorobenzene (m-Dichlorobenzene)	NE	NE	1.10 U	2.50 U	5.90 U	0.770 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	3.1	9	1.10 U	2.50 U	5.90 U	0.770 U
Hexachlorobenzene	0.38	2.3	1.10 U	2.50 U	5.90 U	0.770 U
Chlorinated Hydrocarbons by EPA 8270 (µg/kg)						
1,2,4-Trichlorobenzene	31	51	4.7 U	4.7 U	4.7 U	4.8 U
1,2-Dichlorobenzene (o-Dichlorobenzene)	35	50	4.7 U	4.7 U	4.7 U	4.8 U
1,3-Dichlorobenzene (m-Dichlorobenzene)	NA	NA	4.7 U	4.7 U	4.7 U	4.8 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	110	110	4.7 U	4.7 U	4.7 U	4.8 U
Hexachlorobenzene	22	70	4.7 U	4.7 U	4.7 U	4.8 U

Sample Location ¹	Preliminary Screening Level ³		GEI-SED-9		GEI-SED-10	
Sample Identification			SED-9-0-0.5	SED-9-1.7-2.3	SED-10-0-0.5	SED-10-2-4
Sample Date	SCO/ LAET ⁴	CSL/ 2LAET ⁴	07/16/18	07/17/18	07/18/18	07/17/18
Sample Interval (feet bgs)			0-0.5 ft	1.7-2.3 ft	0-0.5 ft	2-4 ft
Phthalates (OC Normalized ²) by EPA 8270 SIM (mg/kg OC)						
Bis(2-Ethylhexyl) Phthalate	47	78	18.8	24.7 U	59.0 U	7.77 U
Butyl benzyl Phthalate	4.9	64	1.10 U	2.50 U	5.90 U	0.970
Dibutyl Phthalate	220	1,700	4.48 U	9.89 U	23.6 U	3.11 U
Diethyl Phthalate	61	110	3.24	9.53	17.9	2.55
Dimethyl Phthalate	53	53	1.80	2.50 U	5.90 U	0.770 U
Di-N-Octyl Phthalate	58	4,500	4.48 U	9.89 U	23.6 U	3.11 U
Phthalates by EPA 8270 (µg/kg)						
Bis(2-Ethylhexyl) Phthalate	1,300	1,900	79.1	46.9 U	47.2 U	48.2 U
Butyl benzyl Phthalate	63	900	4.7 U	4.7 U	4.7 U	6.0
Dibutyl Phthalate	1,400	1,400	18.8 U	18.8 U	18.9 U	19.3 U
Diethyl Phthalate	200	200	13.6 J	18.1 J	14.3 J	15.8 J
Dimethyl Phthalate	71	160	7.5	4.7 U	4.7 U	4.8 U
Di-N-Octyl Phthalate	6,200	6,200	18.8 U	18.8 U	18.9 U	19.3 U
Phenols by EPA 8270 (µg/kg)						
2,4-Dimethylphenol	29	29	23.5 U	23.5 U	23.6 U	4.6 J
2-methylphenol (o-Cresol)	63	63	18.8 U	18.8 U	18.9 U	19.3 U
4-methylphenol (p-Cresol)	670	670	18.8 U	18.8 U	18.9 U	19.3 U
Pentachlorophenol	360	690	93.8 U	93.8 U	94.3 U	96.5 U
Phenol	420	1,200	18.8 U	18.8 U	18.9 U	19.3 U
Miscellaneous Extractables (OC Normalized ²) by EPA 8270 SIM (mg/kg OC)						
Dibenzofuran	15	58	3.76	2.48 U	5.94 U	2.76
Hexachlorobutadiene	3.9	6.2	1.10 U	2.50 U	5.90 U	0.770 U
N-Nitrosodiphenylamine (as diphenylamine)	11	11	1.10 U	2.50 U	5.90 U	0.770 U
Miscellaneous Extractables by EPA 8270 (mg/kg)						
Dibenzofuran	540	540	15.8	4.72 U	4.75 U	17.1
Hexachlorobutadiene	11	120	4.7 U	4.7 U	4.7 U	4.8 U
N-Nitrosodiphenylamine (as diphenylamine)	28	40	4.7 U	4.7 U	4.7 U	4.8 U
Benzoic Acid	650	650	93.8 U	93.8 U	94.3 U	96.5 U
Benzyl Alcohol	57	730	18.8 U	18.8 U	18.9 U	19.3 U

Notes:

- ¹ Sample locations and summary of remedial investigation results are shown on Figure 5 through 9.
- ² SED-1 was completed by compositing sediment surface samples and cores from 2 locations (SED-1B and SED-1C).
- ³ Screening levels are referenced from Ecology's Sediment Cleanup Users Manual II (SCUM II; Ecology, 2017).
- sediment with a total organic carbon (TOC) concentration
- ⁵ Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.
- of the following LPAH compounds: acenaphthene,
- of the following HPAH compounds: benzo[a]anthracene,
- ⁸ Total benzo[fluoranthenes represents the sum of concentrations of the b, j, and k isomers.

SCO = Sediment Cleanup Objective
CSL = Cleanup Screening Level
LAET = Lowest Apparent Effects Threshold
2LAET = Second Lowest Apparent Effects Threshold
mg/L = milligram per liter
µg/L = microgram per liter
NE = not established
NA = not applicable
-- = not analyzed
mg/kg = milligram per kilogram
mg/kg OC = milligram per kilogram normalized to organic carbon
µg/kg = microgram per kilogram
U = The analyte was not detected at a concentration greater than the value identified.
J = The analyte was detected and the detected concentration is considered an estimate.
cm = centimeters

Bold font type indicates the analyte was detected at the reported concentration.
Yellow shading indicates exceedance of the SCO/LAET screening level.
Orange shading indicates exceedance of the CSL/2LAET screening level.
Blue shading indicates that the practical quantitation limit (PQL) or the organic carbon normalized value calculated from the PQL is above screening level.
Grey shading indicates that the shaded value is not compared to the screening levels because the TOC concentration of the sample is outside the specified range for application of screening levels to the shaded value.

Table 11
Remedial Investigation Sediment Analytical Results for Protection of Human Health
Quiet Cove
Anacortes, Washington

Sample Location ¹	Preliminary Screening Level ³	GEI-SED-1 ²			GEI-SED-2		GEI-SED-3		GEI-SED-4	
Sample Identification		GEI-SED-COMP-1 _ 091517	GEI-SED1-1-3 _ 091517	GEI-SED1-4-6 _ 091517	SED-2-0-2	SED-2-2-4	SED-3-0-2	SED-3-2-3.5	SED-4-0-1.5	SED-4-1.5-3
Sample Date		9/15/2017	9/15/2017	9/15/2017	07/17/18	07/17/18	07/17/18	07/17/18	07/16/18	07/16/18
Sample Interval (feet bgs)		0-10 cm	1 - 3 ft	4 - 6 ft	0-2 ft	2-4 ft	0-2 ft	2-3.5 ft	0-1.5 ft	1.5-3 ft
Field Measured Parameters										
Sheen	NE	NS	NS	NS	NS	NS	NS	NS	NS	NS
Headspace Vapors (ppm)	NE	<1	<1	<1	<1	<1	<1	<1	<1	<1
Metals by EPA 6000/7000 Series (mg/kg)										
Arsenic	11	3.45	3.62	6.83	--	--	--	--	--	--
Cadmium	0.8	0.03 UJ	0.08 UJ	0.56	--	--	--	--	--	--
Chromium	230,000	16.3	17	18.1	--	--	--	--	--	--
Copper	26,000	21.2	30.4	58.6	--	--	--	--	--	--
Lead	21	56.4	60.8	97.1	69.9	--	19.8	--	125	55.8
Silver	3,200	0.02 J	0.02 J	0.14 J	--	--	--	--	--	--
Zinc	190,000	166	68.2	98.7	--	--	--	--	--	--
Mercury	0.2	0.0212 UJ	0.0334	0.235	--	--	--	--	--	--
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)										
Gasoline-range hydrocarbons	30 ⁴	5.95 U	5.36 U	8.59 U	--	--	--	--	--	--
Diesel-range hydrocarbons	2,000	8.58	17.6	580	107	41.1	8.08	5.65 U	78	40
Motor Oil-range hydrocarbons	2,000	46.9	69.4	688	171	76.6	13.8	11.3 U	129	67.9
Volatile Organic Compounds (VOCs) by EPA 8360 (µg/kg)										
Benzene	0.05	0.00134 J	0.00117	0.00120 U	--	--	--	--	--	--
Toluene	3.78	0.00182	0.00177	0.00120 U	--	--	--	--	--	--
Ethylbenzene	1.12	0.00163 U	0.00103 U	0.00120 U	--	--	--	--	--	--
Total Xylenes	2.83	0.00326 U	0.00163	0.00240 U	--	--	--	--	--	--
1,2-Dibromoethane (EDB)	NA	0.00163 U	0.00103 U	0.00120 U	--	--	--	--	--	--
1,2-Dichloroethane (EDC)	0.02	0.00163 U	0.00103 U	0.00120 U	--	--	--	--	--	--
Methyl t-butyl ether (MTBE)	2.59	0.00163 U	0.00103 U	0.00120 U	--	--	--	--	--	--
n-Hexane	0.27	0.00163 U	0.00103 U	0.00120 U	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (LPAHs) by EPA 8270 SIM (mg/kg)										
2-Methylnaphthalene	1,600	0.00339 J	0.0141	0.093	--	--	--	--	--	--
Acenaphthene	25,000	0.00352 J	0.00623	0.15	--	--	--	--	--	--
Acenaphthylene	25,000	0.0155	0.0253	0.211	--	--	--	--	--	--
Anthracene	120,000	0.0238	0.056	0.765	--	--	--	--	--	--
Fluorene	16,000	0.0137	0.0231	0.227	--	--	--	--	--	--
Naphthalene	8,200	0.00487 J	0.018	0.354	--	--	--	--	--	--
Phenanthrene	120,000	0.192	0.214	2.16	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (HPAHs) by EPA 8270 SIM (mg/kg)										
Benzo(a)anthracene	0.600	0.0771	0.168	1.76	0.449	--	0.0368	--	0.617	0.164
Benzo(a)pyrene	0.0600	0.0802	0.147	1.45	0.515	--	0.0386	--	0.701	0.186
Benzo(g,h,i)perylene	12,000	0.0721	0.114	0.921	--	--	--	--	--	--
Benzofluoranthenes (Total)	NE	0.0974	0.207	1.17	0.815	--	0.0611	--	1.09	0.295
Chrysene	6.00	0.0919	0.194	1.72	0.48	--	0.0379	--	0.683	0.175
Dibenzo(a,h)anthracene	0.600	0.0119	0.0297	0.19	0.078	--	0.00984	--	0.101	0.0293
Fluoranthene	16,000	0.207	0.35	3.55	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	0.600	0.0529	0.0912	0.789	0.308	--	0.0195	--	0.381	0.114
Pyrene	12,000	0.225	0.362	4.1	--	--	--	--	--	--

Sample Location ¹	Preliminary Screening Level ³	GEI-SED-1 ²			GEI-SED-2		GEI-SED-3		GEI-SED-4	
Sample Identification		GEI-SED-COMP-1 _ 091517	GEI-SED1-1-3 _ 091517	GEI-SED1-4-6 _ 091517	SED-2-0-2	SED-2-2-4	SED-3-0-2	SED-3-2-3.5	SED-4-0-1.5	SED-4-1.5-3
Sample Date		9/15/2017	9/15/2017	9/15/2017	07/17/18	07/17/18	07/17/18	07/17/18	07/16/18	07/16/18
Sample Interval (feet bgs)		0-10 cm	1 - 3	4 - 6	0-2 ft	2-4 ft	0-2 ft	2-3.5 ft	0-1.5 ft	1.5-3 ft
Carcinogenic PAHs (cPAHs) by EPA 8270 SIM (mg/kg)										
Total cPAH TEQ ⁵ (ND=0)	0.0210	0.105	0.199	1.89	0.662	--	0.0501	--	0.9	0.24
Total cPAH TEQ ⁵ (ND=0.5RL)	0.0210	0.105	0.199	1.89	0.662	--	0.0501	--	0.9	0.24
Chlorinated Hydrocarbons by EPA 8270 (mg/kg)										
1,2,4-Trichlorobenzene	19.0	0.0049 U	0.0047 U	0.0050 U	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	45,000	0.0049 U	0.0047 U	0.0050 U	--	--	--	--	--	--
1,3-Dichlorobenzene (m-Dichlorobenzene)	NE	0.0049 U	0.0047 U	0.0050 U	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	100	0.0049 U	0.0029 J	0.008	--	--	--	--	--	--
Hexachlorobenzene	0.340	0.0049 U	0.0047 U	0.0050 U	--	--	--	--	--	--
Phthalates by EPA 8270 (mg/kg)										
Bis(2-Ethylhexyl) Phthalate	39.0	0.0313 J	0.0468 U	0.0497 U	--	--	--	--	--	--
Butyl benzyl Phthalate	290	0.0049 U	0.0399	0.0050 U	--	--	--	--	--	--
Dibutyl Phthalate	49,000	0.0196 U	0.0094 J	0.0199 U	--	--	--	--	--	--
Diethyl Phthalate	400,000	0.0196 U	0.0187 U	0.0199 U	--	--	--	--	--	--
Dimethyl Phthalate	NE	0.0049 U	0.0047 U	0.0050 U	--	--	--	--	--	--
Di-N-Octyl Phthalate	4,900	0.0196 U	0.0187 U	0.0199 U	--	--	--	--	--	--
Phenols by EPA 8270 (mg/kg)										
2,4-Dimethylphenol	9,900	0.0244 U	0.0234 U	0.0236 J	--	--	--	--	--	--
2-methylphenol (o-Cresol)	25,000	0.0196 U	0.0187 U	0.0158 J	--	--	--	--	--	--
4-methylphenol (p-Cresol)	49,000	0.0196 U	0.0187 U	0.187	--	--	--	--	--	--
Pentachlorophenol	0.62	0.0978 U	0.0935 U	1.11	--	--	--	--	--	--
Phenol	150,000	0.0196 U	0.0187 U	0.0426	--	--	--	--	--	--
Miscellaneous Extractables by EPA 8270 (mg/kg)										
Dibenzofuran	490	0.00851	0.0103	0.139	--	--	--	--	--	--
Hexachlorobutadiene	7.00	0.0049 U	0.0047 U	0.0050 U	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	110	0.0049 U	0.0047 U	0.0050 U	--	--	--	--	--	--
Benzoic Acid	NE	0.0978 U	0.0935 U	0.0994 U	--	--	--	--	--	--
Benzyl Alcohol	49,000,000	0.0196 U	0.0187 U	0.0199 U	--	--	--	--	--	--

Table 11 (Continued)

Remedial Investigation Sediment Analytical Results for Protection of Human Health

Quiet Cove

Anacortes, Washington

Sample Location ¹	Preliminary Screening Level ³	GEI-SED-5		GEI-SED-6		GEI-SED-7		GEI-SED-8	
Sample Identification		SED-5-0-0.5	SED-5-2-4	SED-6-0-0.5	SED-6-1-3	SED-7-0-0.5	SED-7-0-1	SED-8-0-0.5	SED-8-3.2-4.5
Sample Date		07/16/18	07/16/18	07/16/18	07/17/18	07/16/18	07/17/18	07/16/18	07/16/18
Sample Interval (feet bgs)		0-0.5 ft	2-4 ft	0-0.5 ft	1-3 ft	0-0.5 ft	0-1 ft	0-0.5 ft	3.2-4.5 ft
Field Measured Parameters									
Sheen	NE	NS	NS	NS	NS	NS	NS	NS	NS
Headspace Vapors (ppm)	NE	<1	<1	<1	<1	<1	<1	3.3	1.8
Metals by EPA 6000/7000 Series (mg/kg)									
Arsenic	11	3.73	3.30	7.16	5.55	3.05	3.20	3.72	3.57
Cadmium	0.8	0.08 J	0.12	0.07 J	0.09 J	0.06 J	0.06 J	0.04 J	0.42
Chromium	230,000	19.5	14.5	13.6	27.2	17.8	14.3	15.2	15.3
Copper	26,000	21.0	38.6	14.5	43.4	187	165	22.2	47.8
Lead	21	31.3	70.1	34.8	78.8	53.3	40.8	44.4	240
Silver	3,200	0.03 J	0.06 J	0.05 J	0.05 J	0.04 J	0.04 J	0.05 J	0.11 J
Zinc	190,000	51.2	81.8	108	75.7	112	53.8	41.6	132
Mercury	0.2	0.0219 U	0.0427	0.0238 U	0.0234 U	0.0200 U	0.0230 U	0.0244 U	0.168
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)									
Gasoline-range hydrocarbons	30 ⁴	5.26 U	6.6 U	7.66 U	4.64 U	7.44 U	5.54 U	7.07 U	5.96 U
Diesel-range hydrocarbons	2,000	18.1	24.1	10.5	6.39	5.12 U	5.11 U	10.1	135
Motor Oil-range hydrocarbons	2,000	40.6	94.6	43.2	35.1	22.2	24.2	26.7	248
Volatile Organic Compounds (VOCs) by EPA 8360 (µg/kg)									
Benzene	0.05	0.00121	0.00093 J	0.00043 J	0.00205	0.00080 J	0.00028 J	0.00113 U	0.00169
Toluene	3.78	0.00147	0.00041 J	0.00122 U	0.00162	0.00052 J	0.00023 J	0.00113 U	0.00049 J
Ethylbenzene	1.12	0.00106 U	0.00105 U	0.00122 U	0.00095 U	0.00114 U	0.00091 U	0.00113 U	0.00095 U
Total Xylenes	2.83	0.000810	0.00210 U	0.00243 U	0.000440	0.00228 U	0.00182 U	0.00225 U	0.00191 U
1,2-Dibromoethane (EDB)	NA	0.00106 U	0.00105 U	0.00122 U	0.00095 U	0.00114 U	0.00091 U	0.00113 U	0.00095 U
1,2-Dichloroethane (EDC)	0.02	0.00047 J	0.00105 U	0.00122 U	0.00095 U	0.00114 U	0.00091 U	0.00113 U	0.00054 J
Methyl t-butyl ether (MTBE)	2.59	0.00106 U	0.00105 U	0.00122 U	0.00095 U	0.00114 U	0.00091 U	0.00113 U	0.00095 U
n-Hexane	0.27	0.00106 U	0.00105 U	0.00122 U	0.00095 U	0.00114 U	0.00091 U	0.00113 U	0.00095 U
Polycyclic Aromatic Hydrocarbons (LPAHs) by EPA 8270 SIM (mg/kg)									
2-Methylnaphthalene	1,600	0.00935	0.00345 J	0.00250 J	0.00399 J	0.00464 U	0.00414 J	0.00409 J	0.0294
Acenaphthene	25,000	0.00723	0.00277 J	0.00467 U	0.00476 U	0.00464 U	0.00467 U	0.00631	0.0390
Acenaphthylene	25,000	0.0256	0.00997	0.00234 J	0.0197	0.00464 U	0.00647	0.0106	0.0595
Anthracene	120,000	0.0505	0.0267	0.00578	0.0202	0.00270 J	0.00851	0.0348	0.118
Fluorene	16,000	0.0266	0.0107	0.00467 U	0.00332 J	0.00464 U	0.00406 J	0.0129	0.0558
Naphthalene	8,200	0.0322	0.00497	0.00526	0.00335 J	0.00238 J	0.00561	0.00864	0.0742
Phenanthrene	120,000	0.182	0.0871	0.0186	0.0302	0.00622	0.0484	0.119	0.383
Polycyclic Aromatic Hydrocarbons (HPAHs) by EPA 8270 SIM (mg/kg)									
Benzo(a)anthracene	0.600	0.12	0.0455	0.0272	0.0550	0.00844	0.0348	0.0722	0.325
Benzo(a)pyrene	0.0600	0.113	0.0507	0.0257	0.0533	0.00813	0.0393	0.0869	0.338
Benzo(g,h,i)perylene	12,000	0.0783	0.0389	0.0201	0.0524	0.00786	0.0326	0.0668	0.252
Benzo(a)fluoranthene (Total)	NE	0.205	0.0727	0.0458	0.165	0.0215	0.0696	0.12	0.505
Chrysene	6.00	0.212	0.0548	0.0300	0.0952	0.0123	0.0459	0.0851	0.325
Dibenzo(a,h)anthracene	0.600	0.0272	0.0166	0.0143	0.0189	0.0121	0.0159	0.0206	0.0609
Fluoranthene	16,000	0.276	0.116	0.0485	0.114	0.0164	0.0820	0.172	0.84
Indeno(1,2,3-c,d)pyrene	0.600	0.0668	0.0348	0.0234	0.0460	0.0147	0.0308	0.0531	0.185
Pyrene	12,000	0.248	0.13	0.0539	0.118	0.0201	0.0886	0.2	0.938

Sample Location ¹	Preliminary Screening Level ³	GEI-SED-5		GEI-SED-6		GEI-SED-7		GEI-SED-8	
Sample Identification									
Sample Date		SED-5-0-0.5	SED-5-2-4	SED-6-0-0.5	SED-6-1-3	SED-7-0-0.5	SED-7-0-1	SED-8-0-0.5	SED-8-3.2-4.5
Sample Interval (feet bgs)		07/16/18	07/16/18	07/16/18	07/17/18	07/16/18	07/17/18	07/16/18	07/16/18
		0-0.5 ft	2-4 ft	0-0.5 ft	1-3 ft	0-0.5 ft	0-1 ft	0-0.5 ft	3.2-4.5 ft
Carcinogenic PAHs (cPAHs) by EPA 8270 SIM (mg/kg)									
Total cPAH TEQ ⁵ (ND=0)	0.0210	0.157	0.0682	0.0371	0.0827	0.0139	0.0549	0.114	0.449
Total cPAH TEQ ⁵ (ND=0.5RL)	0.0210	0.157	0.0682	0.0371	0.0827	0.0139	0.0549	0.114	0.449
Chlorinated Hydrocarbons by EPA 8270 (mg/kg)									
1,2,4-Trichlorobenzene	19.0	0.0047 U	0.0048 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0048 U	0.0050 U
1,2-Dichlorobenzene (o-Dichlorobenzene)	45,000	0.0047 U	0.0048 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0048 U	0.0050 U
1,3-Dichlorobenzene (m-Dichlorobenzene)	NE	0.0047 U	0.0048 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0048 U	0.0050 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	100	0.0047 U	0.0048 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0048 U	0.0040 J
Hexachlorobenzene	0.340	0.0047 U	0.0048 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0048 U	0.0050 U
Phthalates by EPA 8270 (mg/kg)									
Bis(2-Ethylhexyl) Phthalate	39.0	0.0469 U	0.0476 U	0.0466 U	0.0475	0.0466 U	0.0468 U	0.0479 U	0.0499 U
Butyl benzyl Phthalate	290	0.0047 U	0.0048 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0048 U	0.0050 U
Dibutyl Phthalate	49,000	0.0187 U	0.0190 U	0.0186 U	0.0189 U	0.0186 U	0.0187 U	0.0192 U	0.0199 U
Diethyl Phthalate	400,000	0.0122 J	0.0127 J	0.0102 J	0.0205	0.0139 J	0.0180 J	0.0118 J	0.0188 J
Dimethyl Phthalate	NE	0.0047 U	0.0048 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0048 U	0.0050 U
Di-N-Octyl Phthalate	4,900	0.0187 U	0.0190 U	0.0186 U	0.0189 U	0.0186 U	0.0187 U	0.0192 U	0.0199 U
Phenols by EPA 8270 (mg/kg)									
2,4-Dimethylphenol	9,900	0.0234 U	0.0238 U	0.0233 U	0.0237 U	0.0233 U	0.0234 U	0.0240 U	0.0031 J
2-methylphenol (o-Cresol)	25,000	0.0187 U	0.0190 U	0.0186 U	0.0189 U	0.0186 U	0.0187 U	0.0192 U	0.0199 U
4-methylphenol (p-Cresol)	49,000	0.0187 U	0.0190 U	0.0186 U	0.0189 U	0.0186 U	0.0187 U	0.0192 U	0.0479
Pentachlorophenol	0.62	0.0937 U	0.0952 U	0.0932 U	0.0946 U	0.0932 U	0.0935 U	0.0958 U	0.0574 J
Phenol	150,000	0.0187 U	0.0190 U	0.0186 U	0.0189 U	0.0186 U	0.0187 U	0.0192 U	0.0199 U
Miscellaneous Extractables by EPA 8270 (mg/kg)									
Dibenzofuran	490	0.0113	0.00565	0.00467 U	0.00476 U	0.00464 U	0.00467 U	0.00590	0.0314
Hexachlorobutadiene	7.00	0.0047 U	0.0048 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0048 U	0.0050 U
N-Nitrosodiphenylamine (as diphenylamine)	110	0.0047 U	0.0048 U	0.0047 U	0.0047 U	0.0047 U	0.0047 U	0.0048 U	0.0193
Benzoic Acid	NE	0.0937 U	0.0952 U	0.0282 J	0.0946 U	0.0932 U	0.0210 J	0.0958 U	0.0396 J
Benzyl Alcohol	49,000,000	0.0187 U	0.0190 U	0.0186 U	0.0189 U	0.0186 U	0.0187 U	0.0192 U	0.0199 U

Table 11 (Continued)
Remedial Investigation Sediment Analytical Results for Protection of Human Health
Quiet Cove
Anacortes, Washington

Sample Location ¹	Preliminary Screening Level ³	GEI-SED-9		GEI-SED-10	
Sample Identification		SED-9-0-0.5	SED-9-1.7-2.3	SED-10-0-0.5	SED-10-2-4
Sample Date		07/16/18	07/17/18	07/18/18	07/17/18
Sample Interval (feet bgs)		0-0.5 ft	1.7-2.3 ft	0-0.5 ft	2-4 ft
Field Measured Parameters					
Sheen	NE	NS	NS	NS	NS
Headspace Vapors (ppm)	NE	<1	2.2	<1	<1
Metals by EPA 6000/7000 Series (mg/kg)					
Arsenic	11	3.93	0.75	2.71	4.01
Cadmium	0.8	0.06 J	0.009 J	0.05 J	0.37
Chromium	230,000	15.4	15.9	21.6	15.2
Copper	26,000	47.9	4.49	16.0	17.1
Lead	21	101	0.87	24.5	23.5
Silver	3,200	0.05 J	0.03 J	0.04 J	0.07 J
Zinc	190,000	68.4	20.0	47.7	54.3
Mercury	0.2	0.0353	0.0253 U	0.0291 U	0.0844
Petroleum Hydrocarbons by NWTPH-G/Dx (mg/kg)					
Gasoline-range hydrocarbons	30 ⁴	6.6 U	6.28 U	6.32 U	7.16 U
Diesel-range hydrocarbons	2,000	20.7	5.54 U	5.69 U	29.0
Motor Oil-range hydrocarbons	2,000	51.6	11.1 U	28.2	52.7
Volatile Organic Compounds (VOCs) by EPA 8360 (µg/kg)					
Benzene	0.05	0.00065 J	0.00073 J	0.00109 U	0.00042 J
Toluene	3.78	0.00053 J	0.00034 J	0.00109 U	0.00046 J
Ethylbenzene	1.12	0.00104 U	0.00105 U	0.00109 U	0.00123 U
Total Xylenes	2.83	0.00208 U	0.00211 U	0.00218 U	0.00247 U
1,2-Dibromoethane (EDB)	NA	0.00104 U	0.00105 U	0.00109 U	0.00123 U
1,2-Dichloroethane (EDC)	0.02	0.00104 U	0.00105 U	0.00109 U	0.00123 U
Methyl t-butyl ether (MTBE)	2.59	0.00104 U	0.00105 U	0.00109 U	0.00123 U
n-Hexane	0.27	0.00104 U	0.00105 U	0.00109 U	0.00123 U
Polycyclic Aromatic Hydrocarbons (LPAHs) by EPA 8270 SIM (mg/kg)					
2-Methylnaphthalene	1,600	0.0114	0.00472 U	0.00475 U	0.0148
Acenaphthene	25,000	0.0162	0.00472 U	0.00475 U	0.0149
Acenaphthylene	25,000	0.0364	0.00472 U	0.00292 J	0.0351
Anthracene	120,000	0.12	0.00472 U	0.00475 U	0.0647
Fluorene	16,000	0.0411	0.00472 U	0.00475 U	0.0302
Naphthalene	8,200	0.0285	0.00472 U	0.00475 U	0.0412
Phenanthrene	120,000	0.452	0.00472 U	0.00798	0.21
Polycyclic Aromatic Hydrocarbons (HPAHs) by EPA 8270 SIM (mg/kg)					
Benzo(a)anthracene	0.600	0.218	0.00472 U	0.00704	0.122
Benzo(a)pyrene	0.0600	0.243	0.00472 U	0.00908	0.144
Benzo(g,h,i)perylene	12,000	0.173	0.00472 U	0.00737	0.112
Benzo(a)fluoranthene (Total)	NE	0.393	0.00944 U	0.0179	0.206
Chrysene	6.00	0.296	0.00472 U	0.00896	0.135
Dibenzo(a,h)anthracene	0.600	0.0387	0.00472 U	0.0116	0.0476
Fluoranthene	16,000	0.871	0.00472 U	0.0126	0.291
Indeno(1,2,3-c,d)pyrene	0.600	0.13	0.00472 U	0.0140	0.0971
Pyrene	12,000	0.771	0.00472 U	0.0141	0.392

Sample Location ¹	Preliminary Screening Level ³	GEI-SED-9		GEI-SED-10	
Sample Identification		SED-9-0-0.5	SED-9-1.7-2.3	SED-10-0-0.5	SED-10-2-4
Sample Date		07/16/18	07/17/18	07/18/18	07/17/18
Sample Interval (feet bgs)		0-0.5 ft	1.7-2.3 ft	0-0.5 ft	2-4 ft
Carcinogenic PAHs (cPAHs) by EPA 8270 SIM (mg/kg)					
Total cPAH TEQ ⁵ (ND=0)	0.0210	0.324	0 U	0.0142	0.193
Total cPAH TEQ ⁵ (ND=0.5RL)	0.0210	0.324	0.00360 U	0.0142	0.193
Chlorinated Hydrocarbons by EPA 8270 (mg/kg)					
1,2,4-Trichlorobenzene	19.0	0.0047 U	0.0047 U	0.0047 U	0.0048 U
1,2-Dichlorobenzene (o-Dichlorobenzene)	45,000	0.0047 U	0.0047 U	0.0047 U	0.0048 U
1,3-Dichlorobenzene (m-Dichlorobenzene)	NE	0.0047 U	0.0047 U	0.0047 U	0.0048 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	100	0.0047 U	0.0047 U	0.0047 U	0.0048 U
Hexachlorobenzene	0.340	0.0047 U	0.0047 U	0.0047 U	0.0048 U
Phthalates by EPA 8270 (mg/kg)					
Bis(2-Ethylhexyl) Phthalate	39.0	0.0791	0.0469 U	0.0472 U	0.0482 U
Butyl benzyl Phthalate	290	0.0047 U	0.0047 U	0.0047 U	0.0060
Dibutyl Phthalate	49,000	0.0188 U	0.0188 U	0.0189 U	0.0193 U
Diethyl Phthalate	400,000	0.0136 J	0.0181 J	0.0143 J	0.0158 J
Dimethyl Phthalate	NE	0.0075	0.0047 U	0.0047 U	0.0048 U
Di-N-Octyl Phthalate	4,900	0.0188 U	0.0188 U	0.0189 U	0.0193 U
Phenols by EPA 8270 (mg/kg)					
2,4-Dimethylphenol	9,900	0.0235 U	0.0235 U	0.0236 U	0.0046 J
2-methylphenol (o-Cresol)	25,000	0.0188 U	0.0188 U	0.0189 U	0.0193 U
4-methylphenol (p-Cresol)	49,000	0.0188 U	0.0188 U	0.0189 U	0.0193 U
Pentachlorophenol	0.62	0.0938 U	0.0938 U	0.0943 U	0.0965 U
Phenol	150,000	0.0188 U	0.0188 U	0.0189 U	0.0193 U
Miscellaneous Extractables by EPA 8270 (mg/kg)					
Dibenzofuran	490	0.0158	0.00472 U	0.00475 U	0.0171
Hexachlorobutadiene	7.00	0.0047 U	0.0047 U	0.0047 U	0.0048 U
N-Nitrosodiphenylamine (as diphenylamine)	110	0.0047 U	0.0047 U	0.0047 U	0.0048 U
Benzoic Acid	NE	0.0938 U	0.0938 U	0.0943 U	0.0965 U
Benzyl Alcohol	49,000,000	0.0188 U	0.0188 U	0.0189 U	0.0193 U

Notes:

- ¹ Sample locations and summary of remedial investigation results are shown on Figure 3 through 8.
- ² SED-1 was completed by compositing sediment surface samples and cores from 2 locations (SED-1B and SED-1C).
- ³ Screening levels are based on the exposure pathways specific to intertidal sediment (i.e., beach play, clamming and net fishing) consistent with the RI/FS Work Plan.
- ⁴ Value for gasoline-range petroleum hydrocarbons if benzene is present. If benzene is not present, screening level is 100 mg/kg.
- ⁵ Total cPAH Toxic Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) values referenced from MTCA Table 708.2 (WAC 173-340-900).

ppm = parts per million

mg/kg = milligrams per kilogram

-- = not analyzed

NE = Not Established

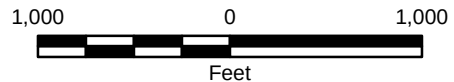
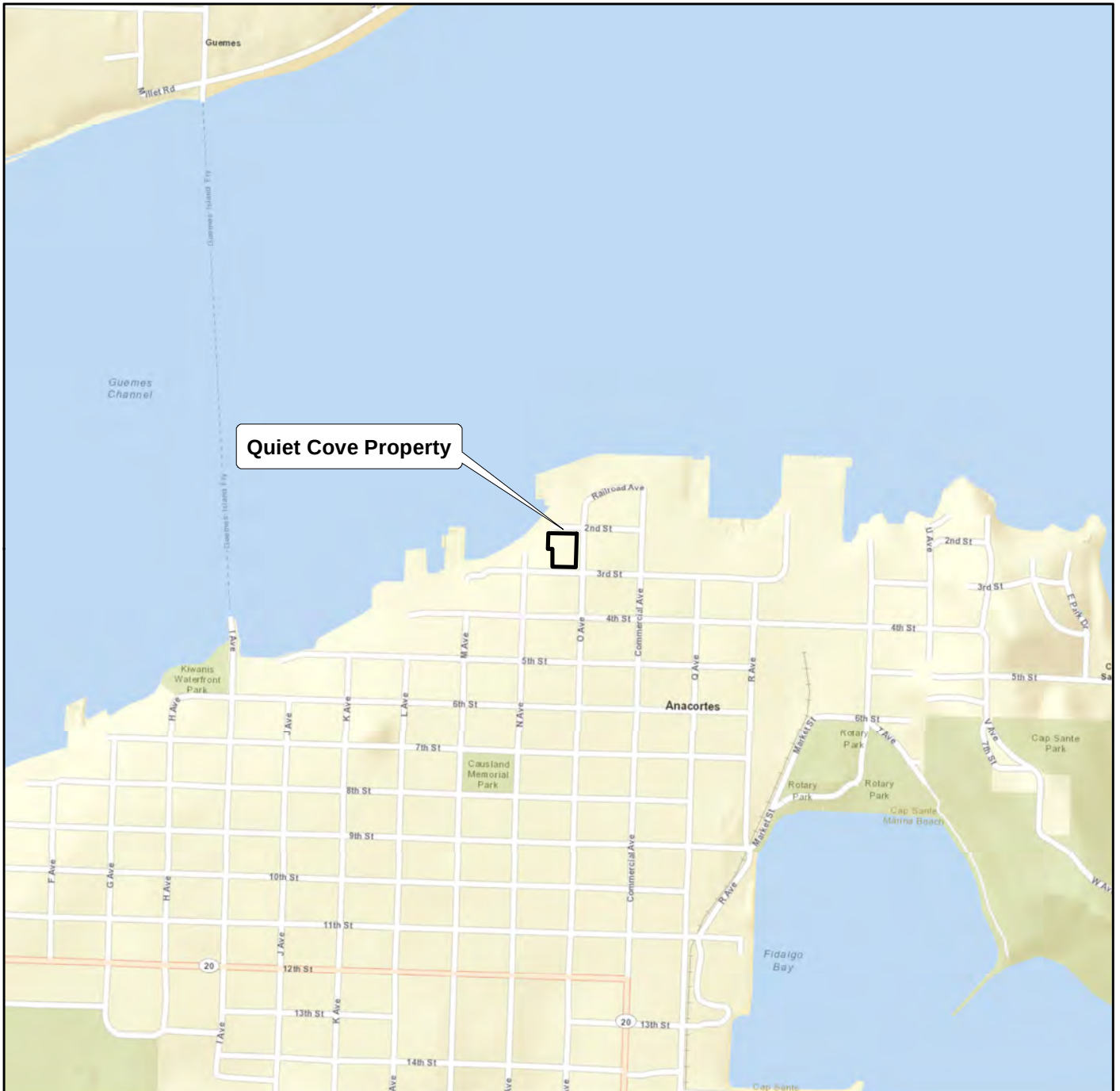
ND = Not Detected

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

Yellow shading indicates that the identified concentration is greater than the preliminary screening level.

Bold font type indicates the analyte was detected at the reported concentration.



Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
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Data Sources: ESRI Data & Maps, Street Data 2013.

Transverse Mercator, Zone 10 N North, North American Datum 1983
North arrow oriented to grid north

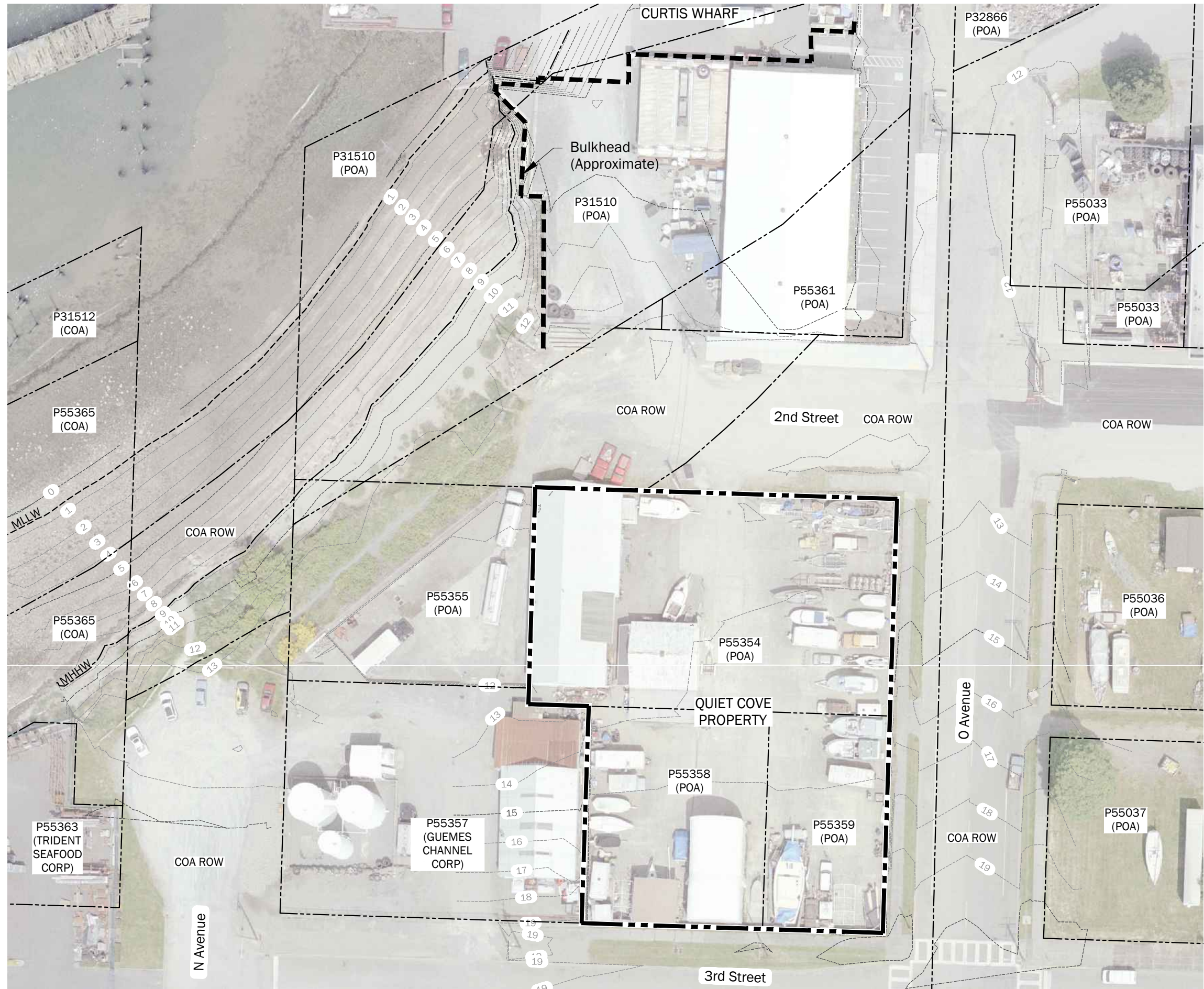
Vicinity Map

Quiet Cove Property
Anacortes, Washington



Figure 1

P:\5147024\CAD\07\RI Data Report\514702407_F02_Site Plan.dwg TAB:F02 Date Exported: 05/13/19 - 15:41 by hmara



Legend

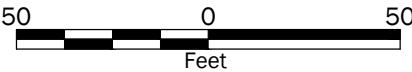
- Quiet Cove Property Boundary
- - - Skagit County Parcel Boundary
- - - 10 - - - Contour (Feet, NAVD 88)
- - - Mean Lower Low Water (MLLW) Line (0.66 Feet NAVD 88)
- - - Mean Higher High Water (MHHW) Line (8.86 Feet NAVD 88)
- P55365 (COA) Parcel Number (Owner)
- POA = Port of Anacortes
- COA = City of Anacortes
- ROW = Right-of-Way

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Base survey by Sound Development Group on 10-11-2017

Projection: NAD83 WA State Planes, N Zone, US Foot



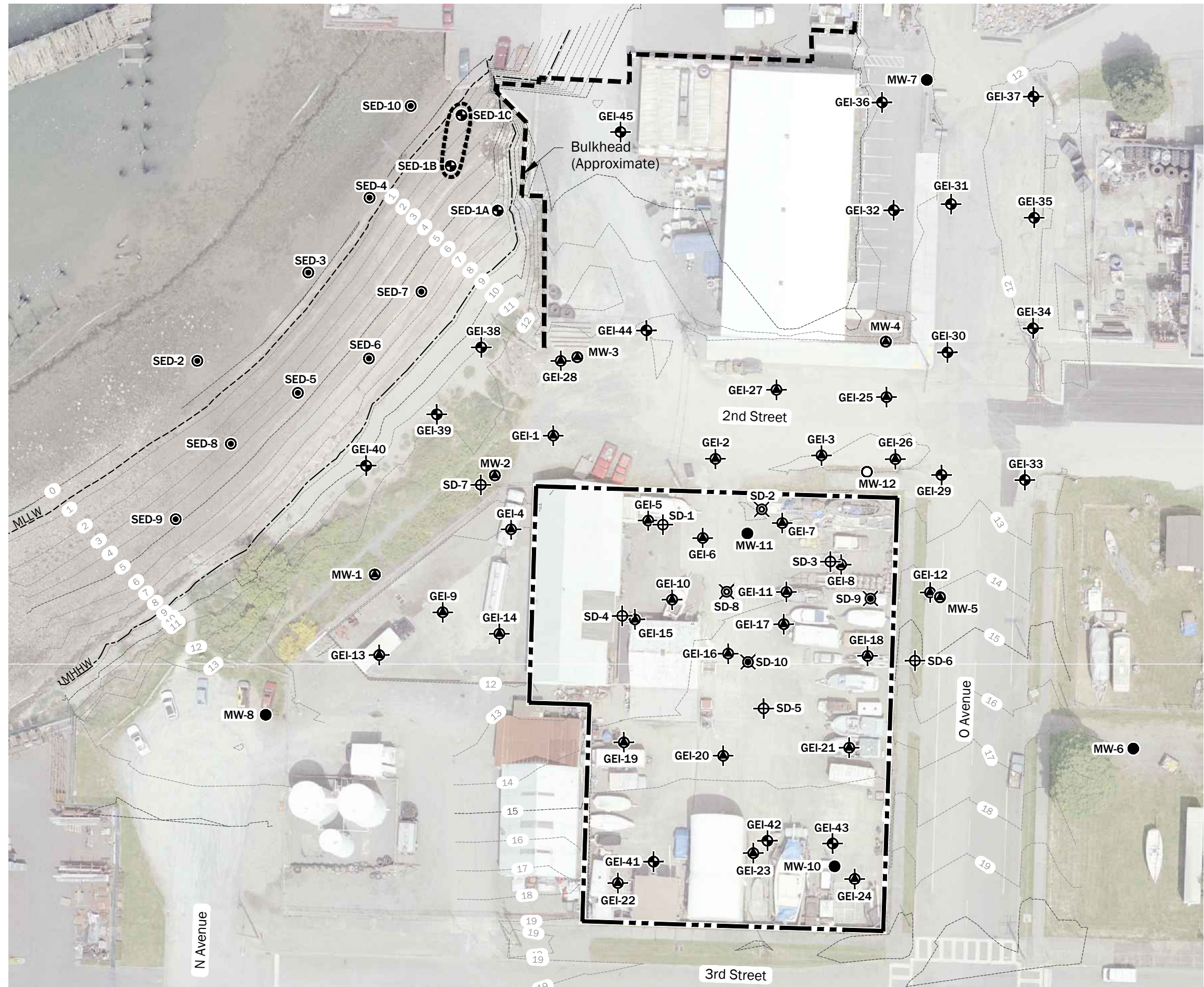
Current Property Layout

Quiet Cove Property
Anacortes, Washington



Figure 2

P:\5147024\CAD\07\RI Data Report\514702407_F03_Site Plan and Sampling Locations.dwg TAB:F03 Date Exported: 05/13/19 - 15:41 by hmar



Legend

--- Quiet Cove Property Boundary

-----10----- Contour (Feet, NAVD 88)

----- Mean Lower Low Water (MLLW) Line (0.66 Feet NAVD 88)

----- Mean Higher High Water (MHHW) Line (8.86 Feet NAVD 88)

Supplemental RI Sample Locations

SD-1 Supplemental RI Soil Boring Location, 2018

SD-2 Supplemental RI Soil Boring Location and Temporary Well Screen, 2018

SD-9 Supplemental RI Shallow Soil Boring Location, 2018

MW-12 Supplemental RI Monitoring Well, 2018

RI Sample Locations

GEI-31 RI Soil Boring Location, 2017

SED-1A RI Tier 1 Sediment Sample, September 2017

SED-2 RI Tier 2 Sediment Sample, July 2018

MW-6 RI Monitoring Well, 2017

Composite Sediment Sample Grab Area (SED-1)

Focused Site Investigation

GEI-1 Focused Site Investigation Soil Boring Location, 2014

MW-1 Focused Site Investigation Monitoring Well, 2014

Notes:

1. The locations of all features shown are approximate.

2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Base survey by Sound Development Group on 10-11-2017

Projection: NAD83 WA State Planes, N Zone, US Foot

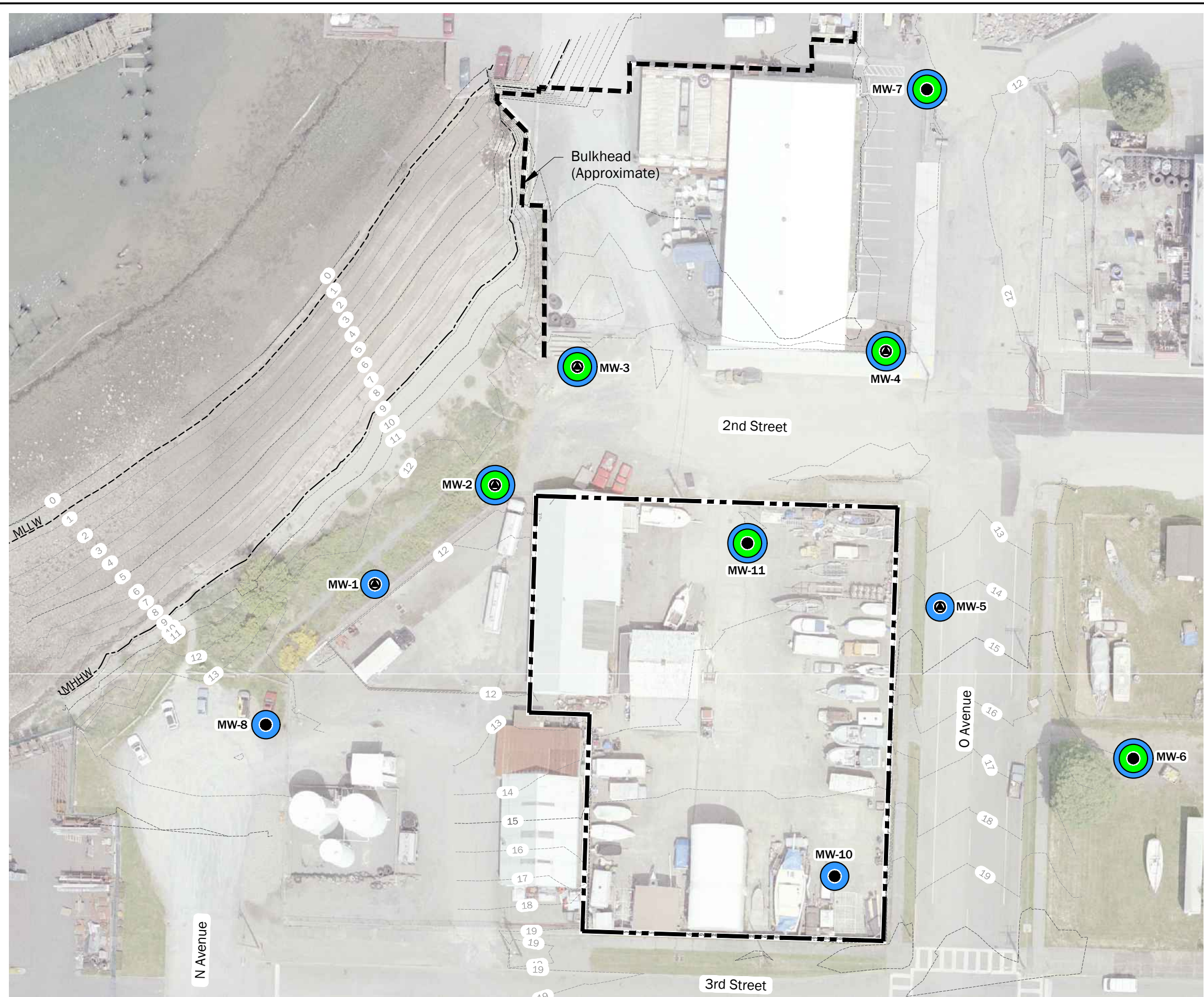
Site Plan and Sampling Locations

Quiet Cove Property
Anacortes, Washington

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Figure 3

P:\5147024\CAD\07\RI Data Report\514702407_F04_Hydrogeologic Investigation Locations.dwg TAB:FO4 Date Exported: 05/13/19 - 15:41 by hmara



Legend

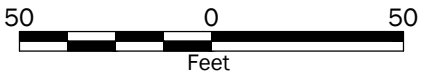
- Quiet Cove Property Boundary
- 10----- Contour (Feet, NAVD 88)
- MW-6 ● RI Monitoring Well
- MW-1 ● Focused Site Investigation Monitoring Well
- Slug Test Location
- 72-Hour Tidal Study Location

Notes:

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Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Base survey by Sound Development Group on 10-11-2017

Projection: NAD83 WA State Planes, N Zone, US Foot



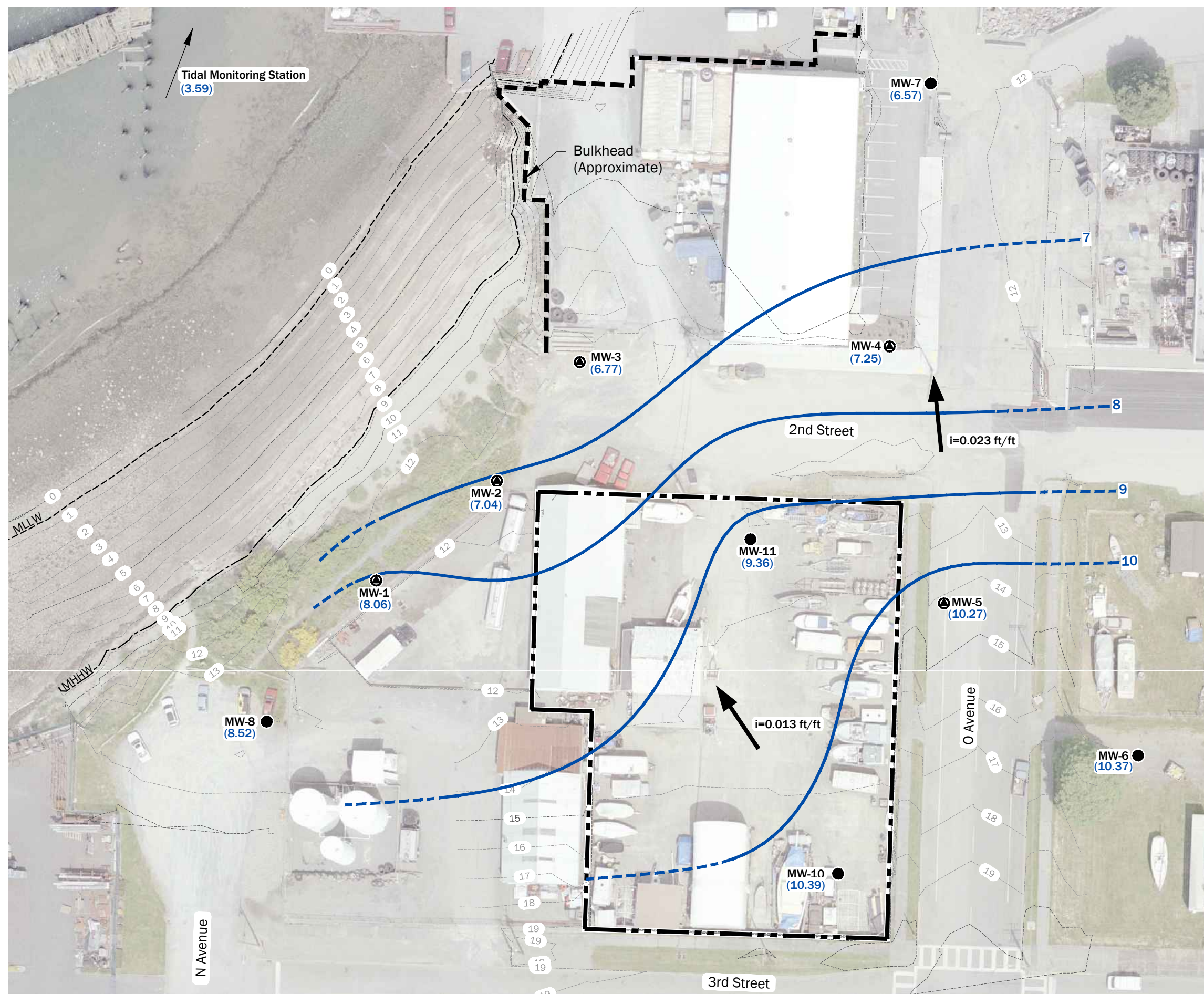
Hydrogeologic Investigation Locations

Quiet Cove Property
Anacortes, Washington



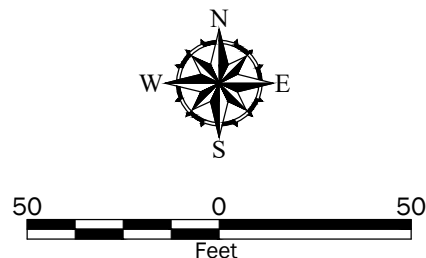
Figure 4

P:\5147024\CAD\07\RI Data Report\514702407_F05_Mean GW and Tidal Elevations.dwg TAB:F05 Date Exported: 05/13/19 15:41 by hmara



- Legend**
- Quiet Cove Property Boundary
 - 10----- Contour (Feet, NAVD 88)
 - MW-6 ● RI Monitoring Well
 - MW-1 ● Focused Site Investigation Monitoring Well
 - (10.39) Mean Groundwater Elevation (Feet, NAVD 88), 72-Hour Tidal Study
 - Groundwater Elevation Contour (Feet, NAVD 88), Mean Elevations 72-Hour Tidal Study. Dashed Where Inferred.
 - Inferred groundwater flow direction and groundwater gradient in feet per foot calculated between monitoring wells MW-10 and MW-2, and between monitoring wells MW-5 and MW-4

- Notes:**
- 72-hour tidal study conducted between 12:30 November 6 and 12:30 November 9, 2017.
 - The locations of all features shown are approximate.
 - This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
- Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Base survey by Sound Development Group on 10-11-2017
- Projection: NAD83 WA State Planes, N Zone, US Foot



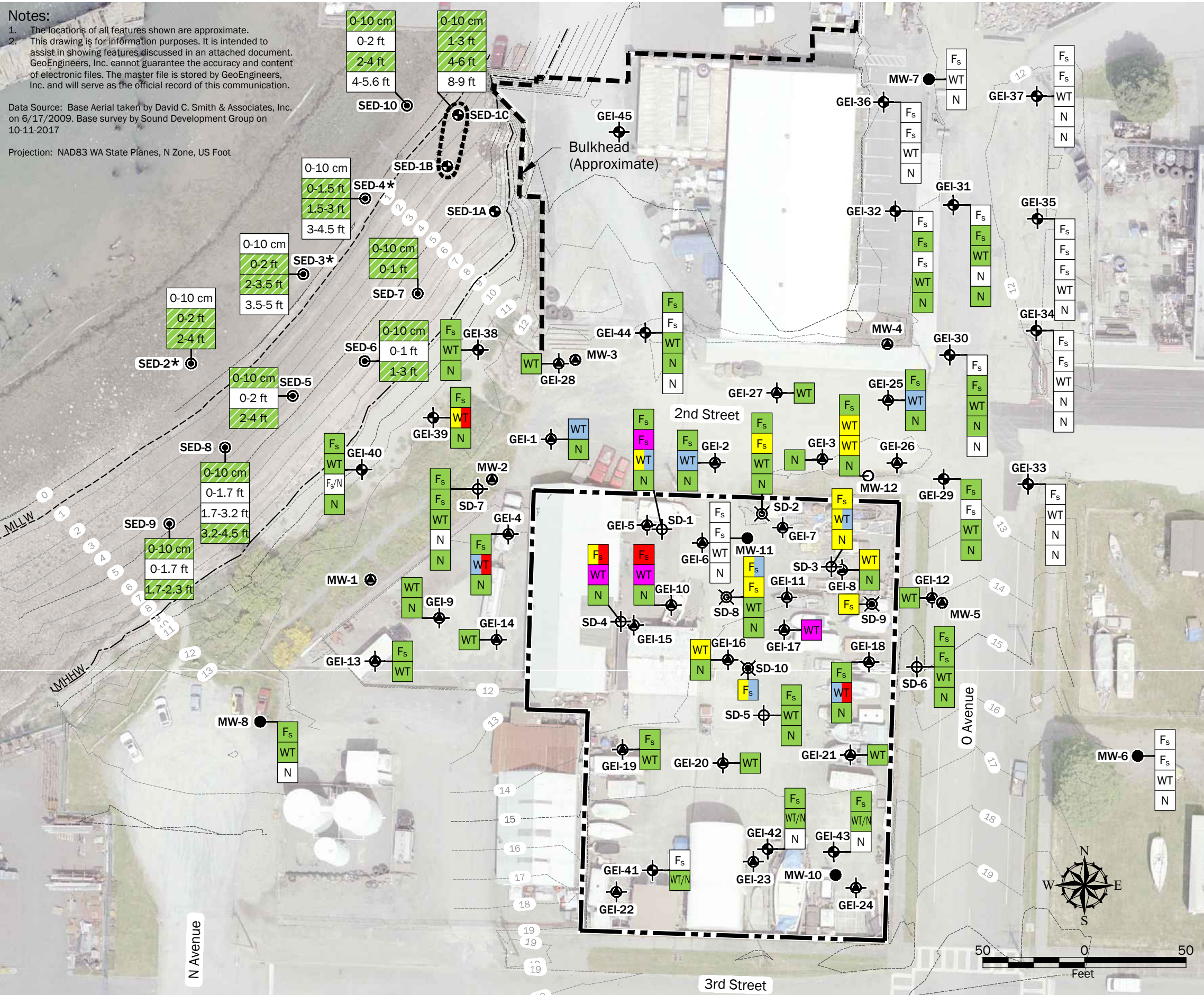
Mean Groundwater and Tidal Elevations, 72-Hour Tidal Study	
Quiet Cove Property Anacortes, Washington	
GEOENGINEERS	Figure 5

Notes:

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Projection: NAD83 WA State Planes, N Zone, US Foot



Legend

- Quiet Cove Property Boundary
- 10 --- Contour (Feet, NAVD 88)
- SD-1 Supplemental RI Soil Boring Location
- SD-2 Supplemental RI Soil Boring Location and Temporary Well Screen
- SD-9 Supplemental RI Shallow Soil Boring Location
- MW-12 Supplemental RI Monitoring Well
- GEI-31 RI Soil Boring Location
- SED-1A RI Tier 1 Sediment Sample
- SED-2 RI Tier 2 Sediment Sample
- MW-6 RI Monitoring Well
- GEI-1 Focused Site Investigation Soil Boring Location
- MW-1 Focused Site Investigation Monitoring Well
- Composite Sediment Sample Grab Area (SED-1)

Soil Sample Result

Exceedance of Preliminary Screening Level for:

- Gasoline-Range TPH
- Diesel-Range TPH
- Heavy-Oil-Range TPH
- Gas, Diesel and Heavy-Oil TPH
- Gas+Diesel TPH
- Gas+Heavy-Oil TPH
- Diesel+Heavy Oil TPH
- No Exceedance for TPH
- Sample Not Analyzed, Archived
- * Sample Only Analyzed for TPH-D

Soil Site Stratigraphy

- F_s Surface Fill
- WT Water Table
- N Native

Sediment Sample Results

- 0-10 cm
- 1-3 ft
- 4-6 ft
- 8-9 ft
- SED-1 Sample Interval Depth (bml)
- No Exceedance
- Human Health Exceedance
- Benthic Exceedance
- Sample Not Analyzed, Archived

Soil and Sediment Analytical Results for Total Petroleum Hydrocarbon

Quiet Cove Property
Anacortes, Washington



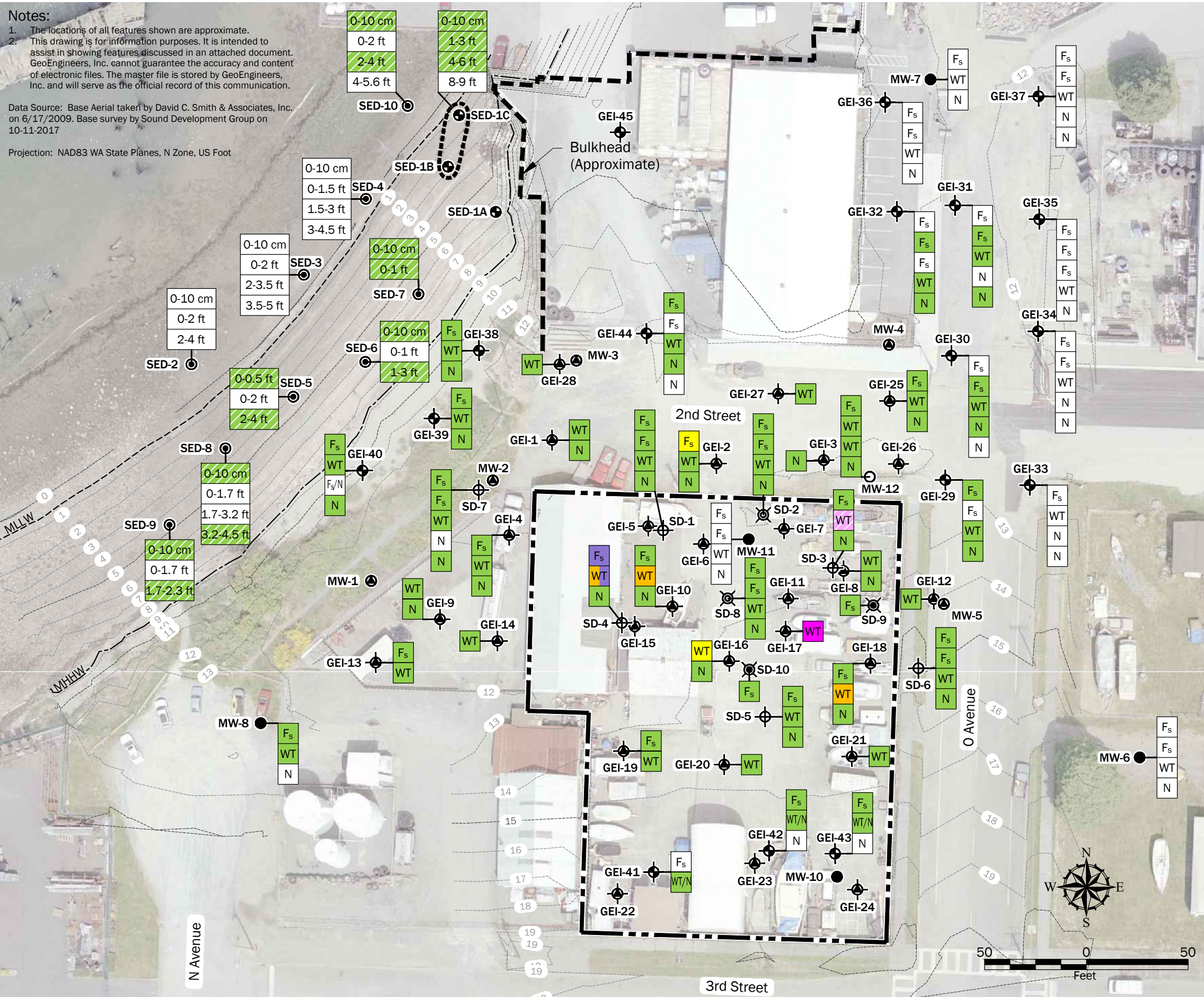
Figure 6

Notes:

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Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Base survey by Sound Development Group on 10-11-2017

Projection: NAD83 WA State Planes, N Zone, US Foot



Legend

- Quiet Cove Property Boundary
- 10 --- Contour (Feet, NAVD 88)
- SD-1 Supplemental RI Soil Boring Location
- SD-2 Supplemental RI Soil Boring Location and Temporary Well Screen
- SD-9 Supplemental RI Shallow Soil Boring Location
- MW-12 Supplemental RI Monitoring Well
- GEI-31 RI Soil Boring Location
- SED-1A RI Tier 1 Sediment Sample
- SED-2 RI Tier 2 Sediment Sample
- MW-6 RI Monitoring Well
- GEI-1 Focused Site Investigation Soil Boring Location
- MW-1 Focused Site Investigation Monitoring Well
- Composite Sediment Sample Grab Area (SED-1)

Soil Sample Result

Exceedance of Preliminary Screening Level for:

- Benzene
- Total Xylenes
- All BETX and n-Hexane
- No Exceedance
- Sample Not Analyzed, Archived
- Toulene
- Benzene, Toulene, Total Xylenes

Soil Site Stratigraphy

- F_s Surface Fill
- N Native
- WT Water Table

Sediment Sample Results

- 0-10 cm
- 1-3 ft
- 4-6 ft
- 8-9 ft
- SED-1 Sample Interval Depth (bml)
- No Exceedance
- Human Health Exceedance
- Benthic Exceedance
- Sample Not Analyzed, Archived

Soil and Sediment Analytical Results for Volatile Organic Compounds

Quiet Cove Property
Anacortes, Washington



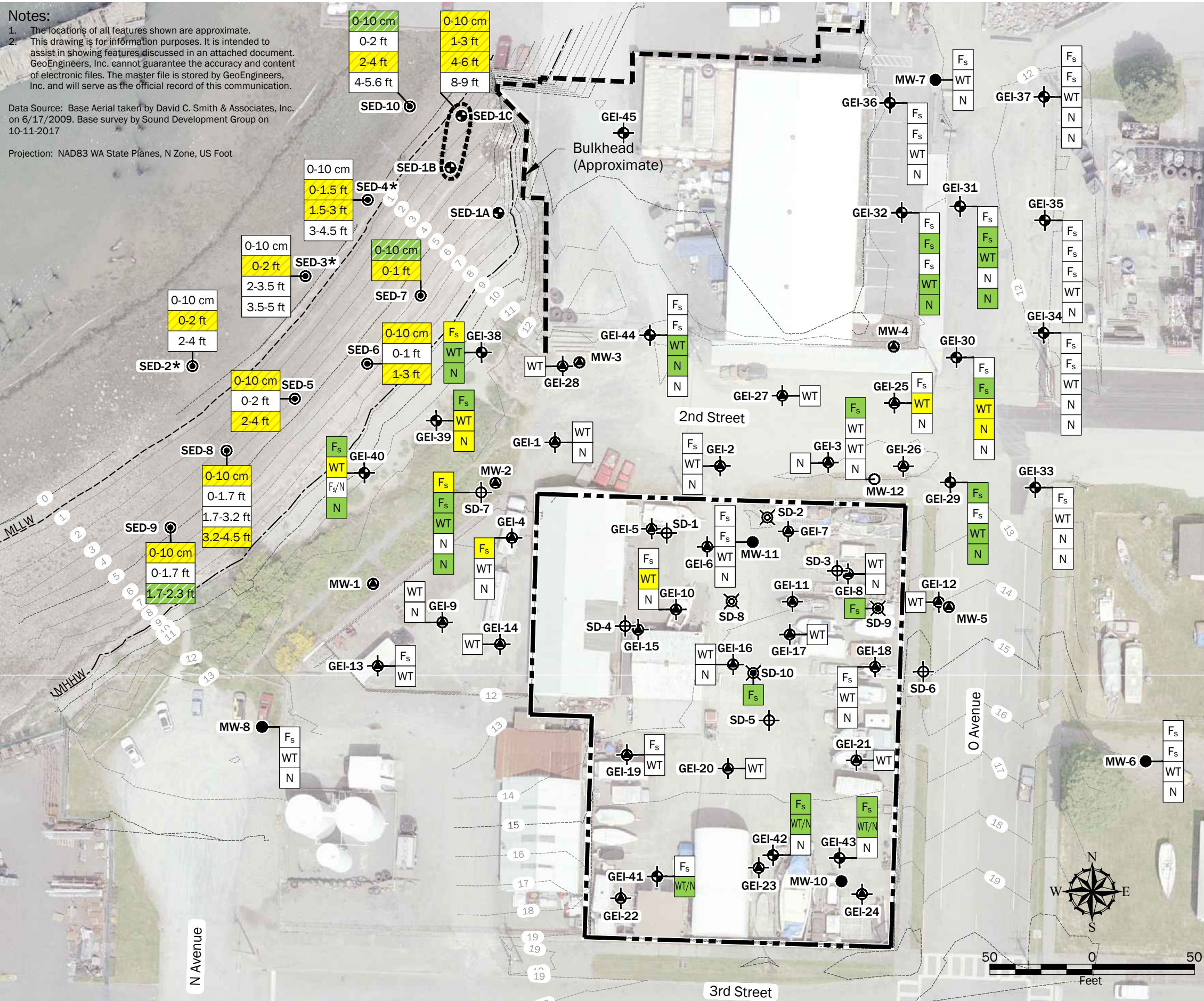
Figure 7

Notes:

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Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Base survey by Sound Development Group on 10-11-2017

Projection: NAD83 WA State Planes, N Zone, US Foot



Legend

- Quiet Cove Property Boundary
- 10 --- Contour (Feet, NAVD 88)
- SD-1 Supplemental RI Soil Boring Location
- SD-2 Supplemental RI Soil Boring Location and Temporary Well Screen
- SD-9 Supplemental RI Shallow Soil Boring Location
- MW-12 Supplemental RI Monitoring Well
- GEI-31 RI Soil Boring Location
- SED-1A RI Tier 1 Sediment Sample
- SED-2 RI Tier 2 Sediment Sample
- MW-6 RI Monitoring Well
- GEI-1 Focused Site Investigation Soil Boring Location
- MW-1 Focused Site Investigation Monitoring Well
- Composite Sediment Sample Grab Area (SED-1)

Soil Sample Result

Exceedance of Preliminary Screening Level for:

- cPAH TEQ
- No Exceedance
- Sample Not Analyzed, Archived
- * Sample Only Analyzed for cPAHs

Soil Site Stratigraphy

- F_s Surface Fill
- WT Water Table
- N Native

Sediment Sample Results

- 0-10 cm
- 1-3 ft
- 4-6 ft
- 8-9 ft
- SED-1 Sample Interval Depth (bml)
- No Exceedance
- Human Health Exceedance
- Benthic Exceedance
- Sample Not Analyzed, Archived

Soil and Sediment Analytical Results for cPAH TEQ

Quiet Cove Property
Anacortes, Washington



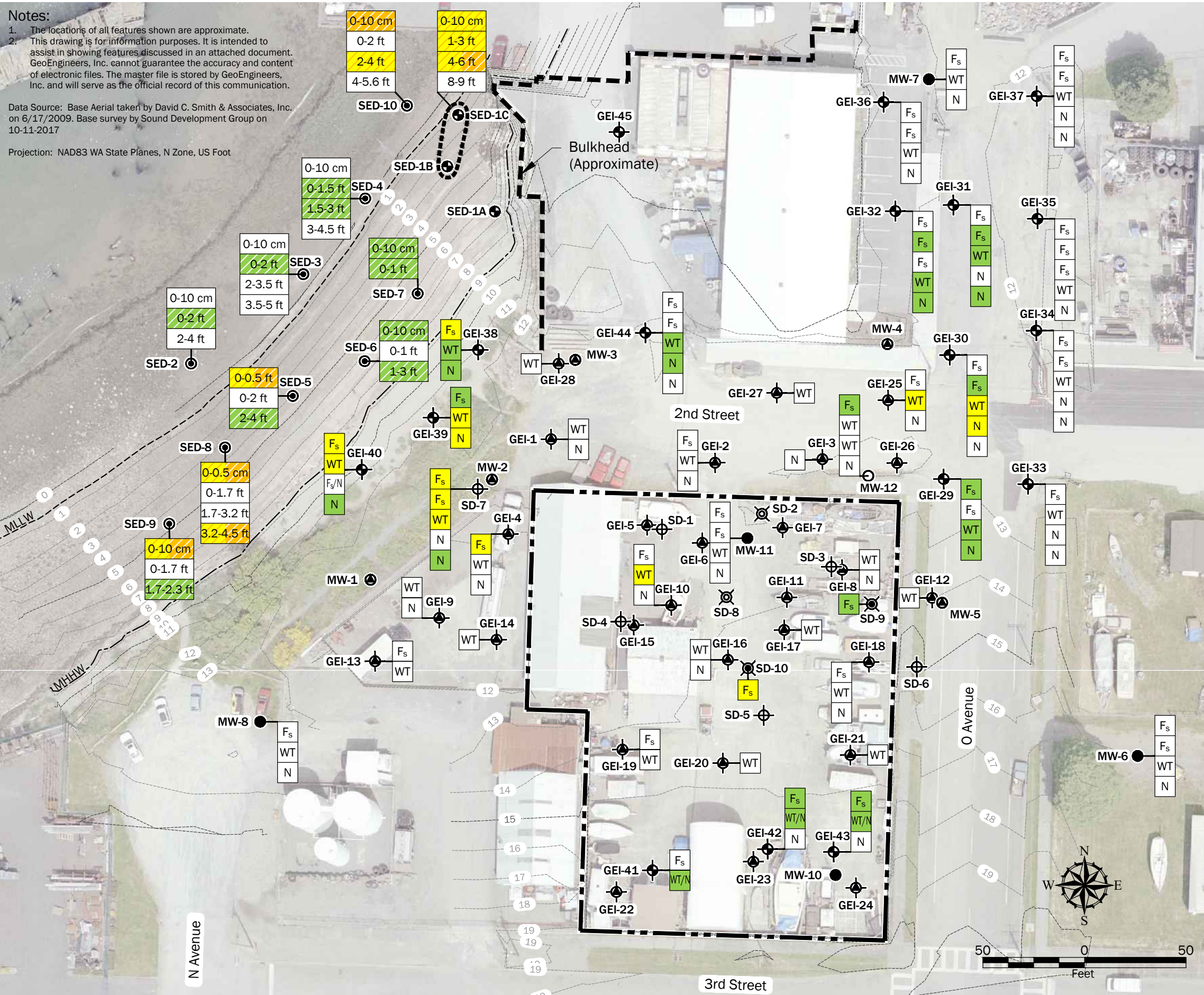
Figure 8

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Projection: NAD83 WA State Planes, N Zone, US Foot



Legend

- Quiet Cove Property Boundary
- 10----- Contour (Feet, NAVD 88)
- SD-1 Supplemental RI Soil Boring Location
- SD-2 Supplemental RI Soil Boring Location and Temporary Well Screen
- SD-9 Supplemental RI Shallow Soil Boring Location
- MW-12 Supplemental RI Monitoring Well
- GEI-31 RI Soil Boring Location
- SED-1A RI Tier 1 Sediment Sample
- SED-2 RI Tier 2 Sediment Sample
- MW-6 RI Monitoring Well
- GEI-1 Focused Site Investigation Soil Boring Location
- MW-1 Focused Site Investigation Monitoring Well
- Composite Sediment Sample Grab Area (SED-1)

Soil Sample Result

Exceedance of Preliminary Screening Level for:

- One or More Individual PAH Detections Greater than Soil Screening Level
- No Detections Above Soil Screening Levels
- Sample Not Analyzed, Archived

Soil Site Stratigraphy

- F_s Surface Fill WT Water Table
- N Native

Sediment Sample Results

- 0-10 cm
- 1-3 ft
- 4-6 ft
- 8-9 ft
- SED-1 Sample Interval Depth (bml)
- No Exceedance
- Human Health Exceedance
- Benthic Exceedance
- Sample Not Analyzed, Archived

Note: Sediment samples exceedance for one or more PAH compound.

PAH = Polycyclic Aromatic Hydrocarbons

Soil and Sediment Analytical Results for PAHs

Quiet Cove Property
Anacortes, Washington



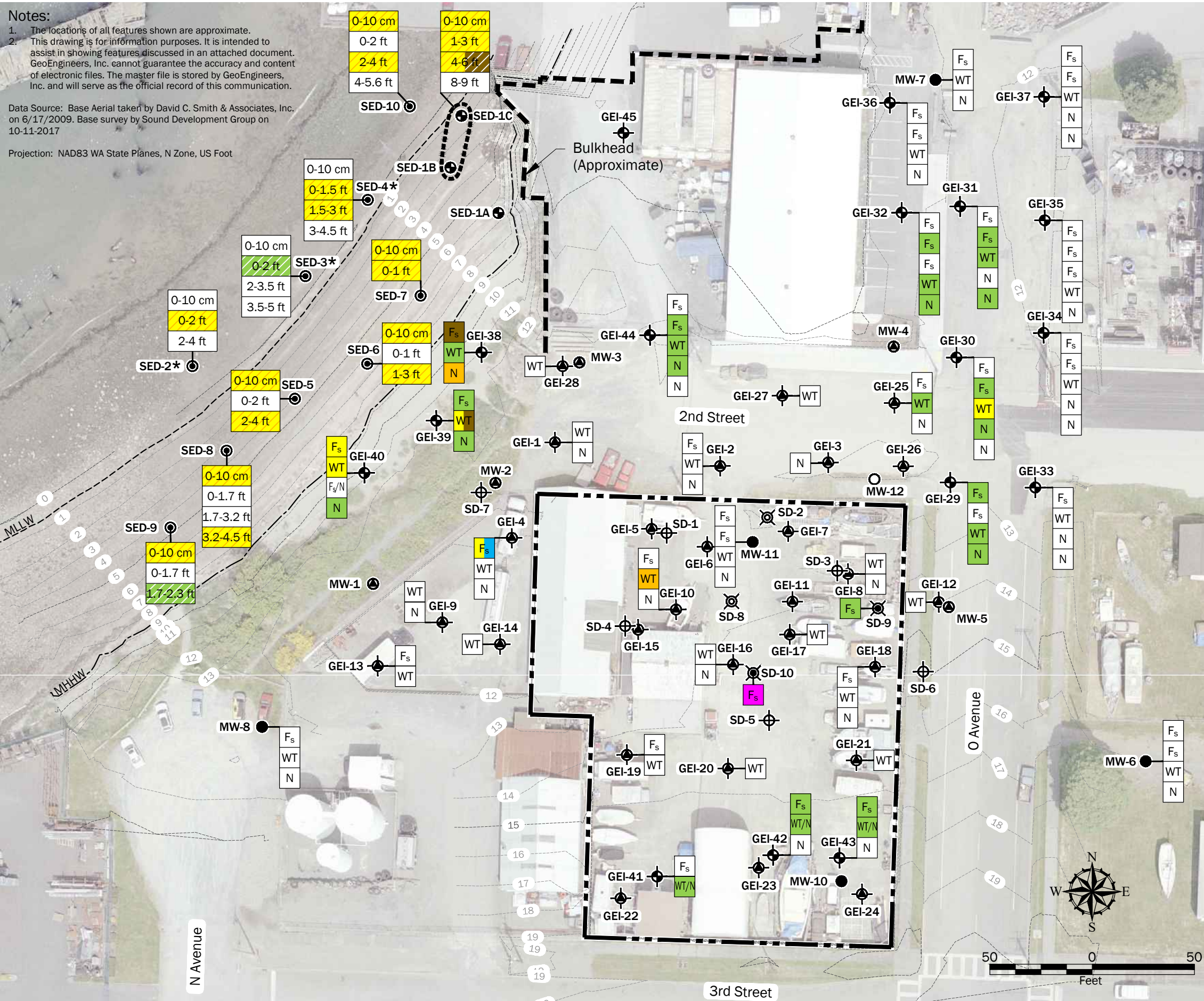
Figure 9

Notes:

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Projection: NAD83 WA State Planes, N Zone, US Foot



Legend

- Quiet Cove Property Boundary
- 10 --- Contour (Feet, NAVD 88)
- SD-1 Supplemental RI Soil Boring Location
- SD-2 Supplemental RI Soil Boring Location and Temporary Well Screen
- SD-9 Supplemental RI Shallow Soil Boring Location
- MW-12 Supplemental RI Monitoring Well
- GEI-31 RI Soil Boring Location
- SED-1A RI Tier 1 Sediment Sample
- SED-2 RI Tier 2 Sediment Sample
- MW-6 RI Monitoring Well
- GEI-1 Focused Site Investigation Soil Boring Location
- MW-1 Focused Site Investigation Monitoring Well
- Composite Sediment Sample Grab Area (SED-1)

Soil Sample Result

Exceedance of Preliminary Screening Level for:

- Lead
- Lead+Cadmium
- Lead+Mercury
- Lead, Cadmium, Mercury
- Chromium
- Cadmium
- Mercury
- No Exceedance for Any Metals
- Sample Not Analyzed, Archived
- Sample Only Analyzed for Lead

Soil Site Stratigraphy

- Fs Surface Fill
- N Native
- WT Water Table

Sediment Sample Results

- 0-10 cm
- 1-3 ft
- 4-6 ft
- 8-9 ft
- SED-1 Sample Interval Depth (bml)
- No Exceedance
- Human Health Exceedance - Lead
- Human Health Exceedance - Mercury
- Benthic Exceedance
- Sample Not Analyzed, Archived

Soil and Sediment Analytical Results for Metals

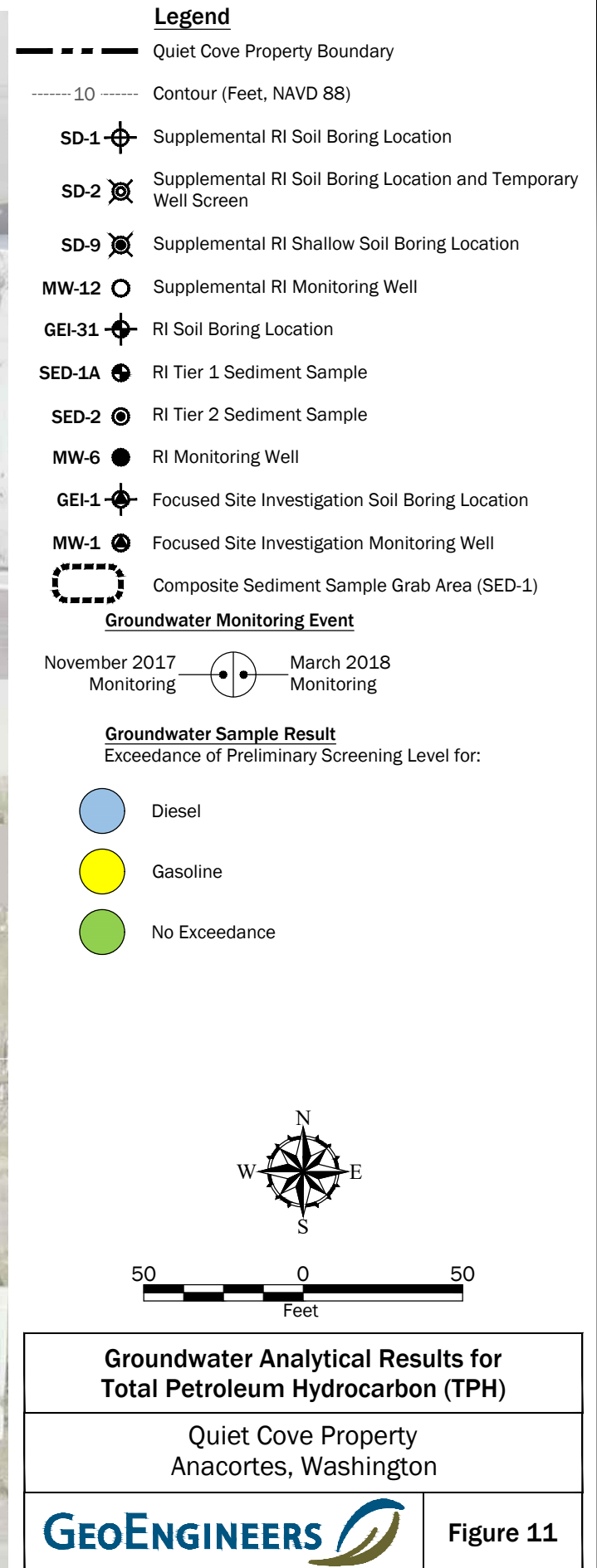
Quiet Cove Property
Anacortes, Washington



Figure 10

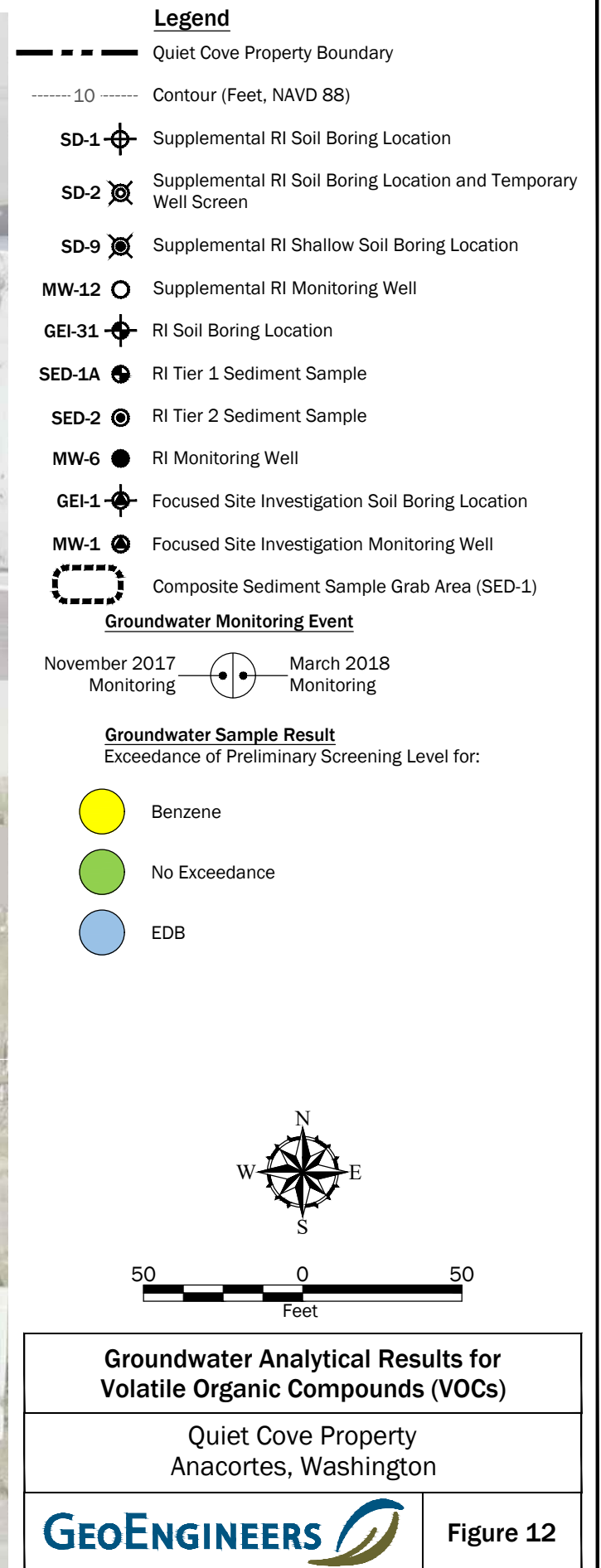
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Projection: NAD83 WA State Planes, N Zone, US Foot



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Projection: NAD83 WA State Planes, N Zone, US Foot

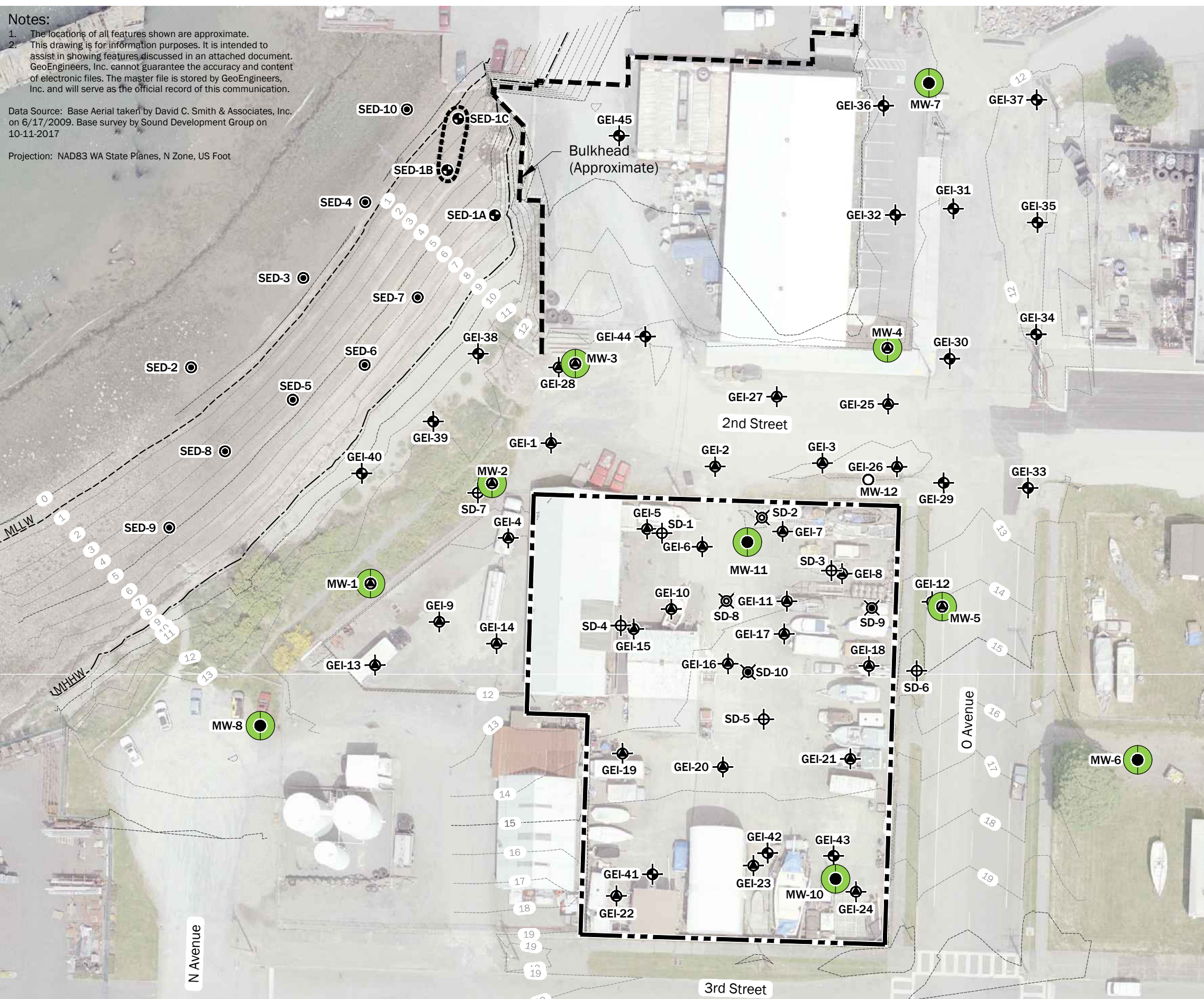


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Projection: NAD83 WA State Planes, N Zone, US Foot



Legend

- Quiet Cove Property Boundary
- 10----- Contour (Feet, NAVD 88)
- SD-1 Supplemental RI Soil Boring Location
- SD-2 Supplemental RI Soil Boring Location and Temporary Well Screen
- SD-9 Supplemental RI Shallow Soil Boring Location
- MW-12 Supplemental RI Monitoring Well
- GEI-31 RI Soil Boring Location
- SED-1A RI Tier 1 Sediment Sample
- SED-2 RI Tier 2 Sediment Sample
- MW-6 RI Monitoring Well
- GEI-1 Focused Site Investigation Soil Boring Location
- MW-1 Focused Site Investigation Monitoring Well
- Composite Sediment Sample Grab Area (SED-1)
- Groundwater Monitoring Event
- November 2017 Monitoring
- March 2018 Monitoring

Groundwater Sample Result

Exceedance of Preliminary Screening Level for:

- No Exceedance

Groundwater Analytical Results for cPAH TEQ

Quiet Cove Property
Anacortes, Washington



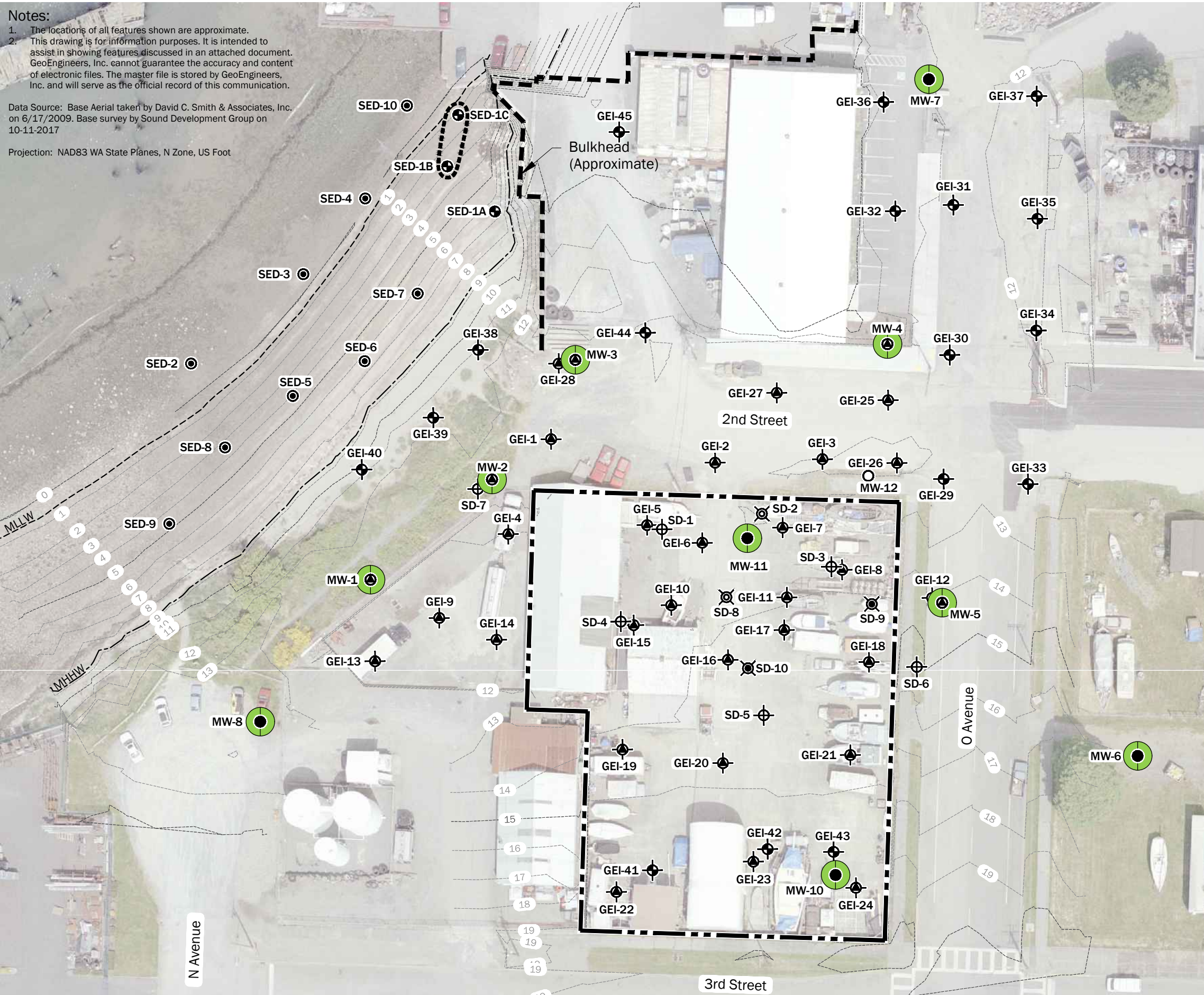
Figure 13

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Projection: NAD83 WA State Planes, N Zone, US Foot



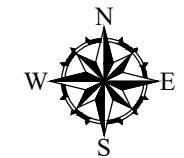
Legend

- Quiet Cove Property Boundary
- 10----- Contour (Feet, NAVD 88)
- SD-1 Supplemental RI Soil Boring Location
- SD-2 Supplemental RI Soil Boring Location and Temporary Well Screen
- SD-9 Supplemental RI Shallow Soil Boring Location
- MW-12 Supplemental RI Monitoring Well
- GEI-31 RI Soil Boring Location
- SED-1A RI Tier 1 Sediment Sample
- SED-2 RI Tier 2 Sediment Sample
- MW-6 RI Monitoring Well
- GEI-1 Focused Site Investigation Soil Boring Location
- MW-1 Focused Site Investigation Monitoring Well
- Composite Sediment Sample Grab Area (SED-1)
- Groundwater Monitoring Event
- November 2017 Monitoring
- March 2018 Monitoring

Groundwater Sample Result

Exceedance of Preliminary Screening Level for:

- No Exceedance



Groundwater Analytical Results for PAHs

Quiet Cove Property
Anacortes, Washington



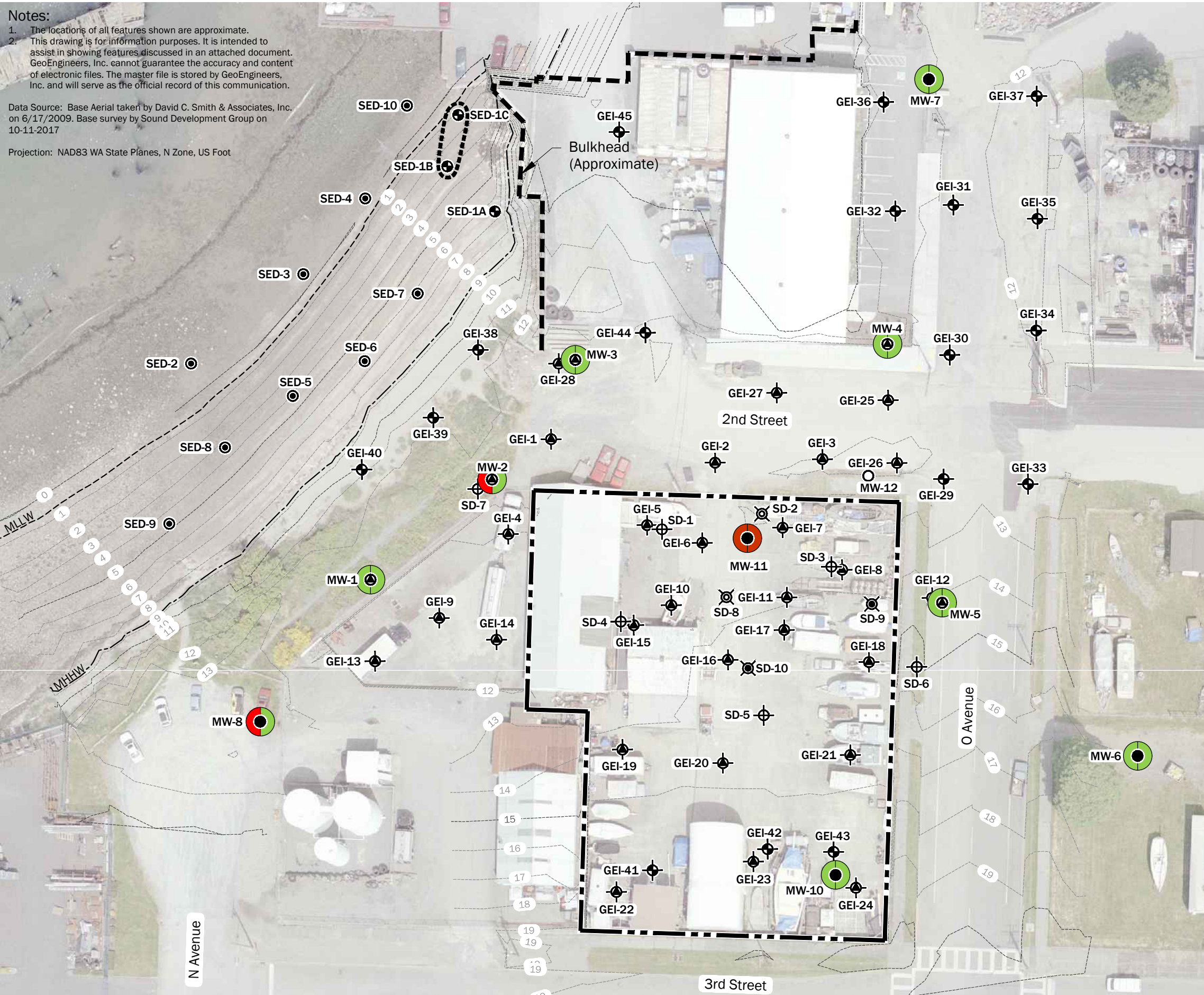
Figure 14

Notes:

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Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Base survey by Sound Development Group on 10-11-2017

Projection: NAD83 WA State Planes, N Zone, US Foot



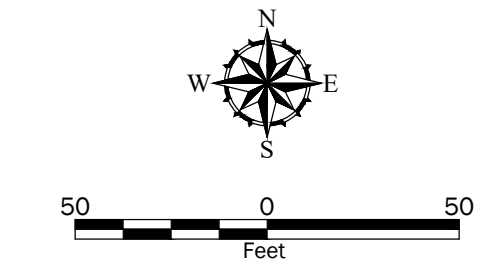
Legend

- Quiet Cove Property Boundary
- 10----- Contour (Feet, NAVD 88)
- SD-1 Supplemental RI Soil Boring Location
- SD-2 Supplemental RI Soil Boring Location and Temporary Well Screen
- SD-9 Supplemental RI Shallow Soil Boring Location
- MW-12 Supplemental RI Monitoring Well
- GEI-31 RI Soil Boring Location
- SED-1A RI Tier 1 Sediment Sample
- SED-2 RI Tier 2 Sediment Sample
- MW-6 RI Monitoring Well
- GEI-1 Focused Site Investigation Soil Boring Location
- MW-1 Focused Site Investigation Monitoring Well
- Composite Sediment Sample Grab Area (SED-1)
- Groundwater Monitoring Event
- November 2017 Monitoring
- March 2018 Monitoring

Groundwater Sample Result

Exceedance of Preliminary Screening Level for:

- Arsenic
- No Exceedance



Groundwater Analytical Results for Dissolved Metals

Quiet Cove Property
Anacortes, Washington



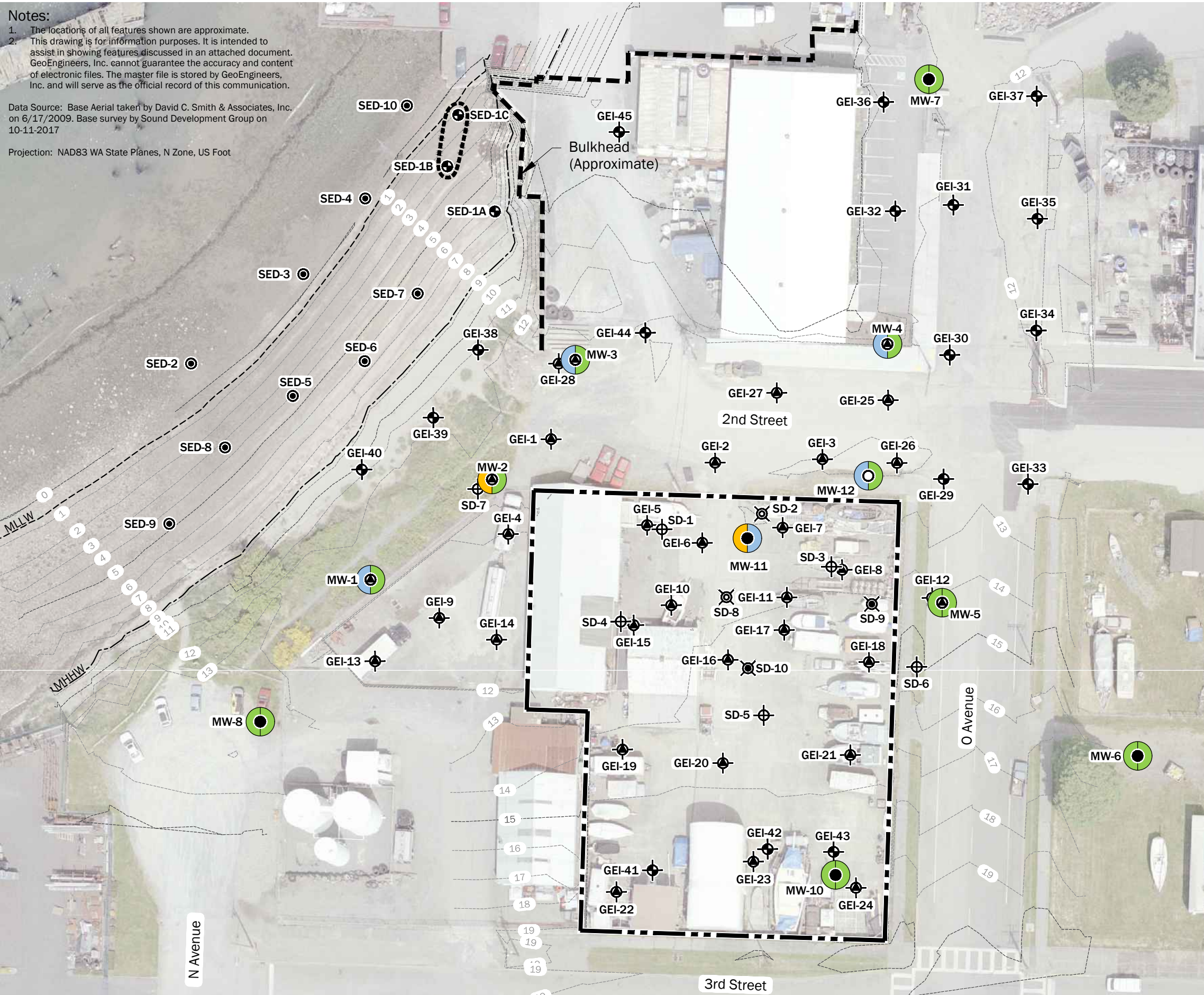
Figure 15

Notes:

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Projection: NAD83 WA State Planes, N Zone, US Foot



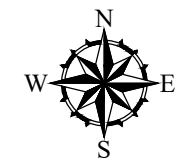
Legend

- Quiet Cove Property Boundary
- 10----- Contour (Feet, NAVD 88)
- SD-1 Supplemental RI Soil Boring Location
- SD-2 Supplemental RI Soil Boring Location and Temporary Well Screen
- SD-9 Supplemental RI Shallow Soil Boring Location
- MW-12 Supplemental RI Monitoring Well
- GEI-31 RI Soil Boring Location
- SED-1A RI Tier 1 Sediment Sample
- SED-2 RI Tier 2 Sediment Sample
- MW-6 RI Monitoring Well
- GEI-1 Focused Site Investigation Soil Boring Location
- MW-1 Focused Site Investigation Monitoring Well
- Composite Sediment Sample Grab Area (SED-1)
- Groundwater Monitoring Event
- TPH-D without Silica Gel Cleanup
- TPH-D with Silica Gel Cleanup

Groundwater Sample Result

Exceedance of Preliminary Screening Level for:

- Diesel
- Diesel and Heavy Oil
- No Exceedance



Groundwater Analytical Results for TPH-Diesel

Quiet Cove Property
Anacortes, Washington



Figure 16

ATTACHMENT 1
Investigation Exploration Logs

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND
				SM	SILTY SANDS, SAND - SILT MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

Sampler Symbol Descriptions

2.4-inch I.D. split barrel

Standard Penetration Test (SPT)

Shelby tube

Piston

Direct-Push

Bulk or grab

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

A "P" indicates sampler pushed using the weight of the drill rig.

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS		TYPICAL DESCRIPTIONS
GRAPH	LETTER	
	AC	Asphalt Concrete
	CC	Cement Concrete
	CR	Crushed Rock/Quarry Spalls
	TS	Topsoil/Forest Duff/Sod

Groundwater Contact



Measured groundwater level in exploration, well, or piezometer



Measured free product in well or piezometer

Graphic Log Contact



Distinct contact between soil strata or geologic units



Approximate location of soil strata change within a geologic soil unit

Material Description Contact



Distinct contact between soil strata or geologic units



Approximate location of soil strata change within a geologic soil unit

Laboratory / Field Tests

%F	Percent fines
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PP	Pocket penetrometer
PPM	Parts per million
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen
NT	Not Tested

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

KEY TO EXPLORATION LOGS



FIGURE A-1

Start Drilled 3/31/2014	End 3/31/2014	Total Depth (ft) 10	Logged By Checked By RST	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559713.808503 1208686.68265	System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes: Crush gravel road surface - flat					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level Graphic Log	Group Classification			
0						GP			
						SM			
				1		SP	NS	<1	
	46.8			2			NS	<1	
						ML	NS	<1	
						SP			
5				3 CA			HS	155	Slight petroleum odor and black staining
	58.9			4		SP	MS	124	Slight petroleum odor
				5 CA		SP	NS	<1	
10									

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-1



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-2
Sheet 1 of 1

Start Drilled 3/31/2014	End 3/31/2014	Total Depth (ft) 15	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559702.238962 1208767.39188	System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes: Crush gravel road surface - flat					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level Graphic Log	Group Classification			
0						GP SP			
				1 CA			NS	<1	
	42.4			2		SM	HS	255	Slight petroleum odor
				3 CA			MS	225	Slight petroleum odor
	26.4			4		SP-SM	MS	148	Slight petroleum odor
				5 CA			NS	53	
10									
	0								
15									

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-2



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-3
Sheet 1 of 1

Start Drilled 3/31/2014	End 3/31/2014	Total Depth (ft) 15	Logged By Checked By RST	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum Undetermined		Hammer Data Pneumatic		Drilling Equipment Geoprobe 6600	
Easting (X) Northing (Y)		System Datum NAD83		Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes: Crush gravel road surface - flat					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level				
0						GP			
				1		SP		NS 145	
49.2									
				2		SM		HS 212	Strong petroleum odor
5				3		SM		HS 124	Strong petroleum odor
				CA					
				4				HS 85	
52.4									
				5		PT		HS 4	Moderate petroleum odor
10				6		SM		NS <1	
				7				NS <1	
50.4									
15						GP		NS <1	

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-3



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-4
Sheet 1 of 1

Start Drilled 4/1/2014	End 4/1/2014	Total Depth (ft) 15	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559667.094916 1208665.63775	System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes: Crush gravel road surface - slope to southwest					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level				
0									

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-4



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-5
Sheet 1 of 1

Start Drilled 4/1/2014	End 4/1/2014	Total Depth (ft) 10	Logged By Checked By RST	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559673.029199 1208729.04073	System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes: Asphalt work surface - flat					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log			
0						AC			
						SM			
				1		GP	NS	<1	
						ML			
				2					
						ML			
						ML			
5				3		ML	HS	242	Free product (product beads)
				4			HS	137	Free product (product beads)
						PT			
				5		SM	NS	2	Free product (product beads)
10									

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-5



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-6
Sheet 1 of 1

Start Drilled 3/31/2014	End 3/31/2014	Total Depth (ft) 15	Logged By Checked By RST	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum Undetermined		Hammer Data Pneumatic		Drilling Equipment Geoprobe 6600	
Easting (X) 559670.247312 Northing (Y) 1208800.65608		System Datum NAD83		Groundwater Date Measured Depth to Water (ft) Elevation (ft)	
Notes: Concrete work surface - flat					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level Graphic Log	Group Classification			
0						CC			
						SP			
				1			NS	5	
						SP			
	3.2			2			HS	30	
				3			HS	36	Strong petroleum odor and black staining
	4.8			4			HS	22	Strong petroleum odor and black staining Free product (product beads)
				5			HS	19	Strong petroleum odor and black staining
				6		GP	SS	22	Strong petroleum odor and black staining
				7			NS	<1	
15									

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-7



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-8
Sheet 1 of 1

Start Drilled 3/31/2014	End 3/31/2014	Total Depth (ft) 15	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559653.480995 1208830.05768	System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes: Concrete work surface - flat					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level Graphic Log	Group Classification			
0						CC			
				1		SM	NS	<1	
	42.2					SP			
				2		GP	HS	234	Moderate petroleum odor and black staining
						ML			
5				3		GP	NS	<1	
						PT			
	54			4 CA		GM	HS	232	Heavy petroleum odor
				5 CA		ML	NS	<1	
10				6			NS	<1	
	21.6						NS	<1	
15									

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-8



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-9
Sheet 1 of 1

Start Drilled 4/1/2014	End 4/1/2014	Total Depth (ft) 10	Logged By Checked By RST	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559625.794741 120831.63921	System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes: Gravel work surface - flat					

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing							
0								SP	Brown medium to coarse sand with occasional gravel (moist) (fill)			
					1			Wood	Approximately 6 inch layer wood debris	NS	<1	
	28.8							PT	Dark brown organic peat (moist) (native)	NS	<1	
					2							
					CA					NS	<1	
5								SP	Grayish-brown coarse sand with occasional gravel (wet)	HS	5	Slight petroleum odor and black staining
					3							
	58.8							SM	Transitions to silty sand (wet)			
					4							
								ML	Gray silt (moist)	NS	<1	
					5							
					CA							
10												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-9



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-10
Sheet 1 of 1

Start Drilled 3/31/2014	End 3/31/2014	Total Depth (ft) 15	Logged By Checked By RST	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559632.085368 1208745.85571	System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes: Concrete/asphalt work surface - flat					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level	Graphic Log	Group Classification		
0							SP		
				1 CA			SP	NS	<1
	34.8			2			ML	HS	18
							SP		
				3 CA			SP	HS	123
5				4			ML	HS	43
	32.4			5			SM	HS	23
				6 CA			ML	NS	<1
	51.6			7			ML	NS	<1
15									

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-10



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-11
Sheet 1 of 1

Start Drilled 3/31/2014	End 3/31/2014	Total Depth (ft) 10	Logged By Checked By RST	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559636.679434 1208803.20423	System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes: Concrete work surface - flat					

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing							
0								CC	Approximately 4-inches cement concrete			
								SM	Brown silty fine to coarse sand with gravel (moist) (fill)			
					1			ML	Black silt with sand and wood debris (unknown) (moist)	NS	<1	
								SP	Brown fine to medium sand with occasional gravel (moist)			
	42.8											
					2					HS	18	Slight petroleum odor and black staining
								ML	Brown silt (moist)			
5					3, Dup-2			SP	Gray fine to coarse sand with occasional gravel (wet)	HS	32	Slight petroleum odor and black staining
	42.8									HS	28	Slight petroleum odor and black staining
					4							
								PT	Brown organic matter (peat) (moist) (native)	NS	<1	
					5							
10												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-11



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-12
Sheet 1 of 1

Start Drilled 4/1/2014	End 4/1/2014	Total Depth (ft) 15	Logged By Checked By RST	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)		System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes: O Avenue right-of-way - slope to north					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level Graphic Log	Group Classification			
0						AC			
						CC			
				1		ML	NS	<1	
	30			2			NS	<1	
5						SP			
				3		CA	NS	<1	
	56.4			4		ML	NS	<1	
				5		SM	NS	<1	
10				6		ML	NS	<1	
	38.4			7			NS	<1	
15									

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-12



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-13
Sheet 1 of 1

Start Drilled 4/1/2014	End 4/1/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559604.485169 1208600.03781	System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes: Gravel work surface - flat					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level Graphic Log	Group Classification			
0						SP			
				1		SP	NS	81	
		36		2 CA		SM	HS	362	Strong petroleum odor
						SP			
						PT			
				3			NS	6	
5									
		60		4. Dup-4 CA		SM	NS	2	
				5		ML	NS	<1	
10									

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-13



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-14
Sheet 1 of 1

Start Drilled 4/1/2014	End 4/1/2014	Total Depth (ft) 10	Logged By Checked By RST	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559615.108573 1208659.82933	System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes:					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level Graphic Log	Group Classification			
0						SP			
				1		SP	NS	<1	
	40.8					ML			
				2		SM	NS	<1	
				3		PT			
5				CA		SM	NS	<1	
	60								
				4			NS	<1	
				5		SM	NS	<1	
10									

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-14



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-15
Sheet 1 of 1

Start Drilled 4/1/2014	End 4/1/2014	Total Depth (ft) 10	Logged By Checked By RST	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559627.988445 1208728.25271	System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes: Asphalt/concrete work surface - flat					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level Graphic Log	Group Classification			
0						AC			
						CC			
				1		GP	NS	<1	
						OL			
	31.2			2		ML	NS	56	Slight petroleum odor and black staining
				3		SP	HS	148	Slight petroleum odor and black staining Free product (product beads)
				4			HS	103	Slight petroleum odor and black staining Free product (product beads)
	44.4					OL			
						ML			
				5		SM	NS	<1	Slight petroleum odor and black staining Free product (product beads)
10									

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-15



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-16
Sheet 1 of 1

Start Drilled 3/31/2014	End 3/31/2014	Total Depth (ft) 10	Logged By Checked By RST	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559605.184619 1208773.99176	System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes: Concrete work surface - flat					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level Graphic Log	Group Classification			
0						CC			
				1		SM		NS	<1
	47.6					ML		NS	<1
				2					
				3				SS	198
5				CA		SM			
				4				SS	44
	46.8					ML		NS	<1
				5					
				CA					
10									

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-16



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-17
Sheet 1 of 1

Start Drilled 3/31/2014	End 3/31/2014	Total Depth (ft) 10	Logged By Checked By RST	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559619.383345 1208802.62127	System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes: Concrete work surface - flat					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level Graphic Log	Group Classification			
0						CC			
				1		SM		NS	<1
	38.4								
				2		SP			
						ML		SS	895
5				3					
				CA		SM		HS	>1000
									Strong petroleum odor
	60			4				HS	>1000
									Strong petroleum odor
						GM			Strong petroleum odor
						SP-SM			
10				5				NS	25

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-17



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-18
Sheet 1 of 1

Start Drilled 3/31/2014	End 3/31/2014	Total Depth (ft) 10	Logged By Checked By RST	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum Undetermined		Hammer Data Pneumatic		Drilling Equipment Geoprobe 6600	
Easting (X) Northing (Y) 559604.089077 1208843.16033		System Datum NAD83		Groundwater Date Measured Depth to Water (ft) Elevation (ft)	
Notes: Concrete work surface - flat					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level Graphic Log	Group Classification			
0						CC			
						ML			
				1 CA			NS	<1	
	38.4					SM			
				2		ML	NS	<1	
						SP	HS	24	Slight petroleum odor
5				3_Dup-3 CA					
	51.6			4			HS	32	Slight petroleum odor
						ML			
				5 CA			NS	<1	
10									

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-18



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-19
Sheet 1 of 1

Start Drilled 4/1/2014	End 4/1/2014	Total Depth (ft) 10	Logged By Checked By RST	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559560.989787 1208721.83017	System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes: Concrete work surface - flat					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level Graphic Log	Group Classification			
0						CC			
						SM			
				1 CA			NS	<1	
	37.2			2			NS	<1	
						SP			
5				3 CA			NS	<1	
						ML			
	60			4			NS	<1	
				5			NS	<1	
10									

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-19



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-20
Sheet 1 of 1

Start Drilled 4/1/2014	End 4/1/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559555.013645 1208770.90691	System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes: Concrete work surface - flat					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level Graphic Log	Group Classification			
0						CC			
						SM			
				1			NS	<1	
	36								
				2		PT	NS	<1	
						SP			
5				3 CA			NS	<1	
	38.4			4, Dup-5			NS	<1	
				5			NS	<1	
10						ML			

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-20



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-21
Sheet 1 of 1

Start Drilled 4/1/2014	End 4/1/2014	Total Depth (ft) 10	Logged By Checked By RST	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559558.366702 12088834.00014	System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes: Concrete work surface - flat					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level Graphic Log	Group Classification			
0						CC			
						SM			
				1		SM	NS	<1	
		32.4				SM			
				2			NS	<1	
						SP			
						SP	NS	<1	
5				3 CA					
						SP			
		51.6		4			NS	<1	
				5			NS	<1	
10									

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-21



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-22
Sheet 1 of 1

Start Drilled 4/2/2014	End 4/2/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559490.925134 1208718.82857	System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes: Concrete work surface - flat					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level Graphic Log	Group Classification			
0						CC			
						SM			
				1			NS	<1	
		39.6				SP			
				2			NS	<1	
						ML			
5				3			NS	<1	
		60		4			NS	<1	
						SP			
				5			NS	<1	
10									

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-22



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-23
Sheet 1 of 1

Drilled	<u>Start</u> 4/1/2014	<u>End</u> 4/1/2014	Total Depth (ft)	10	Logged By Checked By	RST	Driller	Cascade Drilling, L.P.	Drilling Method	Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined				Hammer Data	Pneumatic			Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559505.820472 1208786.26447				System Datum	NAD83			<u>Groundwater</u> <u>Date Measured</u>	Depth to Water (ft) <u>Elevation (ft)</u>
Notes: Concrete work surface - flat										

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level Graphic Log	Group Classification			
0						CC			
						SM			
				1			NS	<1	
	30								
				2		ML	NS	<1	
5				3, Dup-6			NS	<1	
	60			4			NS	<1	
				5			NS	<1	
10									

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-23



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-24
Sheet 1 of 1

Drilled	<u>Start</u> 4/2/2014	<u>End</u> 4/2/2014	Total Depth (ft)	10	Logged By Checked By	RST	Driller	Cascade Drilling, L.P.	Drilling Method	Direct-Push	
Surface Elevation (ft) Vertical Datum			Undetermined		Hammer Data		Pneumatic		Drilling Equipment		Geoprobe 6600
Easting (X) Northing (Y)		559492.730723 1208836.83202			System Datum		NAD83		<u>Groundwater</u> <u>Date Measured</u>		Depth to Water (ft) <u>Elevation (ft)</u>
Notes: Concrete work surface - flat											

Elevation (feet)	FIELD DATA					Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing							
0								CC	Approximately 4-inches cement concrete			
					1			SP	Brown fine to medium sand with occasional gravel (moist) (fill)	NS	<1	
		42.2										
					2			ML	Brown silt with occasional gravel (moist) (native)	NS	<1	
5					3					NS	<1	
					4							
		50.4										
								SP	Brown fine to medium sand (wet)	NS	<1	
					5			SM	Brown silty fine to medium sand with occasional gravel (moist)	NS	<1	
10												

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-24



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-25
Sheet 1 of 1

Start Drilled 4/1/2014	End 4/1/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559732.98936 1208852.565	System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes: Gravel road surface - flat					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level Graphic Log	Group Classification			
0						GP			
						SM			
				1 CA			SS	<1	
	43.2			2			SS	10	
						GP			
5				3 CA			HS	32	Free product (product beads)
				4			HS	31	Free product (product beads)
	50.4					PT			Free product (product beads)
				5 CA			NS	<1	
10									

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-25



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-26
Sheet 1 of 1

Drilled	<u>Start</u> 4/2/2014	<u>End</u> 4/2/2014	Total Depth (ft)	10	Logged By Checked By	RST	Driller	Cascade Drilling, L.P.	Drilling Method	Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined				Hammer Data	Pneumatic		Drilling Equipment	Geoprobe 6600	
Easting (X) Northing (Y)	559702.095257 1208856.96764				System Datum	NAD83		<u>Groundwater</u> <u>Date Measured</u>	Depth to <u>Water (ft)</u>	<u>Elevation (ft)</u>
Notes: Gravel road surface - flat										

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level Graphic Log	Group Classification			
0						SM			
				1			NS	<1	
		18					SS	110	
							MS	142	
									Poor recovery
5				2		SP			
							HS	238	Free product (product beads)
		42.2		3		PT			
							NS	<1	Free product (product beads)
10									

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-26



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-27
Sheet 1 of 1

Drilled	Start 4/2/2014	End 4/2/2014	Total Depth (ft)	10	Logged By Checked By	RST	Driller	Cascade Drilling, L.P.	Drilling Method	Direct-Push	
Surface Elevation (ft) Vertical Datum			Undetermined		Hammer Data		Pneumatic		Drilling Equipment		Geoprobe 6600
Easting (X) Northing (Y)			559736.600528 1208797.78828		System Datum		NAD83		Groundwater Date Measured		Depth to Water (ft) Elevation (ft)
Notes: Gravel road surface - flat											

Elevation (feet)	FIELD DATA					Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level					
0						SM	Gray silty fine to medium sand with gravel (moist) (fill)			
				1				NS	<1	
						SM	Brown silty fine to medium sand with occasional gravel (moist)			
	3.4			2				NS	<1	
5							Approximate 2-inch roots at 5 feet			
				3				NS	<1	
				CA						
	3.9			4		PT	Dark brown organic matter (peat) with roots and grass reed traces (moist) (native)			
10								NS	<1	

Note: See Figure A-1 for explanation of symbols.

Log of Boring GEI-27



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-28
Sheet 1 of 1

Start Drilled 4/2/2014	End 4/2/2014	Total Depth (ft) 10	Logged By RST Checked By	Driller Cascade Drilling, L.P.	Drilling Method Direct-Push
Surface Elevation (ft) Vertical Datum	Undetermined	Hammer Data	Pneumatic	Drilling Equipment	Geoprobe 6600
Easting (X) Northing (Y)	559751.019073 1208690.39644	System Datum	NAD83	Groundwater Date Measured	Depth to Water (ft) Elevation (ft)
Notes: Gravel road surface - flat					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample Sample Name Testing	Water Level	Graphic Log	Group Classification		
0							SP		
				1			GP	NS	<1
	46.8			2			SM	NS	<1
							SP		
5				3			SP	NS	<1
							SP		
	58.8			4. Dup-7 CA				NS	<1
				5				NS	<1
10									

Note: See Figure A-1 for explanation of symbols.

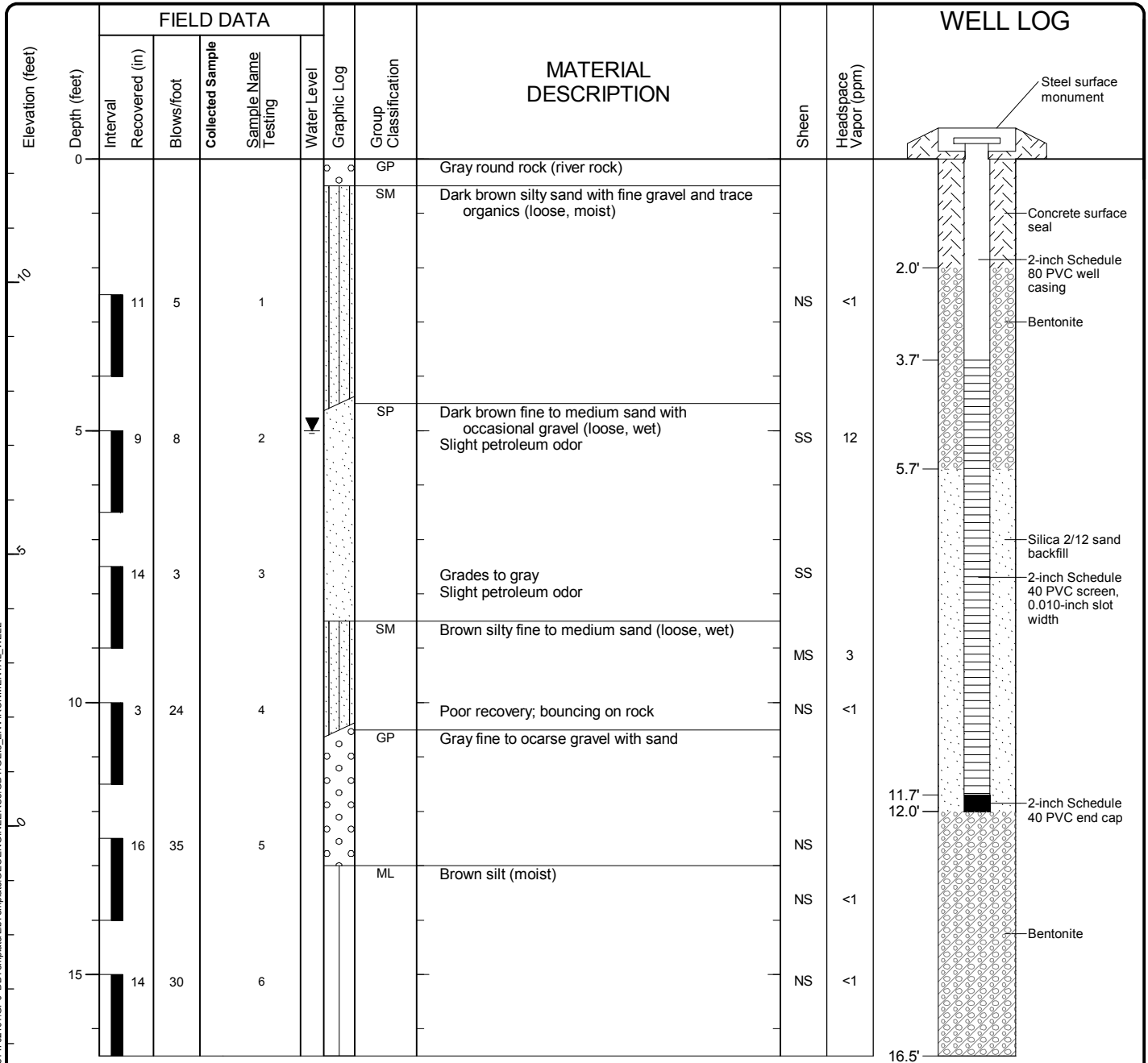
Log of Boring GEI-28



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-29
Sheet 1 of 1

Start Drilled 6/23/2014	End 6/23/2014	Total Depth (ft) 16.5	Logged By Checked By NRS	Driller Cascade Drilling, L.P.	Drilling Method Hollow-Stem Auger
Hammer Data Automatic 140 (lbs) / 30 (in) Drop		Drilling Equipment		DOE Well I.D.: BID 546 A 2 (in) well was installed on 6/23/2014 to a depth of 12 (ft).	
Surface Elevation (ft) Vertical Datum NAVD88 12.27		Top of Casing Elevation (ft)		Groundwater Date Measured 6/23/2014	
Easting (X) Northing (Y) 559643.3137 1208598.405		Horizontal Datum NAD83		Depth to Water (ft) 5.0 Elevation (ft) 7.3	
Notes:					



Note: See Figure A-1 for explanation of symbols.

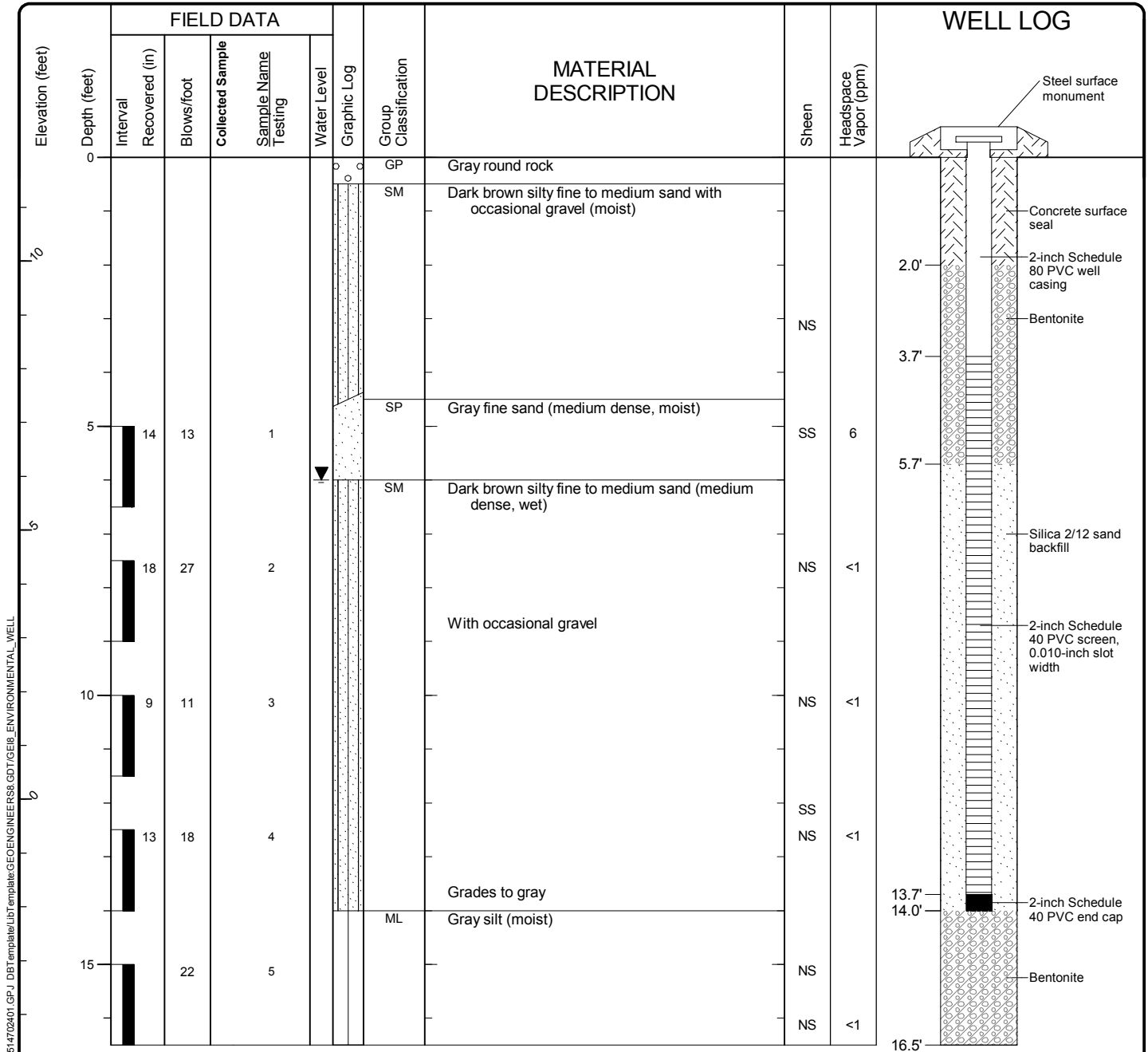
Log of Monitoring Well MW-1



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-30
Sheet 1 of 1

Start Drilled 6/23/2014	End 6/23/2014	Total Depth (ft) 16.5	Logged By Checked By NRS	Driller Cascade Drilling, L.P.	Drilling Method Hollow-Stem Auger
Hammer Data Automatic 140 (lbs) / 30 (in) Drop		Drilling Equipment		DOE Well I.D.: BID 547 A 2 (in) well was installed on 6/23/2014 to a depth of 14 (ft).	
Surface Elevation (ft) Vertical Datum 11.93 NAVD88		Top of Casing Elevation (ft)		Groundwater Date Measured 6/23/2014	
Easting (X) Northing (Y) 559692.5327 1208656.1166		Horizontal Datum NAD83		Depth to Water (ft) 6.0	Elevation (ft) 5.9
Notes:					



Note: See Figure A-1 for explanation of symbols.

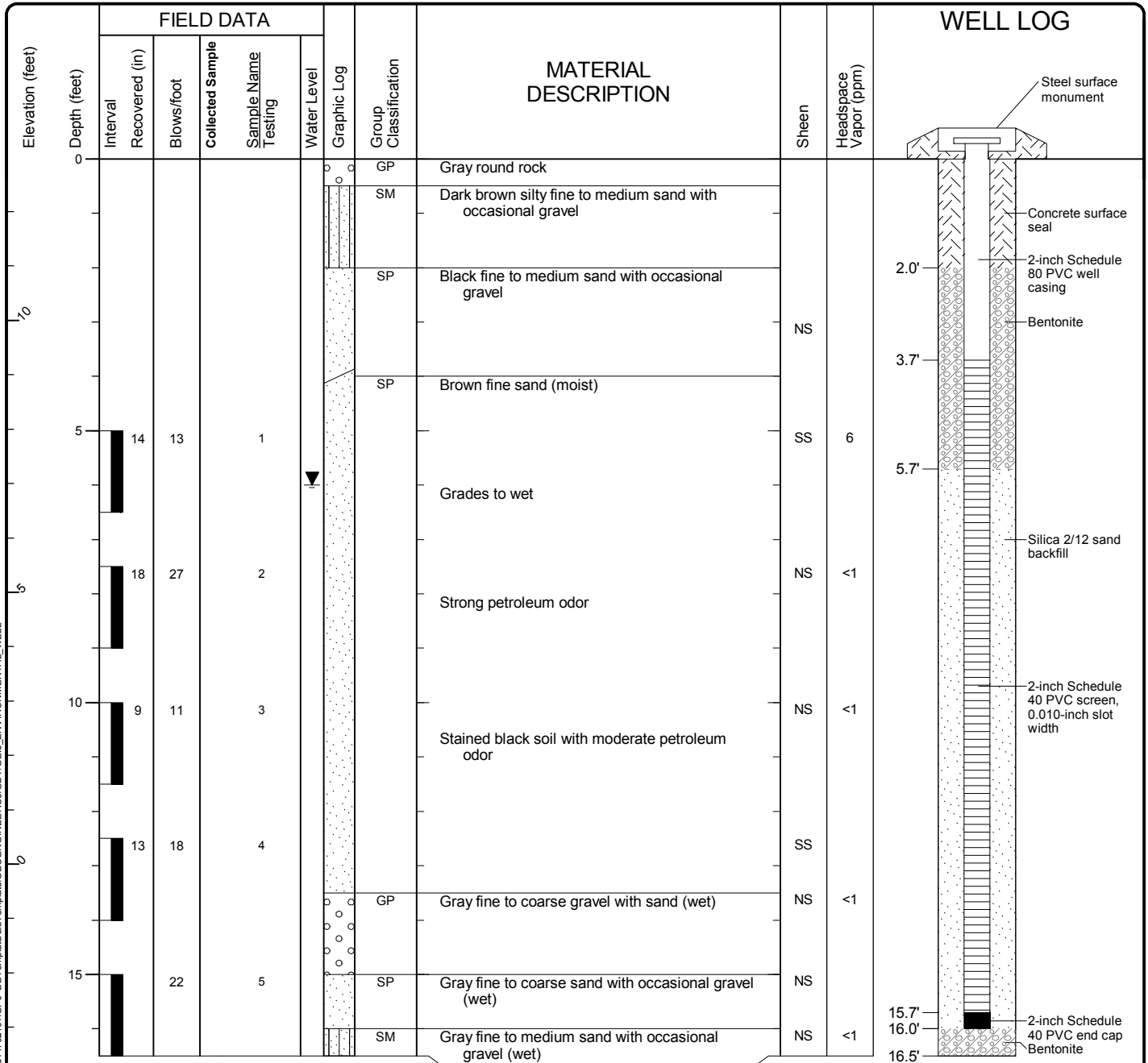
Log of Monitoring Well MW-2



Project: Quiet Cove Property
Project Location: Anacortes, Washington
Project Number: 5147-024-01

Figure A-31
Sheet 1 of 1

Start Drilled 6/23/2014	End 6/23/2014	Total Depth (ft) 16.5	Logged By Checked By NRS	Driller Cascade Drilling, L.P.	Drilling Method Hollow-Stem Auger
Hammer Data Automatic 140 (lbs) / 30 (in) Drop		Drilling Equipment		DOE Well I.D.: BID 548 A 2 (in) well was installed on 6/23/2014 to a depth of 16 (ft).	
Surface Elevation (ft) Vertical Datum 12.97 NAVD88		Top of Casing Elevation (ft)		Groundwater Date Measured 6/23/2014	
Easting (X) Northing (Y) 559756.678468316 1208701.08910405		Horizontal Datum NAD83		Depth to Water (ft) 6.0 Elevation (ft) 7.0	
Notes:					



Note: See Figure A-1 for explanation of symbols.

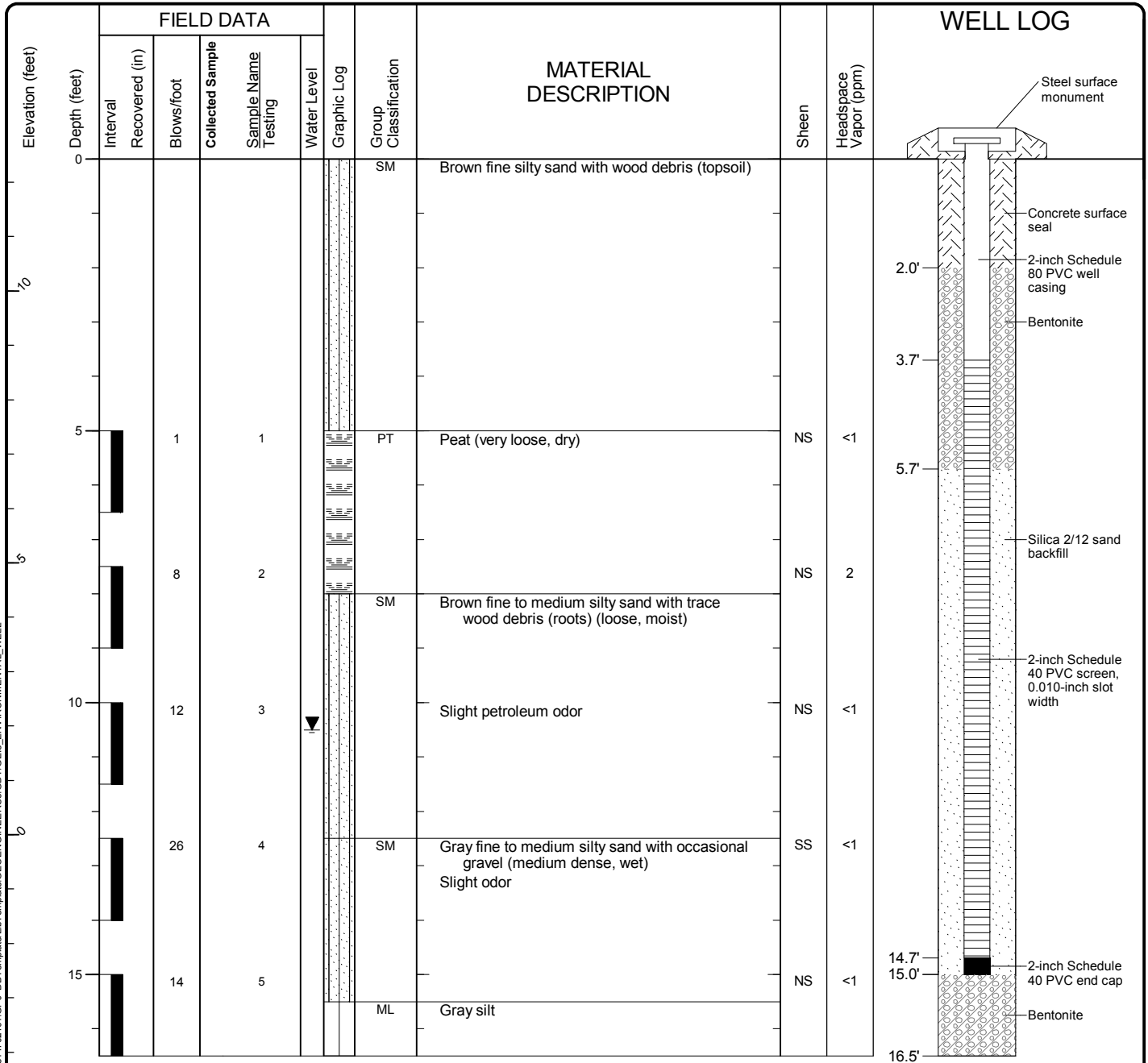
Log of Monitoring Well MW-3



Project: Quiet Cove Property
 Project Location: Anacortes, Washington
 Project Number: 5147-024-01

Figure A-32
 Sheet 1 of 1

Start Drilled 6/24/2014	End 6/24/2014	Total Depth (ft) 16.5	Logged By Checked By NRS	Driller Cascade Drilling, L.P.	Drilling Method Hollow-Stem Auger
Hammer Data Automatic 140 (lbs) / 30 (in) Drop		Drilling Equipment		A 2 (in) well was installed on 6/24/2014 to a depth of 15 (ft).	
Surface Elevation (ft) Vertical Datum 12.43 NAVD88		Top of Casing Elevation (ft)		Groundwater Date Measured 6/24/2014	
Easting (X) Northing (Y) 559760.5958 1208852.2931		Horizontal Datum NAD83		Depth to Water (ft) 10.5 Elevation (ft) 1.9	
Notes:					



Note: See Figure A-1 for explanation of symbols.

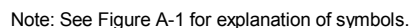
Log of Monitoring Well MW-4



Project: Quiet Cove Property
 Project Location: Anacortes, Washington
 Project Number: 5147-024-01

Figure A-33
 Sheet 1 of 1

Seattle: Date: 7/29/14 Path: \\SEA\PROJECTS\515147024\GINT\514702401.GPJ DBT: template\libTemplate:GEOENGINEERS8.GDT\GEI8 ENVIRONMENTAL WELL



GEOENGINEERS

Figure A-34
Sheet 1 of 1

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS	
			GRAPH	LETTER		
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES	
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES	
		GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES	
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES	
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS
			(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND
FINE GRAINED SOILS	SILTS AND CLAYS	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES	
			(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
			MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	
		CL				INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL				ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY	
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY	
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

Sampler Symbol Descriptions

	2.4-inch I.D. split barrel
	Standard Penetration Test (SPT)
	Shelby tube
	Piston
	Direct-Push
	Bulk or grab
	Continuous Coring

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

"P" indicates sampler pushed using the weight of the drill rig.

"WOH" indicates sampler pushed using the weight of the hammer.

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS		TYPICAL DESCRIPTIONS
GRAPH	LETTER	
	AC	Asphalt Concrete
	CC	Cement Concrete
	CR	Crushed Rock/Quarry Spalls
	SOD	Sod/Forest Duff
	TS	Topsoil

Groundwater Contact



Measured groundwater level in exploration, well, or piezometer



Measured free product in well or piezometer

Graphic Log Contact



Distinct contact between soil strata



Approximate contact between soil strata

Material Description Contact



Contact between geologic units



Contact between soil of the same geologic unit

Laboratory / Field Tests

%F	Percent fines
%G	Percent gravel
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DD	Dry density
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
Mohs	Mohs hardness scale
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen

Key to Exploration Logs



Figure B-1

Start Drilled 9/12/2017	End 9/12/2017	Total Depth (ft) 15	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) Vertical Datum 12.15 NAVD88		Hammer Data Pneumatic		Drilling Equipment GeoProbe 6600	
Easting (X) Northing (Y) 1208879.93 559694.22		System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed	
Notes:					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
0	8					AC Approximately 6 inches asphalt concrete			
						NR No recovery			
5	52				1 CA	ML Brown silt with occasional sand and gravel (moist) (fill)	NS	<1	
						SP Dark brown-gray fine to coarse sand with occasional gravel (moist)	NS	2.1	
					2	PT Brown organic matter (moist) (peat) (native)	SS	<1	
						ML Brown silt with trace organic matter (weathered wood) (moist)	NS	<1	
						ML Wood chuck chunk at 8¼ feet			
						ML Brown silt with sand and trace organic matter	NS	<1	
10	60				3 CA	ML Light gray silt with sand (wet)	NS	<1	Groundwater observed at approximately 10 feet at time of drilling
							NS	<1	
							NS	<1	
							NS	<1	
					4 CA	ML Gray silt with occasional sand (moist)	NS	<1	
15							NS	<1	

Note: See Figure B-1 for explanation of symbols.

Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-29



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-2
Sheet 1 of 1

Start Drilled 9/12/2017	End 9/12/2017	Total Depth (ft) 15	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) Vertical Datum 12.27 NAVD88		Hammer Data Pneumatic		Drilling Equipment GeoProbe 6600	
Easting (X) Northing (Y) 1208882.91 559755.28		System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed	
Notes:					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
0	48				1 DUP 1	AC			Wood chunk in shoe Groundwater observed at approximately 7 feet at time of drilling
						SP	NS	<1	
					2 CA	ML	NS	<1	
							NS	<1	
5	56					SP	NS	<1	
					3 CA	PT	SS	<1	
							NS	<1	
							NS	<1	
					4 CA	SP	NS	<1	
10	60					SP	NS	<1	
							NS	<1	
							NS	<1	
							NS	<1	
					5	SP	NS	<1	
							NS	<1	
15									

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-30



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-3
Sheet 1 of 1

Start Drilled 9/11/2017	End 9/11/2017	Total Depth (ft) 15	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) Vertical Datum 12.34 NAVD88		Hammer Data Pneumatic		Drilling Equipment GeoProbe 6600	
Easting (X) Northing (Y) 1208884.7 559829.12		System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed	
Notes:					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
0		42				AC			
					1	SP	NS	<1	
10						SP	NS	<1	Geotextile at 2 feet bgs
					2	SP	NS	<1	
					3	SP	NS	<1	
5		60				SP	NS	<1	
					4	SP	NS	<1	
					5	SP	NS	<1	
					6	SP	NS	<1	
10		60				SP	NS	<1	Groundwater observed at approximately 6½ feet at time of drilling
					7	SP	NS	<1	
					8	SP	NS	<1	
					9	SP	NS	<1	
15						SP	NS	<1	

Note: See Figure B-1 for explanation of symbols.

Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-31



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-4
Sheet 1 of 1

Start Drilled 9/11/2017	End 9/11/2017	Total Depth (ft) 15	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) Vertical Datum 13.44 NAVD88		Hammer Data Pneumatic		Drilling Equipment GeoProbe 6600	
Easting (X) Northing (Y) 1208856.16 559826.1		System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed	
Notes:					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
0		54				AC			
					1	SP-SM	NS	<1	
					2	ML	NS	<1	
					3	SP-SM	NS	<1	
					4	SP-SM	NS	<1	
5		58					NS	<1	
					5	SP-SM	NS	<1	
					6	SP	NS	<1	
10		60					NS	<1	
							NS	<1	
							NS	<1	
							NS	<1	
							NS	<1	
15							NS	<1	

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-32



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-5
Sheet 1 of 1

Start Drilled 9/12/2017	End 9/12/2017	Total Depth (ft) 15	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) Vertical Datum 12.25 NAVD88		Hammer Data Pneumatic		Drilling Equipment GeoProbe 6600	
Easting (X) Northing (Y) 1208921.46 559691.72		System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed	
Notes:					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
0	12					AC			
						SP			
10					1		NS	<1	
							NS	<1	
							NS	<1	
							NS	<1	
5	54				2	SP	NS	<1	Groundwater observed at approximately 6 feet at time of drilling
							NS	<1	
							NS	<1	
						ML	NS	<1	
					3	PT	NS	<1	
							NS	<1	
10	60					SPSM	NS	<1	
							NS	<1	
						SPSM	NS	<1	
					4		NS	<1	
						ML	NS	<1	
							NS	<1	
15									

Note: See Figure B-1 for explanation of symbols.

Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-33



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-6
Sheet 1 of 1

Start Drilled 9/12/2017	End 9/12/2017	Total Depth (ft) 15	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) Vertical Datum 11.87 NAVD88		Hammer Data Pneumatic		Drilling Equipment GeoProbe 6600	
Easting (X) Northing (Y) 1208925.51 559767.3		System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed	
Notes:					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
0	48					AC			
						SP	NS	<1	
						ML	NS	<1	
							NS	<1	
5	56					PT	NS	<1	
						ML	NS	<1	
						SP	NS	<1	
							NS	<1	
							NS	<1	
10	60						NS	<1	
							NS	<1	
							NS	<1	
						SP	NS	<1	
15							NS	<1	

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-34



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-7
Sheet 1 of 1

Start Drilled 9/11/2017	End 9/11/2017	Total Depth (ft) 10	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) Vertical Datum 11.67 NAVD88		Hammer Data Pneumatic		Drilling Equipment GeoProbe 6600	
Easting (X) Northing (Y) 1208926.08 559822.33		System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed	
Notes:					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
0						AC			
					1	ML		NS	<1
					2	SP		NS	<1
						ML		NS	<1
						ML		NS	<1
					3			NS	<1
5						SP-SM		NS	<1
					4			NS	<1
						SP		NS	<1
					5			NS	<1
						SP		NS	<1
10									

Note: See Figure B-1 for explanation of symbols.

Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-35



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-8
Sheet 1 of 1

Start Drilled 9/11/2017	End 9/11/2017	Total Depth (ft) 15	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) Vertical Datum 13.47 NAVD88		Hammer Data Pneumatic		Drilling Equipment GeoProbe 6600	
Easting (X) Northing (Y) 1208850.34 559879.78		System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed	
Notes:					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
0	36				1	AC SP Approximately 3 inches asphalt concrete Gray-brown fine to coarse sand with gravel (moist) (fill)	NS	<1	Groundwater observed at approximately 8 feet at time of drilling
					2		NS	<1	
							NS	<1	
							NS	<1	
5	48				3	SP Brown fine to medium sand with occasional gravel and trace organic matter (moist)	NS	<1	
						Becomes wet	NS	<1	
							NS	<1	
							NS	<1	
10	60				4	SP Gray fine to medium sand with gravel (wet) (native)	NS	<1	
							NS	<1	
							NS	<1	
							NS	<1	
15						SP Gray fine to medium sand with occasional gravel (moist)	NS	<1	
							NS	<1	

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-36



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-9
Sheet 1 of 1

Start Drilled 9/11/2017	End 9/11/2017	Total Depth (ft) 15	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) Vertical Datum 11.52 NAVD88		Hammer Data Pneumatic		Drilling Equipment GeoProbe 6600	
Easting (X) Northing (Y) 1208925.74 559882.69		System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed	
Notes:					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
0		39				AC			
						SM			
					1	SP	NS	<1	
						SP	NS	<1	Geotextile fabric at 2¼ feet
					2		NS	<1	
						ML	NS	<1	
						SP	NS	<1	
5		60			3	SP-SM	NS	<1	
							NS	<1	
							NS	<1	Groundwater observed at approximately 8 feet at time of drilling
					4	SP	NS	<1	
10		60					NS	<1	
							NS	<1	
							NS	<1	
					5		NS	<1	
							NS	<1	
15									

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-37



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-10
Sheet 1 of 1

Start Drilled 9/19/2017	End 9/19/2017	Total Depth (ft) 15	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) Vertical Datum 11.06 NAVD88		Hammer Data Pneumatic		Drilling Equipment GeoProbe 7822 DT	
Easting (X) Northing (Y) 1208650.79 559757.76		System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed	
Notes:					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
0	24					SP	NS	<1	Groundwater observed at approximately 4 feet at time of drilling
1							NS	<1	
2						SP-SM	NS	<1	
3						SP-SM	NS	<1	
4							NS	<1	
5	48						NS	<1	
6							NS	<1	
7							NS	<1	
8							NS	<1	
9							NS	<1	
10	58					SP-SM	NS	<1	
11							NS	<1	
12							NS	<1	
13						ML	NS	<1	
14							NS	<1	
15							NS	<1	

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-38



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-11
Sheet 1 of 1

Drilled	Start	End	Total Depth (ft)	10	Logged By	NS	Checked By	BJT	Driller	Cascade Drilling, LP	Drilling Method	Direch Push	
Surface Elevation (ft)			11.42		Hammer Data		Pneumatic			Drilling Equipment			GeoProbe 7822 DT
Vertical Datum			NAVD88		System Datum			WA State Plane North NAD83 (feet)			See "Remarks" section for groundwater observed		
Easting (X)			1208628.66		System Datum			WA State Plane North NAD83 (feet)			See "Remarks" section for groundwater observed		
Northing (Y)			559724.41										
Notes:													

Elevation (feet)	Depth (feet)	FIELD DATA				Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
		Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
0		26					SP	Light brown fine to medium sand (dry) (fill)	NS	<1	Groundwater observed at approximately 6 feet at time of drilling
1					1 CA				NS	<1	
2									NS	<1	
3									NS	<1	
4									NS	<1	
5		30			2 CA		SP	Brown fine to medium sand with occasional gravel (moist)	NS	<1	
6							SP	Gray fine to medium sand (moist)	NS	<1	Groundwater observed at approximately 6 feet at time of drilling
7							SP	Dark gray fine to medium sand with organic matter (weathered wood) (wet)	SS	<1	
8							SP	Dark gray fine to medium sand (wet)	NS	<1	
9									NS	<1	
10		21			3 CA		SP	Gray fine to medium sand with occasional gravel (dense, wet) (native)	NS	<1	

Note: See Figure B-1 for explanation of symbols.

Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-39



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-12
Sheet 1 of 1

Start Drilled 9/19/2017	End 9/19/2017	Total Depth (ft) 15	Logged By Checked By SJB/NS BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) Vertical Datum 10.3 NAVD88		Hammer Data Pneumatic		Drilling Equipment GeoProbe 7822 DT	
Easting (X) Northing (Y) 1208593.49 559698.84		System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed	
Notes:					

Elevation (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
0	39						SP	Light brown fine to medium sand (dry) (fill)	NS	<1	
					1 CA				NS	<1	
							SPSM	Brown fine to medium sand with occasional silt and gravel (moist)	NS	<1	
								Becomes wet	NS	<1	
5	54				2 CA		SPSM	Dark gray to black fine to medium sand with silt and gravel (wet)	SS	18	Groundwater observed at approximately 6 feet at time of drilling
							SPSM	Gray fine to medium sand with occasional silt and gravel (wet)	NS	<1	
					3				NS	<1	
10	48								NS	<1	
							SPSM	Gray fine to coarse sand with occasional silt and gravel (wet) (native)	NS	<1	
					4 CA				NS	<1	
									NS	<1	
									NS	<1	
15									NS	<1	

Note: See Figure B-1 for explanation of symbols.

Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-40



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-13
Sheet 1 of 1

Start Drilled 9/13/2017	End 9/13/2017	Total Depth (ft) 10	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) Vertical Datum 14.5 NAVD88		Hammer Data Pneumatic		Drilling Equipment GeoProbe 6600	
Easting (X) Northing (Y) 1208736.61 559501.57		System Datum WA State Plane North NAD83 (feet)		Groundwater not observed at time of exploration	
Notes:					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
0	12				1	Approximately 4 inches cement concrete Brown fine to coarse sand with gravel (fill)	NS	<1	Rock in shoe
							NS	<1	
							NS	<1	
							NS	<1	
5	60				2 CA	Gray sandy silt with trace gravel (moist) (native)	NS	<1	
							NS	<1	
							NS	<1	
							NS	<1	
							NS	<1	
10							NS	<1	

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-41



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-14
Sheet 1 of 1

Drilled	Start	End	Total Depth (ft)	15	Logged By	NS	Checked By	BJT	Driller	Cascade Drilling, LP	Drilling Method	Direch Push	
Surface Elevation (ft)			14.27		Hammer Data			Pneumatic			Drilling Equipment		GeoProbe 6600
Vertical Datum			NAVD88		System Datum			WA State Plane North NAD83 (feet)			See "Remarks" section for groundwater observed		
Easting (X)			1208793.28		System Datum			WA State Plane North NAD83 (feet)			See "Remarks" section for groundwater observed		
Northing (Y)			559512.02										
Notes:													

Elevation (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
0	26						CC	Approximately 4 inches cement concrete	NS	<1	Groundwater observed at approximately 8 feet at time of drilling
					1 CA		SP	Dark brown fine to coarse sand with gravel (dry) (fill)	NS	<1	
									NS	<1	
							SP	Light brown fine to medium sand with occasional gravel (moist)	NS	<1	
									NS	<1	
5	60				2 CA		ML	Gray silt with sand (moist) (native)	NS	<1	
							ML	Brown-gray silt with sand (moist)	NS	<1	
								Becomes wet	NS	<1	
									NS	<1	
									NS	<1	
10	60				3		ML	Brown silt with sand (moist)	NS	<1	
									NS	<1	
									NS	<1	
									NS	<1	
15									NS	<1	

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-42



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-15
Sheet 1 of 1

Drilled	Start 9/13/2017	End 9/13/2017	Total Depth (ft)	10	Logged By Checked By	NS BJT	Driller	Cascade Drilling, LP	Drilling Method	Direch Push
Surface Elevation (ft)	14.37		Hammer		Pneumatic			Drilling		
Vertical Datum	NAVD88		Data					Equipment		
Easting (X)	1208825.75		System		WA State Plane North			Groundwater not observed at time of exploration		
Northing (Y)	559510.64		Datum		NAD83 (feet)					
Notes:										

Elevation (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
0		36					CC	Approximately 6 inches cement concrete			
							SP	Dark brown fine to coarse sand with gravel (fill)	NS	<1	
									NS	<1	
							SP	Light brown fine to medium sand with gravel (moist)	NS	<1	
							ML	Brown silt with sand (wet) (native)	NS	<1	
5		60					ML	Brown silt with sand (moist)	NS	<1	
									NS	<1	
							ML	Brown silt with sand (dry)	NS	<1	
									NS	<1	
10											

Note: See Figure B-1 for explanation of symbols.

Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring GEI-43



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-16
Sheet 1 of 1

Start Drilled 9/13/2017	End 9/13/2017	Total Depth (ft) 15	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) Vertical Datum 12.94 NAVD88		Hammer Data Pneumatic		Drilling Equipment GeoProbe 6600	
Easting (X) Northing (Y) 1208733.06 559766.2		System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed	
Notes:					

Elevation (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
0		32					CR	Crushed gravel			
							SP	Brown fine to coarse sand with gravel (dry) (fill)	NS	<1	
					1 CA				NS	<1	
									NS	<1	
							SP	Light brown fine to medium sand (dry)	NS	<1	
5		60			2				NS	<1	
								Becomes moist, 1-inch shell layer	NS	<1	
					3 CA DUP 2				NS	<1	
							SP	Gray fine to medium sand (wet) (native)	NS	<1	
									NS	<1	
10		60			4 CA				NS	<1	
									NS	<1	
							SP	Dark gray fine to medium sand with occasional gravel (wet)	NS	<1	
									NS	<1	
					5				NS	<1	
15									NS	<1	

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

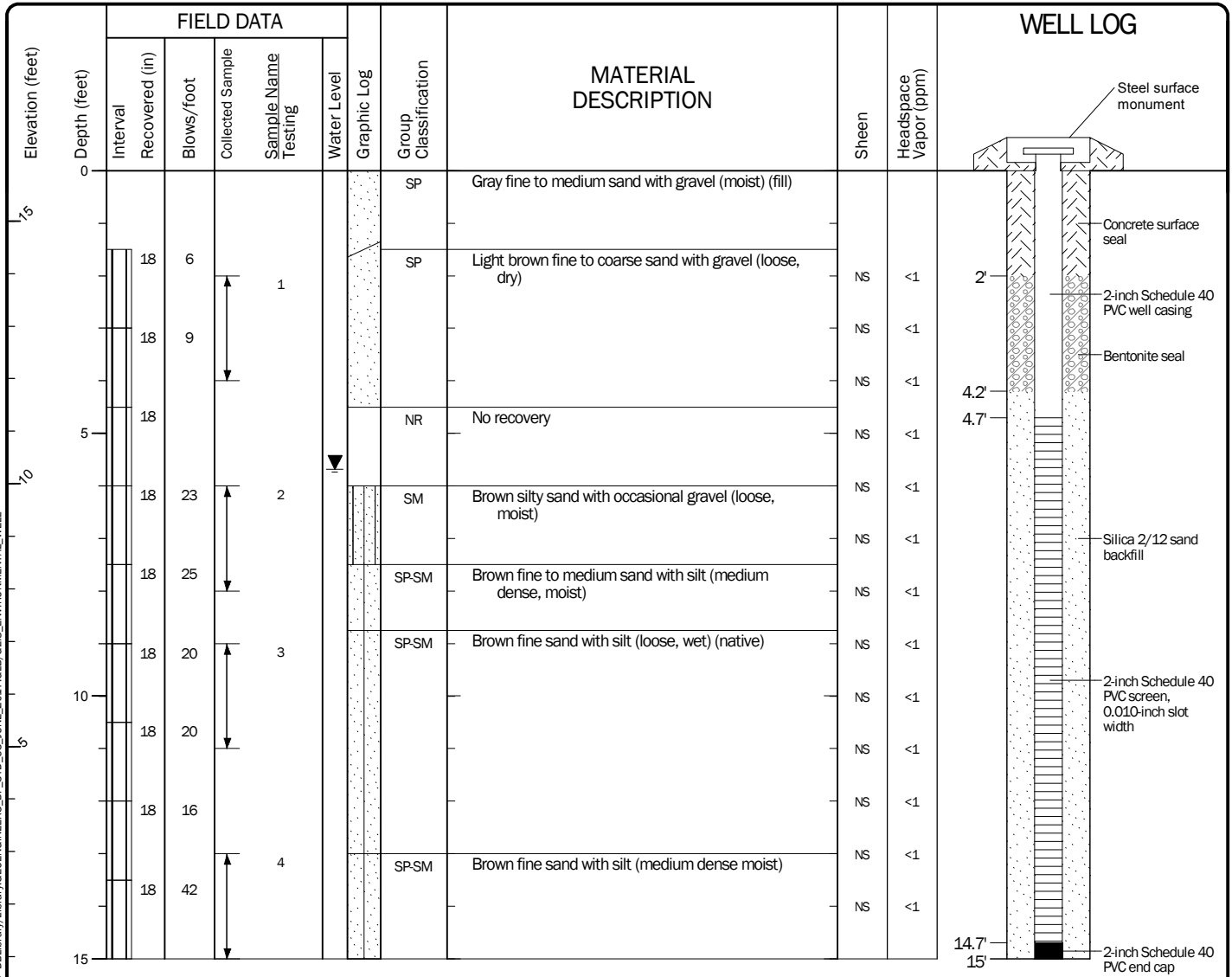
Log of Boring GEI-44



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-17
Sheet 1 of 1

Start Drilled 9/18/2017	End 9/18/2017	Total Depth (ft) 15	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Hollow-stem Auger
Hammer Data		Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment CME 75		DOE Well I.D.: BKA-355 A 2 (in) well was installed on 9/18/2017 to a depth of 15 (ft).
Surface Elevation (ft) Vertical Datum		15.96 NAVD88	Top of Casing Elevation (ft) 15.43		Groundwater Date Measured 10/18/2017
Easting (X) Northing (Y)		1208975.42 559557.88	Horizontal Datum WA State Plane North NAD83 (feet)		Depth to Water (ft) 5.68 Elevation (ft) 9.75
Notes:					



Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

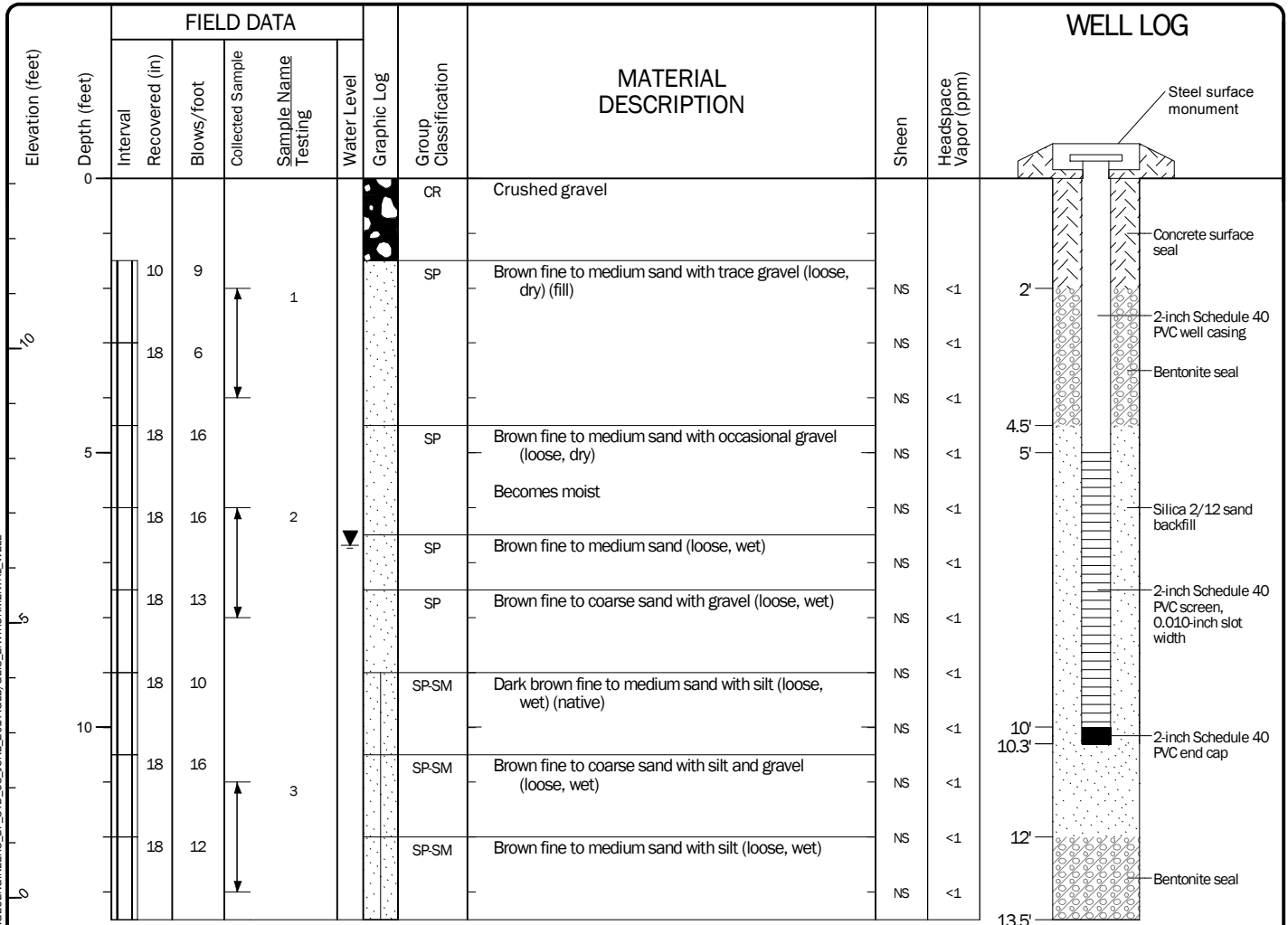
Log of Monitoring Well MW-6



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-18
Sheet 1 of 1

Start Drilled 9/19/2017	End 9/19/2017	Total Depth (ft) 13.5	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Hollow-stem Auger
Hammer Data Rope & Cathead 140 (lbs) / 30 (in) Drop		Drilling Equipment CME 75		DOE Well I.D.: BKA-357 A 2 (in) well was installed on 9/19/2017 to a depth of 10.3 (ft).	
Surface Elevation (ft) Vertical Datum 13.1 NAVD88		Top of Casing Elevation (ft) 12.62		Groundwater Date Measured 10/18/2017	
Easting (X) Northing (Y) 1208872.65 559890.97		Horizontal Datum WA State Plane North NAD83 (feet)		Depth to Water (ft) 6.69	Elevation (ft) 5.93
Notes:					



Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

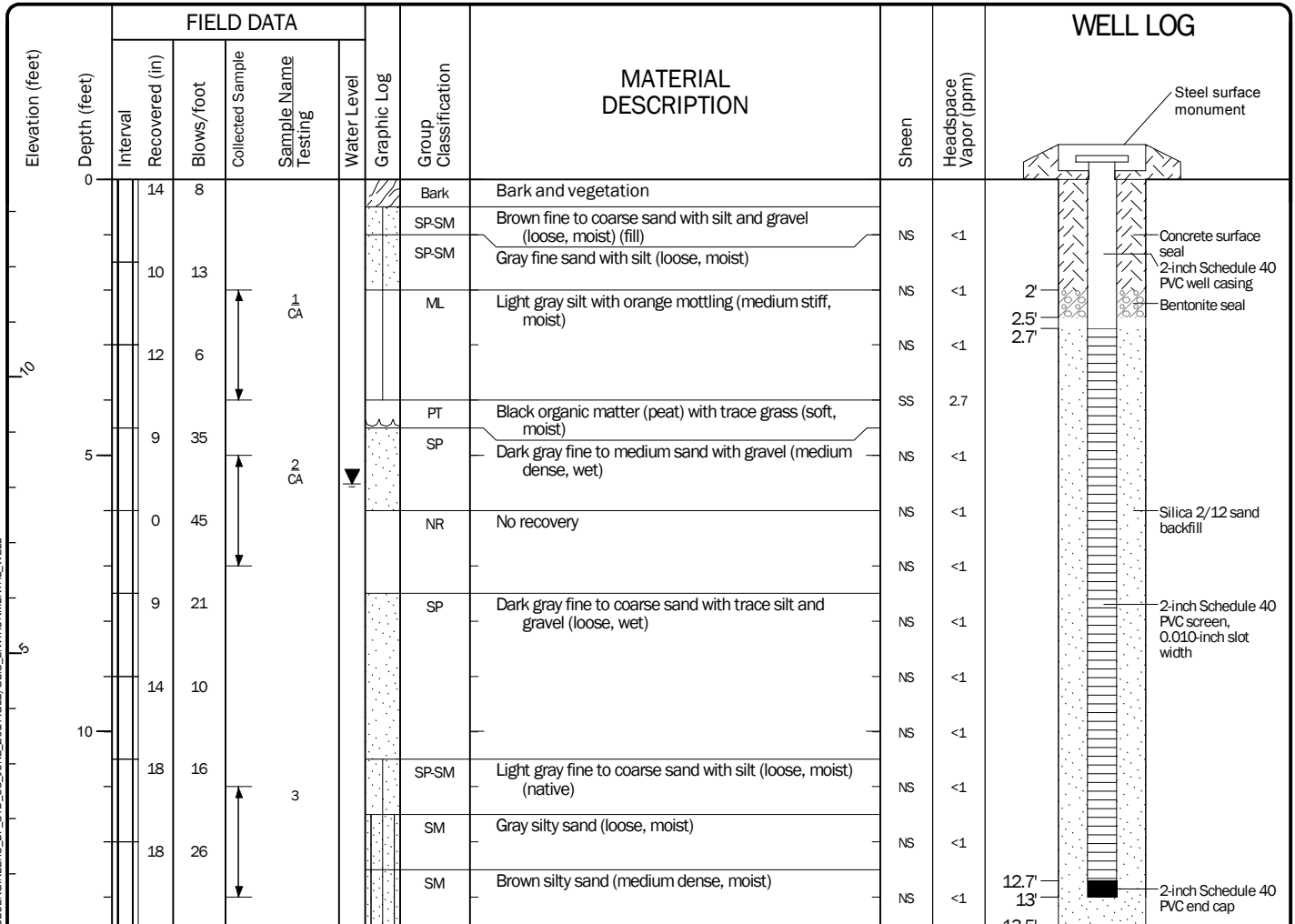
Log of Monitoring Well MW-7



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-19
Sheet 1 of 1

Start Drilled 9/19/2017	End 9/19/2017	Total Depth (ft) 13.5	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Hollow-stem Auger
Hammer Data Rope & Cathead 140 (lbs) / 30 (in) Drop		Drilling Equipment CME 75		DOE Well I.D.: BKA-356 A 2 (in) well was installed on 9/19/2017 to a depth of 13 (ft).	
Surface Elevation (ft) Vertical Datum 13.58 NAVD88		Top of Casing Elevation (ft) 13.13		Groundwater Date Measured 10/17/2017	
Easting (X) Northing (Y) 1208872.65 559890.97		Horizontal Datum WA State Plane North NAD83 (feet)		Depth to Water (ft) 5.51	Elevation (ft) 7.62
Notes:					



Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

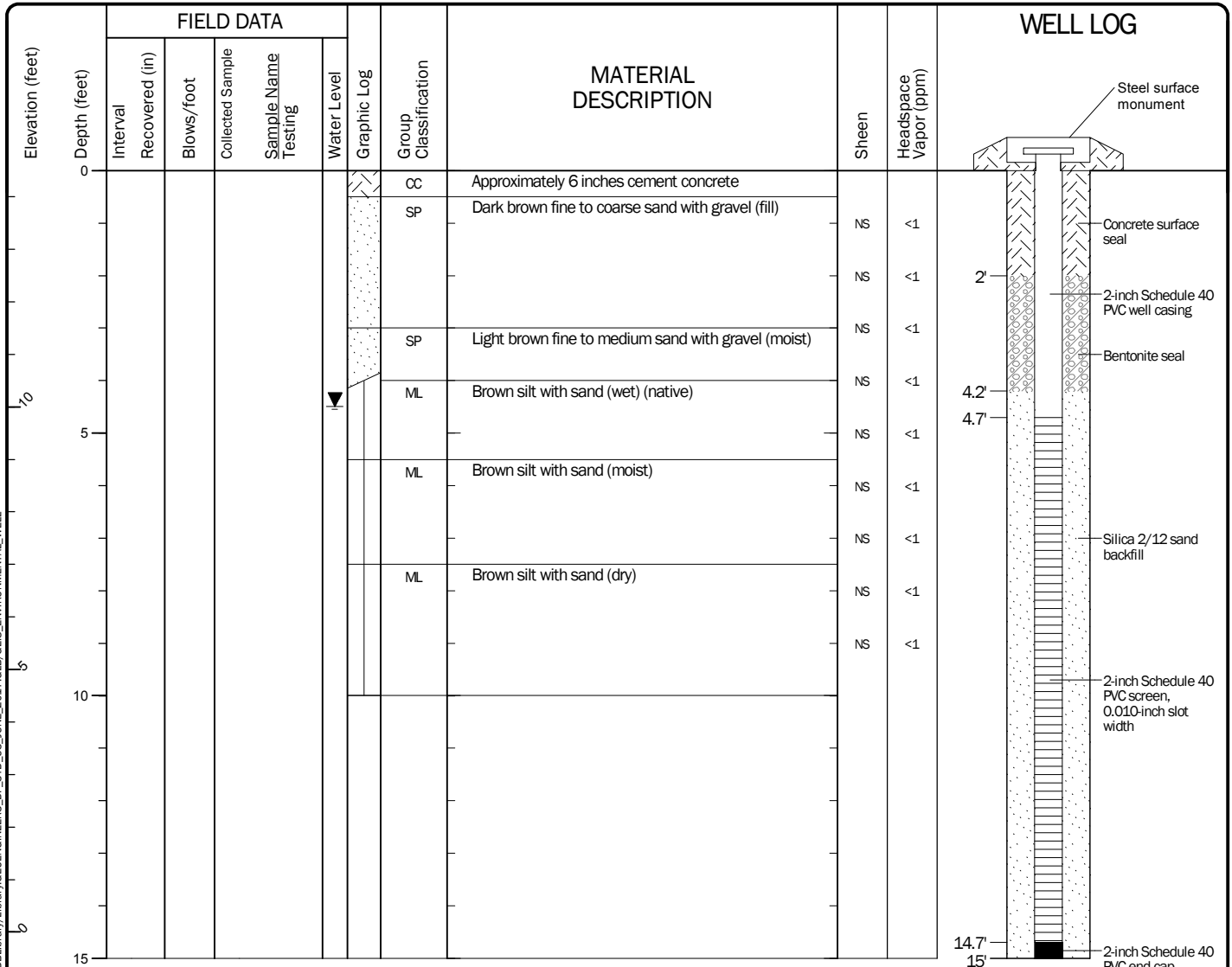
Log of Monitoring Well MW-8



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-20
Sheet 1 of 1

Start Drilled 9/18/2017	End 9/18/2017	Total Depth (ft) 15	Logged By Checked By	Driller Cascade Drilling, LP	Drilling Method Hollow-stem Auger
Hammer Data		Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment CME 75		DOE Well I.D.: BKA-353 A 2 (in) well was installed on 9/18/2017 to a depth of 15 (ft).
Surface Elevation (ft) Vertical Datum		14.5 NAVD88	Top of Casing Elevation (ft) 14.17		Groundwater Date Measured 10/17/2017
Easting (X) Northing (Y)		1208826.27 559499.27	Horizontal Datum WA State Plane North NAD83 (feet)		Depth to Water (ft) 4.49 Elevation (ft) 9.68
Notes: Soil descriptions referenced from exploration log GEI-43					



Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

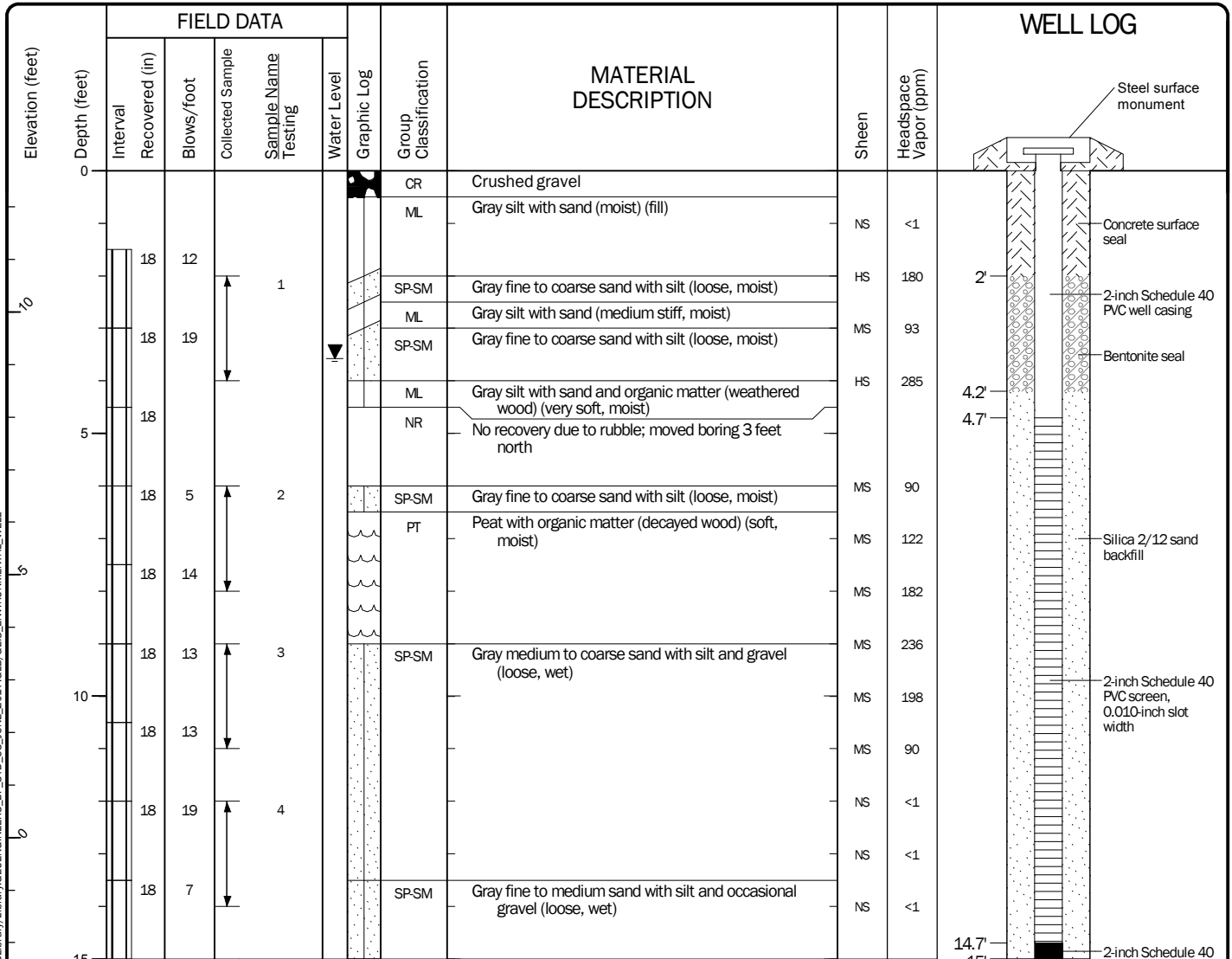
Log of Monitoring Well MW-10



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-21
Sheet 1 of 1

Start Drilled 9/18/2017	End 9/18/2017	Total Depth (ft) 15	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Hollow-stem Auger
Hammer Data		Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment CME 75		DOE Well I.D.: BKA-354 A 2 (in) well was installed on 9/18/2017 to a depth of 15 (ft).
Surface Elevation (ft) Vertical Datum		12.69 NAVD88	Top of Casing Elevation (ft) 12.28		Groundwater Date Measured 10/17/2017
Easting (X) Northing (Y)		1208783.3 559665.06	Horizontal Datum WA State Plane North NAD83 (feet)		Depth to Water (ft) 3.58 Elevation (ft) 8.70
Notes:					



Note: See Figure B-1 for explanation of symbols.

Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Monitoring Well MW-11



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-22
Sheet 1 of 1

Start Drilled 9/15/2017	End 9/15/2017	Total Depth (ft) 9	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) Vertical Datum 4.41 NAVD88		Hammer Data Pneumatic		Drilling Equipment GeoProbe 7822 DT	
Easting (X) Northing (Y) 1208635.57 559848.09		System Datum WA State Plane North NAD83 (feet)		Groundwater not observed at time of exploration	
Notes:					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
0	18				1 CA	GP			
						SP	NS	<1	
							NS	<1	
	32				2 CA	SPSM	NS	<1	
							NS	<1	
5							NS	<1	
	30						NS	<1	
							NS	<1	
					3	GP	NS	<1	
						SP			

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring SED-1B



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-23
Sheet 1 of 1

Start Drilled 9/15/2017	End 9/15/2017	Total Depth (ft) 12	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direch Push
Surface Elevation (ft) Vertical Datum 1.17 NAVD88		Hammer Data Pneumatic		Drilling Equipment GeoProbe 7822 DT	
Easting (X) Northing (Y) 1208640.96 559873.14		System Datum WA State Plane North NAD83 (feet)		Groundwater not observed at time of exploration	
Notes:					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
0	23					GP Sand and cobble (moist)			
					1 CA	SP-SM Brown fine to coarse sand with silt and occasional shell fragments (moist)	NS	<1	
						SP Dark gray to black fine to coarse sand with occasional gravel (moist)	NS	<1	
27					2 CA	SP-SM Gray fine sand with silt and occasional gravel (wet)	NS	<1	
5							NS	<1	
36						SP-SM Brown fine to medium sand with silt and occasional gravel (wet)	NS	<1	
							NS	<1	
					3		NS	<1	
							NS	<1	
10	36						NS	<1	
							NS	<1	

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on topographic land survey completed by Sound Development Group October 6, 2017. Vertical approximated based on topographic land survey completed by Sound Development Group October 6, 2017.

Log of Boring SED-1C



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-24
Sheet 1 of 1

Date:5/17/19 Path:W:\PROJECTS\5\5147024\GINT\514702405.GPJ DBLibrary/Library\GEOENGINEERS_DF_STD_US_JUNE_2017.GLB\GEI8_ENVIRONMENTAL_STANDARD_NO_GW

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

GEOENGINEERS

Figure B-
Sheet 1 of 1

Drilled	Start 7/17/2018	End 7/17/2018	Total Depth (ft)	5	Logged By Checked By	PR BJT	Driller	Gravity Environmental	Drilling Method	Vibracore
Surface Elevation (ft) Vertical Datum					Undetermined		Hammer Data		N/A	
Easting (X) Northing (Y)					1208564.71 559795.03		System Datum		WA State Plane North NAD83 (feet)	
Groundwater not observed at time of exploration										
Notes:										

Elevation (feet)	FIELD DATA					Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing						
0		60					ML	Brown-black silt with sand			
							SP-SM	Brown-black fine to coarse sand with silt	NS	<1	
							GP	Brown-black fine to coarse gravel with sand and trace silt	NS	<1	
							SP	Brown fine to coarse sand with gravel	NS	<1	
5											Difficult to recover sediment at base of core

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Boring SED-3	
	Project: Quiet Cove
	Project Location: Anacortes, Washington
	Project Number: 5147-024-05
Figure B- Sheet 1 of 1	

Drilled	Start 7/16/2018	End 7/16/2018	Total Depth (ft)	5.5	Logged By Checked By	PR BJT	Driller	Gravity Environmental	Drilling Method	Vibracore
Surface Elevation (ft) Vertical Datum					Undetermined		Hammer Data		N/A	
Easting (X) Northing (Y)					1208595.18 559832.32		System Datum		WA State Plane North NAD83 (feet)	
Groundwater not observed at time of exploration										
Notes:										

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS	
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing					
0	54					GP	Black fine to coarse gravel with sand	NS	<1	
						SP	Black fine to coarse sand with trace silt and occasional gravel	NS	<1	
						ML	Black silt with sand and occasional gravel	NS	<1	
						GP	Fine to coarse gravel with trace silt, sand and occasional cobbles	NS	<1	
5										

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Boring SED-4	
	Project: Quiet Cove
	Project Location: Anacortes, Washington
	Project Number: 5147-024-05
Figure B- Sheet 1 of 1	

Date:5/17/19 Path:W:\PROJECTS\5\5147024\GINT\514702405.GPJ DBLibrary/Library\GEOENGINEERS_DF_STD_US_JUNE_2017.GLB\GEI8_ENVIRONMENTAL_STANDARD_NO_GW

Date:5/17/19 Path:W:\PROJECTS\5\5147024\GINT\514702405.GPJ DBLibrary/Library\GEOENGINEERS_DF_STD_US_JUNE_2017.GLB\GEI8_ENVIRONMENTAL_STANDARD_NO_GW

GEOENGINEERS

Figure B-
Sheet 1 of 1

Drilled	Start 7/17/2018	End 7/17/2018	Total Depth (ft)	4.75	Logged By Checked By	PR BJT	Driller	Cascade Drilling, LP	Drilling Method	Direct Push
Surface Elevation (ft) Vertical Datum					Undetermined		Hammer Data		N/A	
Easting (X) Northing (Y)					1208594.91 559752.22		System Datum		WA State Plane North NAD83 (feet)	
Groundwater not observed at time of exploration										
Notes:										

Elevation (feet)	Depth (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
		Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
0		42					Brown fine to coarse sand with occasional sand	NS	<1	<10% shell fragments
							No recovery, refusal			Multiple attempts with consistent refusal at approximately 3 feet depth

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

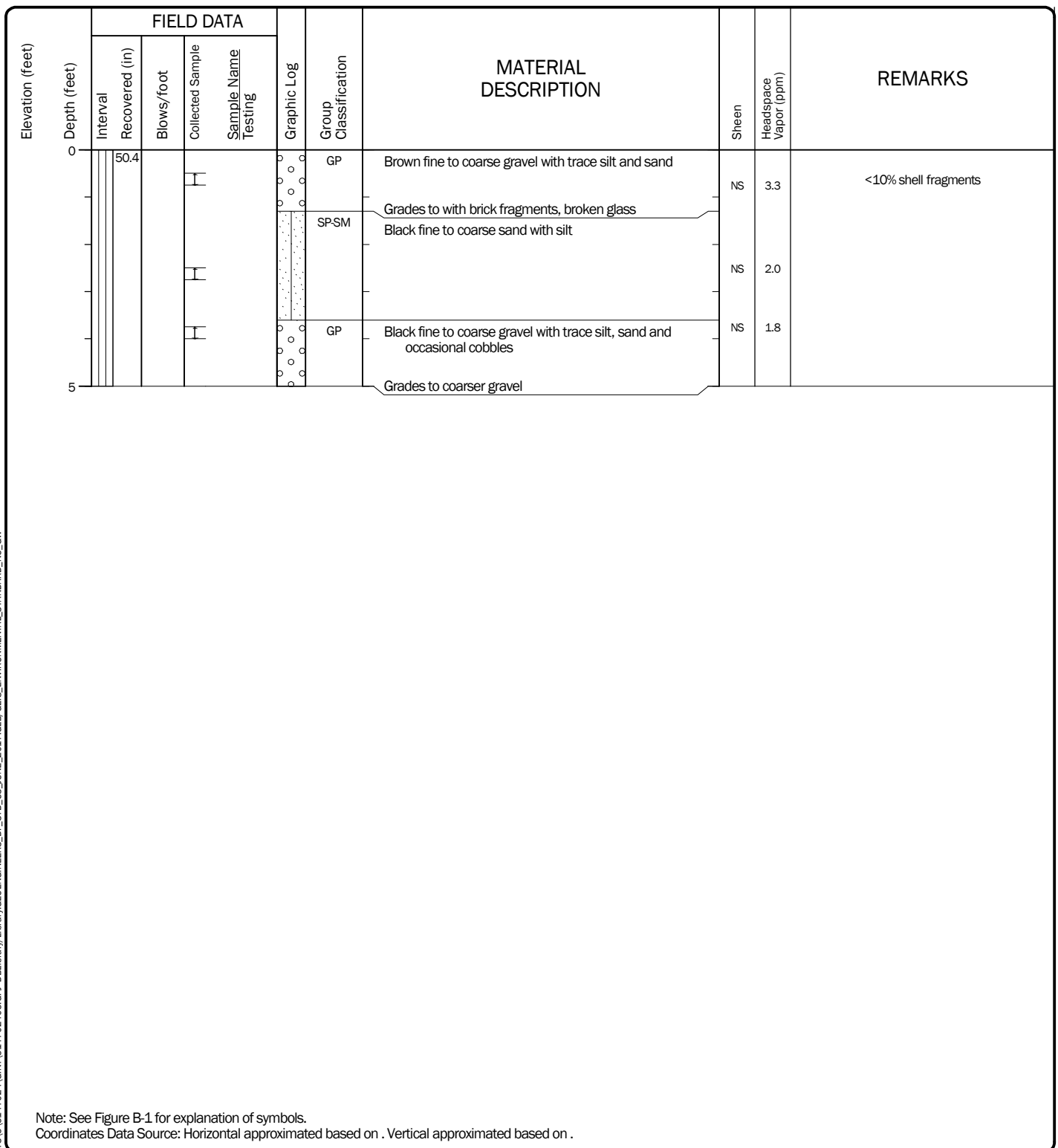
Log of Boring SED-6



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-
Sheet 1 of 1

Start Drilled 7/16/2018	End 7/16/2018	Total Depth (ft) 5	Logged By Checked By PR BJT	Driller Gravity Environmental	Drilling Method Vibracore
Surface Elevation (ft) Vertical Datum Undetermined			Hammer Data N/A		Drilling Equipment RV Discovery, 27' Research Vessel
Easting (X) Northing (Y) 1208526.17 559709.73			System Datum WA State Plane North NAD83 (feet)		Groundwater not observed at time of exploration
Notes:					



Log of Boring SED-8	
	Project: Quiet Cove
	Project Location: Anacortes, Washington
	Project Number: 5147-024-05
Figure B- Sheet 1 of 1	

Date:5/17/19 Path:W:\PROJECTS\5\5147024\GINT\514702405.GPJ DBLibrary/Library\GEOENGINEERS_DF_STD_US_JUNE_2017.GLB\GEI8_ENVIRONMENTAL_STANDARD_NO_GW

Date:5/17/19 Path:W:\PROJECTS\5\5147024\GINT\514702405.GPJ DBLibrary/Library\GEOENGINEERS_DF_STD_US_JUNE_2017.GLB\GEI8_ENVIRONMENTAL_STANDARD_NO_GW

Figure B-
Sheet 1 of 1

Drilled	Start 7/17/2018	End 7/17/2018	Total Depth (ft)	6.75	Logged By Checked By	PR BJT	Driller	Gravity Environmental	Drilling Method	Vibracore
Surface Elevation (ft) Vertical Datum					Undetermined		Hammer Data		N/A	
Easting (X) Northing (Y)					1208615.7 559878		System Datum		WA State Plane North NAD83 (feet)	
Groundwater not observed at time of exploration										
Notes:										

Elevation (feet)	FIELD DATA					Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing					
0	74.4					ML	Brown-black silt with sand	NS	<1	<5% shell fragments
						SM	Becomes more dense Brown-black silty fine sand			
						SP	Decreased silt content Brown-black medium to coarse sand with gravel and occasional cobbles	NS	2.2	
5										

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Boring SED-10	
	Project: Quiet Cove
	Project Location: Anacortes, Washington
	Project Number: 5147-024-05
Figure B- Sheet 1 of 1	

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS	
			GRAPH	LETTER		
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES	
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES	
		GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES	
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES	
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS
			(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND
MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE		SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES	
			(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY	
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
	MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
					CH	INORGANIC CLAYS OF HIGH PLASTICITY
					OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

Sampler Symbol Descriptions

	2.4-inch I.D. split barrel
	Standard Penetration Test (SPT)
	Shelby tube
	Piston
	Direct-Push
	Bulk or grab
	Continuous Coring

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

"P" indicates sampler pushed using the weight of the drill rig.

"WOH" indicates sampler pushed using the weight of the hammer.

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS		TYPICAL DESCRIPTIONS
GRAPH	LETTER	
	AC	Asphalt Concrete
	CC	Cement Concrete
	CR	Crushed Rock/Quarry Spalls
	SOD	Sod/Forest Duff
	TS	Topsoil

Groundwater Contact



Measured groundwater level in exploration, well, or piezometer



Measured free product in well or piezometer

Graphic Log Contact



Distinct contact between soil strata



Approximate contact between soil strata

Material Description Contact



Contact between geologic units



Contact between soil of the same geologic unit

Laboratory / Field Tests

%F	Percent fines
%G	Percent gravel
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DD	Dry density
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
Mohs	Mohs hardness scale
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen

Key to Exploration Logs



Figure A-1

Start Drilled 10/17/2018	End 10/17/2018	Total Depth (ft) 20	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direct Push
Surface Elevation (ft) Vertical Datum 12.35			Hammer Data N/A		Drilling Equipment Track-mounted Drill Rig
Easting (X) Northing (Y) 559669.4416 1208741.24			System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed
Notes:					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
0	36					CR SP Crushed rock Brown fine to coarse sand with occasional gravel (loose, moist)			
5	60					ML Gray silt with sand	SS	<1	
10	60					SM Gray silty fine to coarse sand (medium dense, moist)	HS	315	
15	60					PT Brown peat (medium stiff, wet)	NS	<1	Groundwater observed at approximately 8 feet during drilling
20	60					SM Gray silty fine to coarse sand with gravel (loose, wet)	HS	121	
						SP Gray fine to coarse sand with trace silt (loose, wet)	SS	28	
						SP Gray medium to coarse sand			
						SM Gray silty fine to medium sand (dense, wet)			
						ML Gray silt (very dense, moist to wet) (native till)	NS	<1	

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Boring SD-1



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-2
Sheet 1 of 1

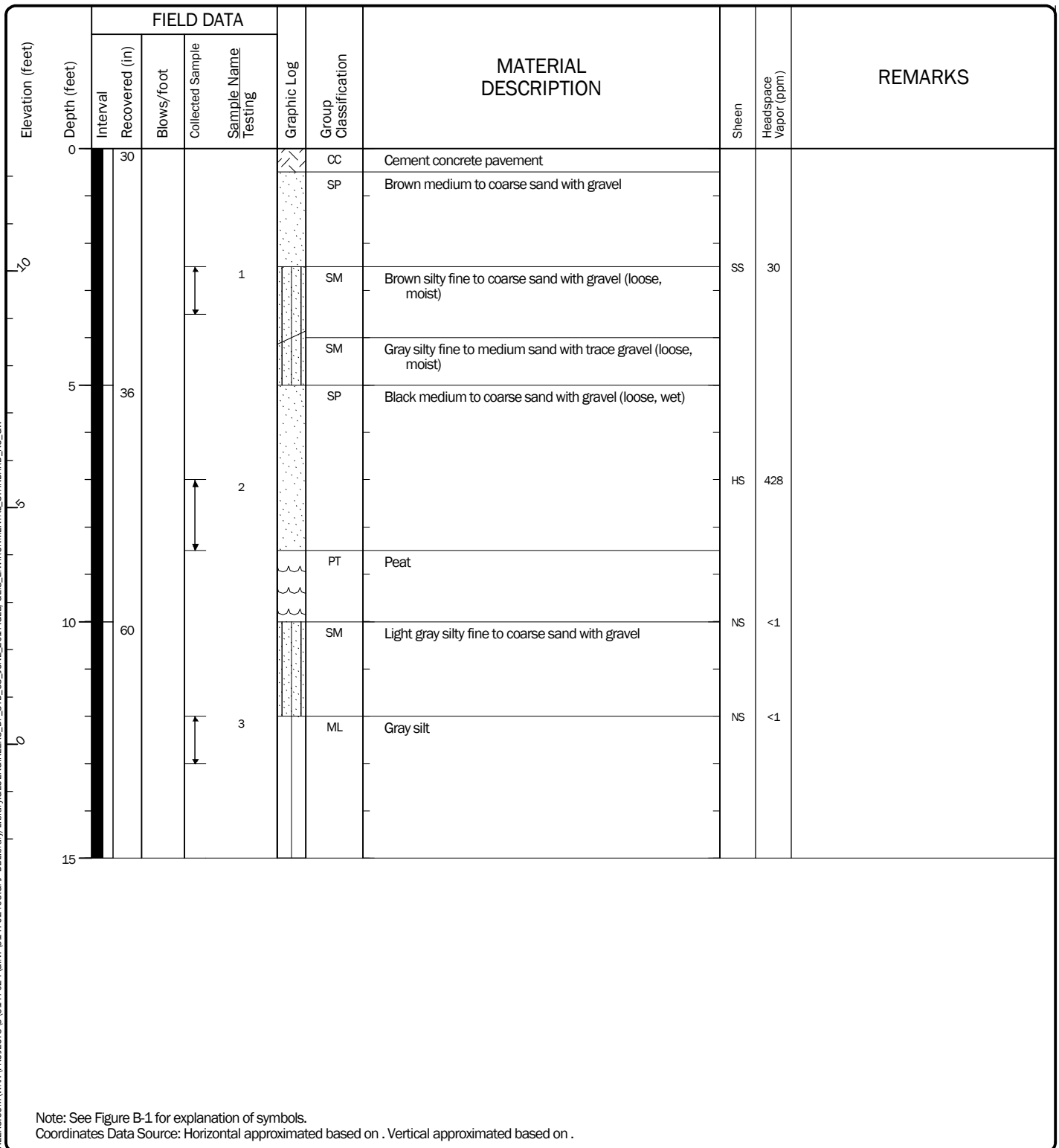
Start Drilled	10/17/2018	End 10/17/2018	Total Depth (ft)	15	Logged By Checked By	NS BJT	Driller	Cascade Drilling, LP	Drilling Method	Direct Push	
Surface Elevation (ft) Vertical Datum				12.36	Hammer Data			N/A	Drilling Equipment		Track-mounted Drill Rig
Easting (X) Northing (Y)		559677.0847 1208790.458			System Datum		WA State Plane North NAD83 (feet)		Groundwater not observed at time of exploration		
Notes:											

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
0	36					CR			
1						SP	SS	9	
						ML	SS	11	
5						SM	SS	20	
2						SM	MS	226	
						PT			
10						SM	NS	1	
						SM			
						ML	NS	<1	
15									

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

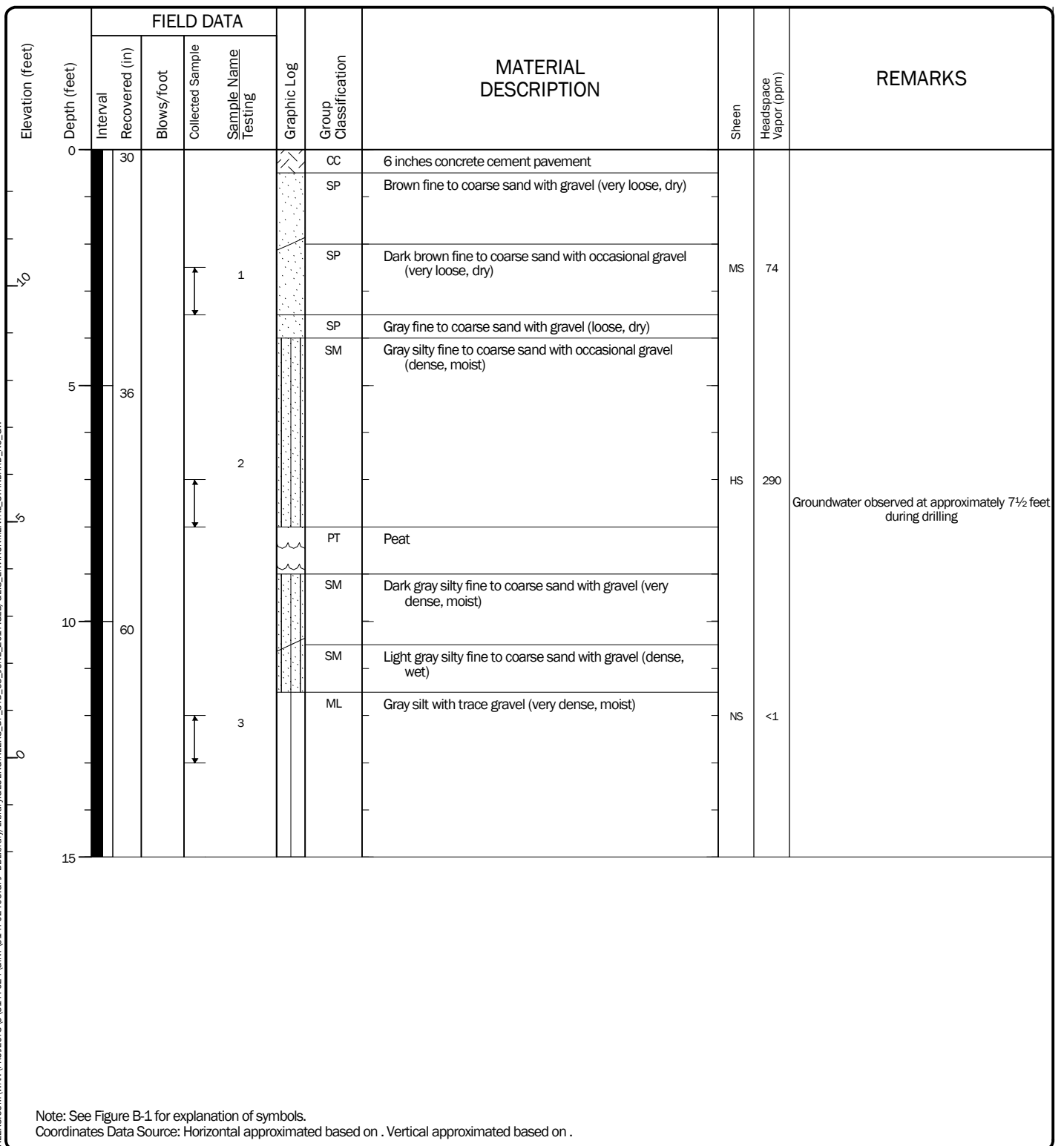
Log of Boring SD-2		
	Project: Quiet Cove	
	Project Location: Anacortes, Washington	
	Project Number: 5147-024-05	
		Figure B-3 Sheet 1 of 1

Start Drilled 10/17/2018	End 10/17/2018	Total Depth (ft) 15	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direct Push
Surface Elevation (ft) Vertical Datum 12.59			Hammer Data N/A		Drilling Equipment Track-mounted Drill Rig
Easting (X) Northing (Y) 559651.0388 1208824.646			System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed
Notes:					



Log of Boring SD-3		
	Project: Quiet Cove	
	Project Location: Anacortes, Washington	
	Project Number: 5147-024-05	
		Figure B-4 Sheet 1 of 1

Drilled	Start 10/17/2018	End 10/17/2018	Total Depth (ft)	15	Logged By Checked By	NS BJT	Driller	Cascade Drilling, LP	Drilling Method	Direct Push	
Surface Elevation (ft) Vertical Datum				12.89	Hammer Data			N/A	Drilling Equipment		Track-mounted Drill Rig
Easting (X) Northing (Y)		559624.0329 1208721.003			System Datum		WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed		
Notes:											



Start Drilled 10/18/2018	End 10/18/2018	Total Depth (ft) 11	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direct Push
Surface Elevation (ft) Vertical Datum 13.1			Hammer Data N/A		Drilling Equipment Track-mounted Drill Rig
Easting (X) Northing (Y) 559577.8851 1208791.369			System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed
Notes:					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
0	18					SOD			
					1	SM		<1	
						SM			
						SM			
5	60				2	SM	SS	<1	Groundwater observed at approximately 5 feet during drilling
						SM			
					3	ML	NS	<1	
10	12								

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Boring SD-5



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-6
Sheet 1 of 1

Start Drilled 10/18/2018	End 10/18/2018	Total Depth (ft) 10	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direct Push
Surface Elevation (ft) Vertical Datum 15.66			Hammer Data N/A		Drilling Equipment Track-mounted Drill Rig
Easting (X) Northing (Y) 559601.709 1208866.706			System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed
Notes:					

Elevation (feet)	FIELD DATA					MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing				
0	54					SOD			
					1	SM		<1	
						SM			
					2	SM		<1	
5	60								
					3			<1	
						SM			
					4	ML		<1	
10									Groundwater observed at approximately 6 feet during drilling

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Boring SD-6



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-7
Sheet 1 of 1

Start Drilled 10/17/2018	End 10/17/2018	Total Depth (ft) 20	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direct Push
Surface Elevation (ft) Vertical Datum 12.28			Hammer Data N/A		Drilling Equipment Track-mounted Drill Rig
Easting (X) Northing (Y) 559689.3087 1208650.605			System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed
Notes:					

Elevation (feet)	FIELD DATA					Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	Interval Depth (feet)	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing					
0	48					CR	Gravel surface			
					1	SP	Dark brown fine to coarse sand with occasional gravel and trace organic matter (roots) (loose, moist)	SS	<1	
					2	SP	Brown fine to medium sand with trace gravel (medium dense, moist)	SS	<1	
						SP	Gray fine sand (medium dense, moist)	NS	<1	
5	60									
						SM	Gray silty fine to medium sand with occasional gravel (medium dense, moist)	NS	<1	
					3	SM	Gray silty fine to medium sand with occasional gravel (dense, wet)	NS	<1	Groundwater observed at approximately 8½ feet during drilling
10	60									
						SM	Gray silty fine to coarse sand with gravel (very dense, wet)	NS	<1	
15	60				4					
						SM	Gray silty fine to coarse sand (very dense, wet)	NS	<1	
					5	ML	Gray silt with sand (very dense, moist)	NS	<1	
20										

Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

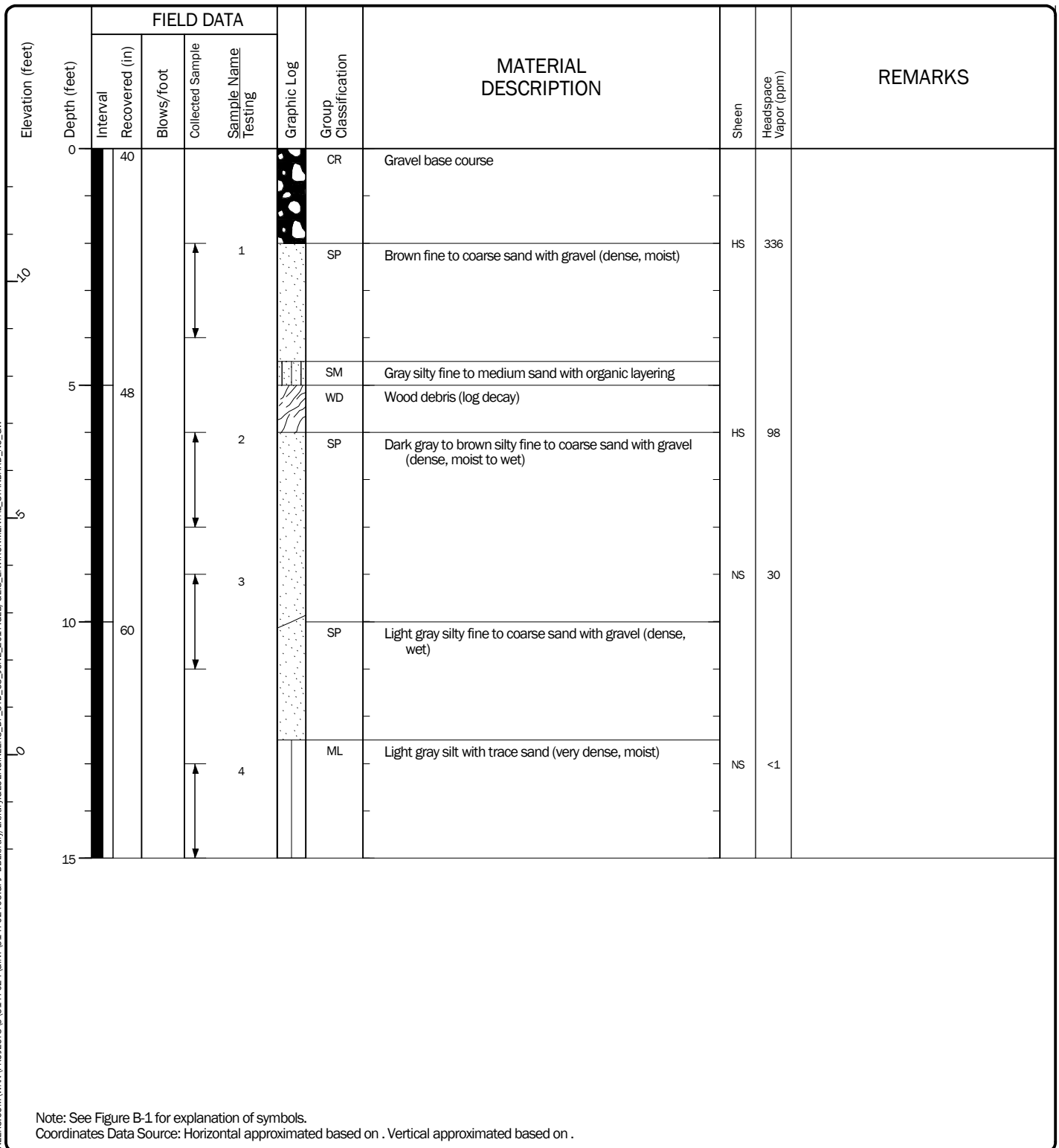
Log of Boring SD-7



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

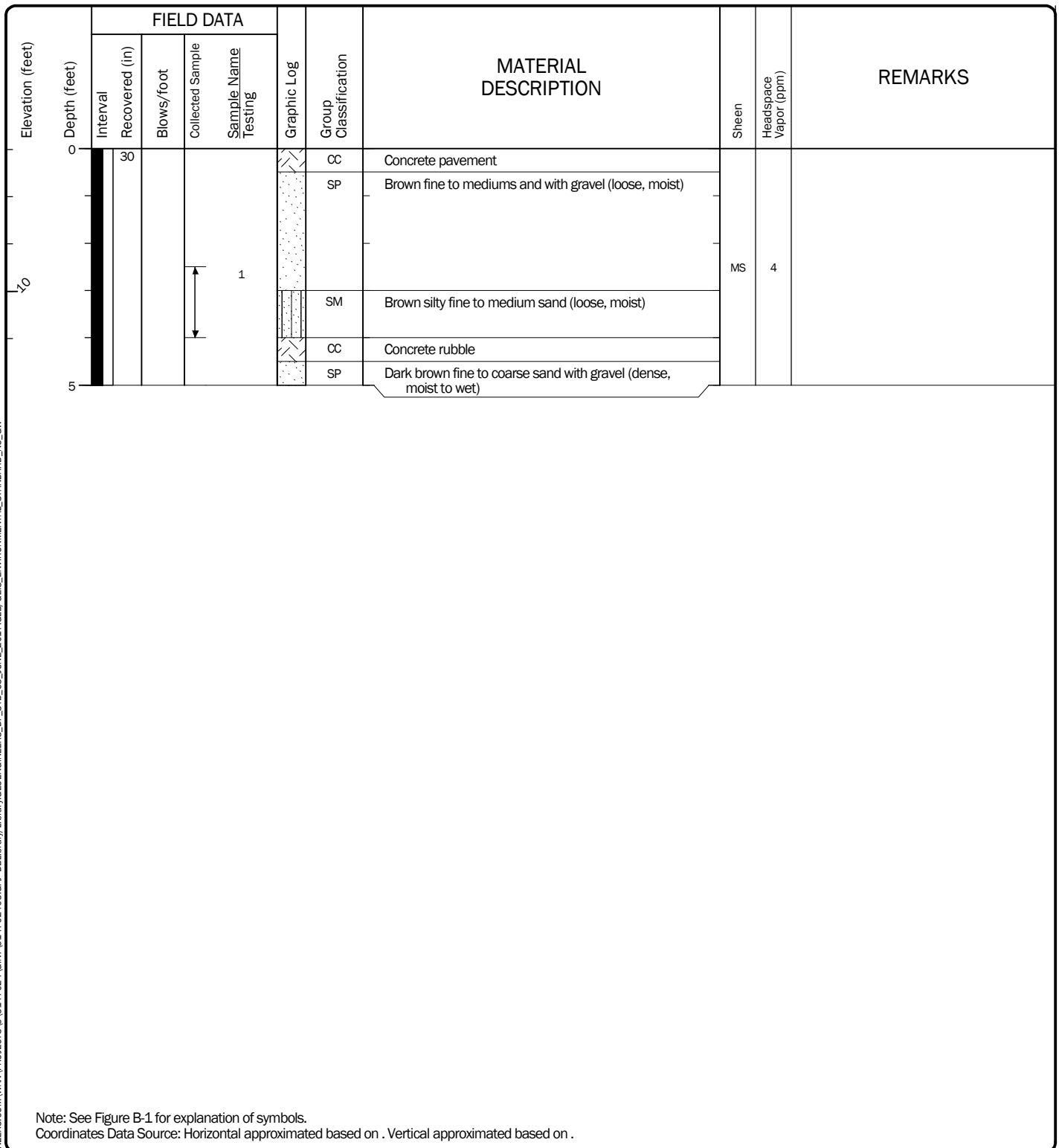
Figure B-8
Sheet 1 of 1

Start Drilled 10/17/2018	End 10/17/2018	Total Depth (ft) 15	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direct Push
Surface Elevation (ft) Vertical Datum 12.81			Hammer Data N/A		Drilling Equipment Track-mounted Drill Rig
Easting (X) Northing (Y) 559636.0374 1208772.986			System Datum WA State Plane North NAD83 (feet)		Groundwater not observed at time of exploration
Notes:					



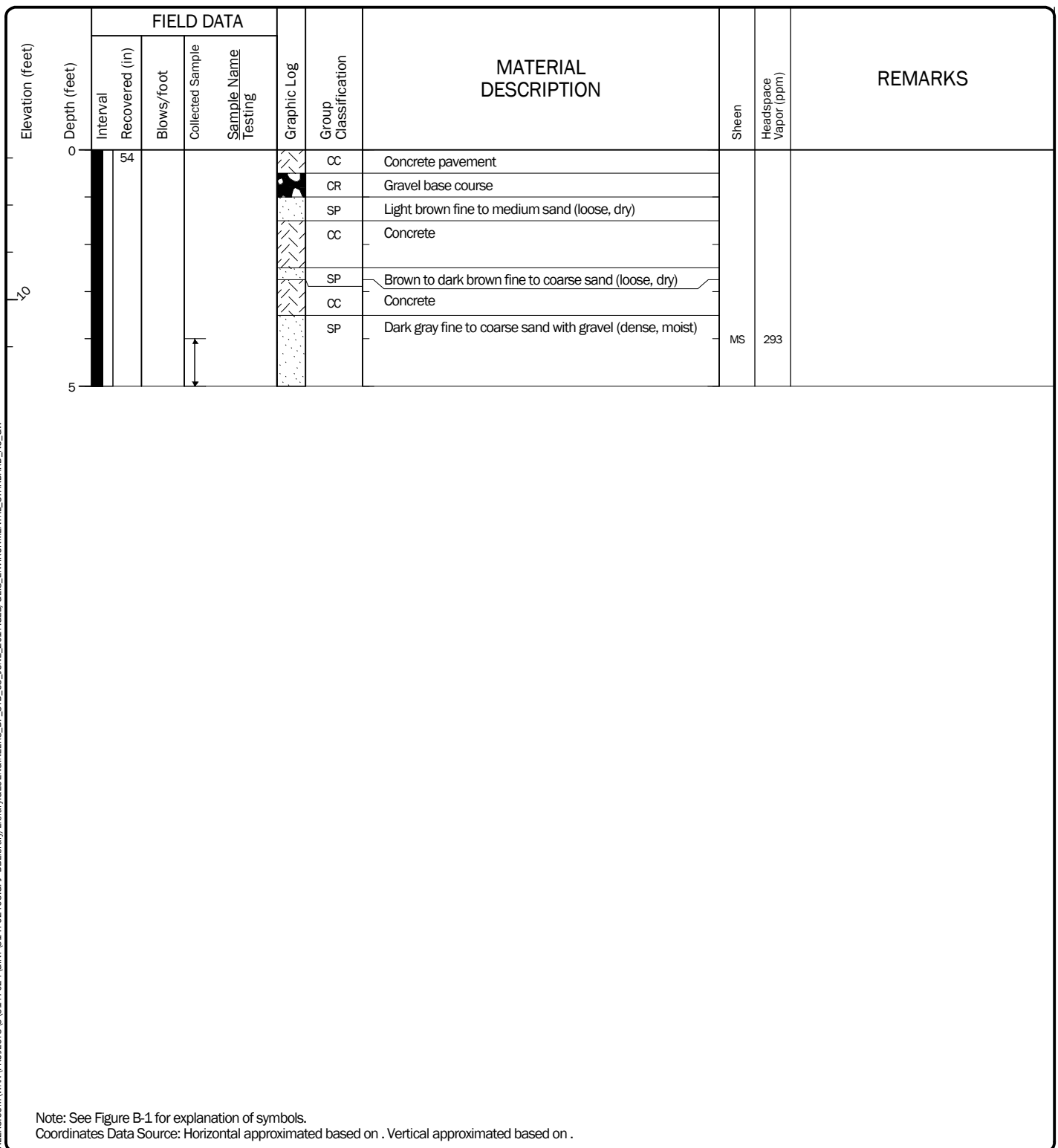
Log of Boring SD-8		
	Project: Quiet Cove	
	Project Location: Anacortes, Washington	
	Project Number: 5147-024-05	
		Figure B-9 Sheet 1 of 1

Start Drilled 10/17/2018	End 10/17/2018	Total Depth (ft) 5	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direct Push
Surface Elevation (ft) Vertical Datum 13.02			Hammer Data N/A		Drilling Equipment Track-mounted Drill Rig
Easting (X) Northing (Y) 559632.6333 1208844.563			System Datum WA State Plane North NAD83 (feet)		Groundwater not observed at time of exploration
Notes:					



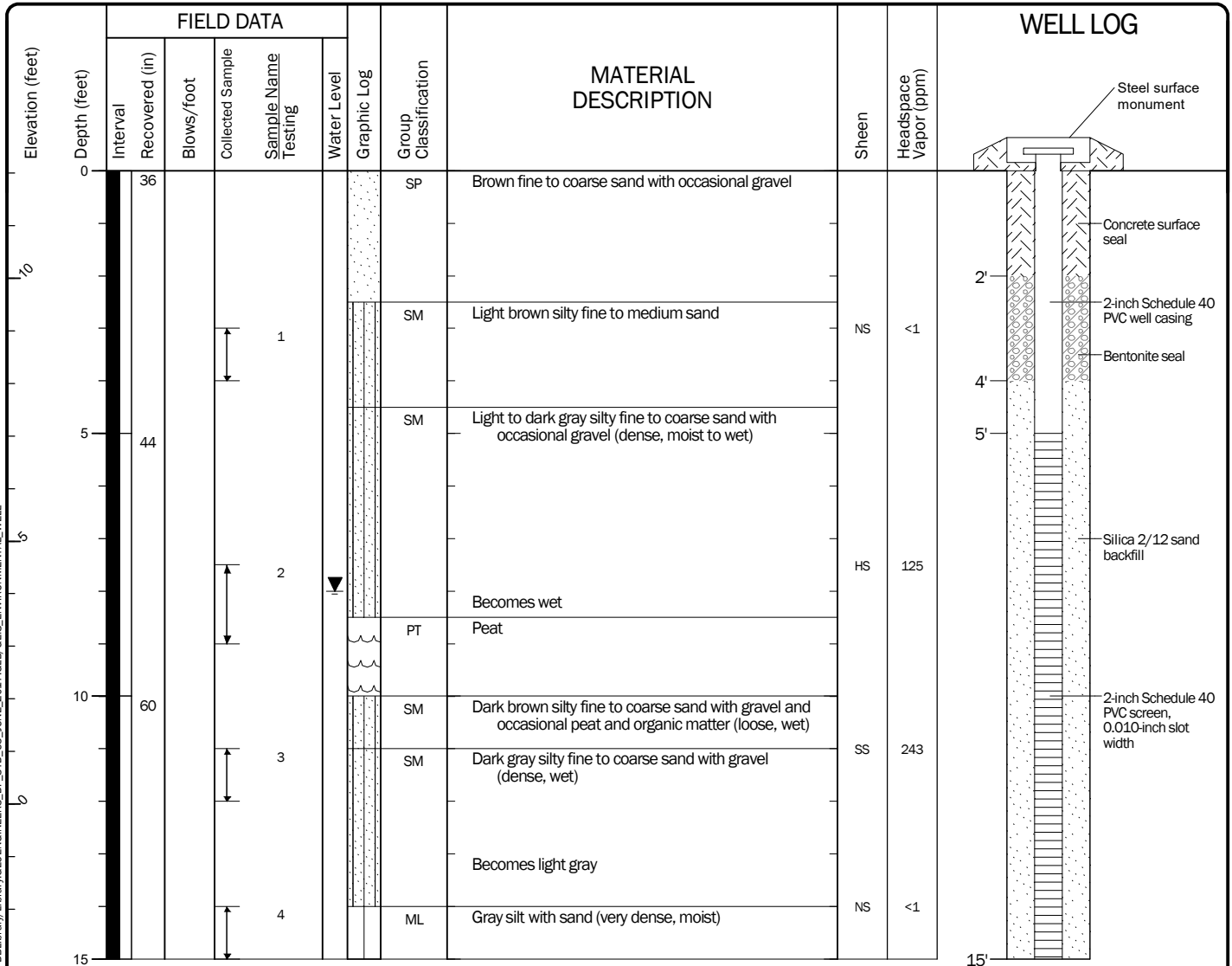
Log of Boring SD-9		
	Project: Quiet Cove	
	Project Location: Anacortes, Washington	
	Project Number: 5147-024-05	
		Figure B-10 Sheet 1 of 1

Start Drilled 10/18/2018	End 10/18/2018	Total Depth (ft) 5	Logged By Checked By NS BJT	Driller Cascade Drilling, LP	Drilling Method Direct Push
Surface Elevation (ft) Vertical Datum 13.17			Hammer Data N/A		Drilling Equipment Track-mounted Drill Rig
Easting (X) Northing (Y) 559601.036 1208783.61			System Datum WA State Plane North NAD83 (feet)		Groundwater not observed at time of exploration
Notes:					



Log of Boring SD-10		
	Project: Quiet Cove	
	Project Location: Anacortes, Washington	
	Project Number: 5147-024-05	
		Figure B-11 Sheet 1 of 1

Start Drilled 10/18/2018	End 10/18/2018	Total Depth (ft)	15	Logged By Checked By	NS BJT	Driller	Cascade Drilling, LP	Drilling Method	Direct Push
Hammer Data		N/A		Drilling Equipment		Track-mounted Drill Rig		DOE Well I.D.: BKF-773 A 2-in well was installed on 10/18/2018 to a depth of 15 ft.	
Surface Elevation (ft) Vertical Datum		12.05		Top of Casing Elevation (ft)		11.17		Groundwater	
Easting (X) Northing (Y)		559695.7474 1208842.819		Horizontal Datum		WA State Plane North NAD83 (feet)		Date Measured 10/18/2018	Depth to Water (ft) 8.00
								Elevation (ft) 3.17	
Notes:									



Note: See Figure B-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Boring MW-12



Project: Quiet Cove
Project Location: Anacortes, Washington
Project Number: 5147-024-05

Figure B-12
Sheet 1 of 1

ATTACHMENT 2

Surveys



View of the lower beach from N Avenue looking northeast.

Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 11.7 feet below ground surface.
6. Static water level was 6.37 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study and Slug Testing/Slug Tests/MW-2_BouwerRice1976.xlsx

Visual Survey – Quiet Cove Beach

Quiet Cove Property
Anacortes, WA



Figure 2-1



View of the lower beach from adjacent to Quiet Cove Site looking northeast.

Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 11.7 feet below ground surface.
6. Static water level was 6.37 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study and Slug Testing/Slug Tests/MW-2_BouwerRice1976.xlsx

Visual Survey – Quiet Cove Beach

Quiet Cove Property
Anacortes, WA



Figure 2-2



View from the lower beach looking east at the Quiet Cove Site (building is the office/maintenance building).

Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 11.7 feet below ground surface.
6. Static water level was 6.37 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study and Slug Testing/Slug Tests/MW-2_BouwerRice1976.xls

Visual Survey – Quiet Cove Beach

Quiet Cove Property
Anacortes, WA



Figure 2-3



View of the lower beach from adjacent to the Quiet Cove Site looking southwest.

Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 11.7 feet below ground surface.
6. Static water level was 6.37 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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Visual Survey – Quiet Cove Beach

Quiet Cove Property
Anacortes, WA



Figure 2-4



Close-up of beach substrate at elevation around 0 feet MLLW.

Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 11.7 feet below ground surface.
6. Static water level was 6.37 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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Visual Survey – Quiet Cove Beach

Quiet Cove Property
Anacortes, WA



Figure 2-5



View of the south end of Curtis Wharf looking east from the lower beach.

Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 11.7 feet below ground surface.
6. Static water level was 6.37 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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Visual Survey – Quiet Cove Beach

Quiet Cove Property
Anacortes, WA



Figure 2-6



View of the southwest section of Curtis Wharf from the lower beach.

Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 11.7 feet below ground surface.
6. Static water level was 6.37 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study and Slug Testing/Slug Tests/MW-2_BouwerRice1976.xlsx

Visual Survey – Curtis Wharf

Quiet Cove Property
Anacortes, WA



Figure 2-7



Under-wharf view of the southwest bulkhead on Curtis Wharf. Pipe is for fire suppression system. No evidence of historical product lines coming through the bulkhead.

Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 11.7 feet below ground surface.
6. Static water level was 6.37 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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Visual Survey – Curtis Wharf

Quiet Cove Property
Anacortes, WA



Figure 2-8



Under-wharf view from the bulkhead looking north. Pipe is for fire suppression system.

Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 11.7 feet below ground surface.
6. Static water level was 6.37 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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Visual Survey – Curtis Wharf

Quiet Cove Property
Anacortes, WA



Figure 2-9



Under-wharf view close up of bulkhead and wharf interface near the west end of the wharf.

Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 7.6 feet.
5. Well is screened from 3.7 to 11.7 feet below ground surface.
6. Static water level was 6.37 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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Visual Survey – Curtis Wharf

Quiet Cove Property
Anacortes, WA



Figure 2-10

Point #	Row Description	Rim Elevation	Top of Pipe	Northing	Easting
1327	sed 1a	4.410		559834.0830	1208641.3250
1295	mw-2	12.421	12.01	559693.9790	1208657.5940
1331	gei 44	12.938		559766.2000	1208733.0590
1315	mw-1	12.229	11.91	559644.6200	1208597.8020
1325	sed 1c	1.182		559873.4100	1208640.9590
1326	sed 1b	2.830		559848.0990	1208635.5730
1328	gei 38	11.059		559757.7590	1208650.7900
1457	mw-8	13.575	13.13	559574.7290	1208543.5030
1329	gei 39	11.424		559724.4140	1208628.6570
1330	gei 40	10.295		559698.8360	1208593.4930
1332	gei 43	14.371		559510.6390	1208825.7510
1333	gei 42	14.273		559512.0150	1208793.2780
1334	gei 41	14.500		559501.5740	1208736.6060
1335	gei 29	12.146		559694.2160	1208879.9360
1336	gei 33	12.250		559691.7200	1208921.4610
1338	gei 35	11.673		559822.3250	1208926.0830
1339	gei 37	11.519		559882.6920	1208925.7370
1340	gei 36	13.466		559879.7810	1208850.3360
1341	gei 32	13.437		559826.0970	1208856.1550
1342	gei 31	12.345		559829.1170	1208884.6970
1344	gei 30	12.272		559755.2750	1208882.9000
1352	mw-3	12.764	12.42	559752.8430	1208698.6380
1337	gei 34	11.872		559767.2990	1208925.5050
1361	mw-4	12.94	12.42	559760.7700	1208852.9400
1372	mw-11	12.686	12.28	559665.0550	1208763.3000
1372	mw-10	14.501	14.17	559499.2730	1208826.7160
1570	mw-6	15.956	15.43	559557.8830	1208975.4200
1696	mw-7	13.101	12.62	559890.9730	1208872.6500
185	SD-1	12.353		559669.4416	1208741.2395
192	SD-2	12.359	12.04	559677.0847	1208790.4584
187	SD-3	12.591		559651.0388	1208824.6462
186	SD-4	12.889		559624.0329	1208721.0025
189	SD-5	13.103		559577.8851	1208791.3689
196	SD-6	15.662		559601.7090	1208866.7063
184	SD-7	12.278		559689.3087	1208650.6050
194	SD-8	12.805	12.47	559636.0374	1208772.9862
190	SD-9	13.017		559632.6333	1208844.5630
188	SD-10	13.166		559601.0360	1208783.6097
191	MW-12	12.054	11.17	559695.7474	1208842.8186
199	MW-5	14.72	14.48	559633.052	1208866.74

Point #	Row Description	Rim Elevation	Top of Pipe	Northing	Easting
1327	sed 1a	4.410		559834.0830	1208641.3250
1295	mw-2	12.421	12.01	559693.9790	1208657.5940
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1329	gei 39	11.424		559724.4140	1208628.6570
1330	gei 40	10.295		559698.8360	1208593.4930
1332	gei 43	14.371		559510.6390	1208825.7510
1333	gei 42	14.273		559512.0150	1208793.2780
1334	gei 41	14.500		559501.5740	1208736.6060
1335	gei 29	12.146		559694.2160	1208879.9360
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1361	mw-4	12.94	12.42	559760.7700	1208852.9400
1372	mw-11	12.686	12.28	559665.0550	1208763.3000
1372	mw-10	14.501	14.17	559499.2730	1208826.7160
1570	mw-6	15.956	15.43	559557.8830	1208975.4200
1696	mw-7	13.101	12.62	559890.9730	1208872.6500
185	SD-1	12.353		559669.4416	1208741.2395
192	SD-2	12.359	12.04	559677.0847	1208790.4584
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196	SD-6	15.662		559601.7090	1208866.7063
184	SD-7	12.278		559689.3087	1208650.6050
194	SD-8	12.805	12.47	559636.0374	1208772.9862
190	SD-9	13.017		559632.6333	1208844.5630
188	SD-10	13.166		559601.0360	1208783.6097
191	MW-12	12.054	11.17	559695.7474	1208842.8186
199	MW-5	14.72	14.48	559633.052	1208866.74

	EXISTING RIGHT OF WAY LINE
	ASBLUT ROAD CENTERLINE
	EXISTING ROAD CENTERLINE
	EXISTING PROPERTY LINE
	EXISTING PROPERTY CORNER
	EXISTING STORM DRAIN
	EXISTING TYPE 2 CB
	EXISTING TYPE 1 CB
	EXISTING SANITARY SEWER
	EXISTING SANITARY MANHOLE
	EXISTING WATERLINE
	EXISTING WATER VALVE
	EXISTING FIRE HYDRANT
	EXISTING GAS LINE
	EXISTING POWERLINE
	EXISTING FENCELINE
	EXISTING EDGE OF ASPHALT
	EXISTING CURB & GUTTER
	EXISTING CONCRETE
	EXISTING ASPHALT
	EXISTING GRAVEL
	EXISTING CONTOUR
	PILE [TYP.]
	EXISTING UNDERGROUND LOW VOLTAGE
	EXISTING OVERHEAD LOW VOLTAGE
	EXISTING OVERHEAD POWER

LOTS 1 THROUGH 6, INCLUSIVE, AND LOTS 16 THROUGH 20, INCLUSIVE, BLOCK 66,
"MAP OF THE CITY OF ANACORTES, SKAGIT COUNTY, WASHINGTON," AS PER PLAT
RECORDED IN VOLUME 2 OF PLATS, PAGE 4, RECORDS OF SKAGIT COUNTY,
WASHINGTON.

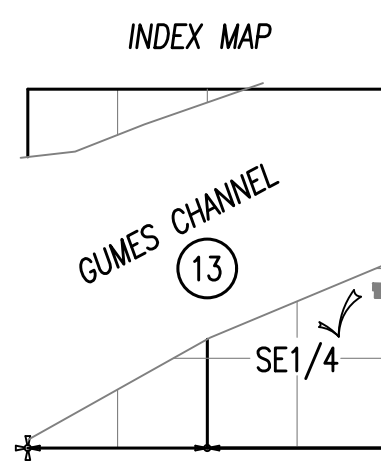
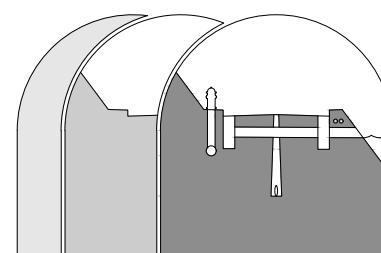
SITUATE IN THE COUNTY OF SKAGIT, STATE OF WASHINGTON. (FROM GUARDIAN
NORTHWEST TITLE REPORT ORDER NO. 107445, DATED APRIL 4, 2014)

VERTICAL DATUM BASED ON TIE TO JETTY 2 AS PUBLISHED BY THE "PORT OF ANACORTES" BY WHPACIFIC.
NAVD 88 + 0.66 = MLLW (TIDAL DATUM) AS PUBLISHED BY THE "PORT OF ANACORTES" BY WHPACIFIC.

BASED ON THE MONUMENTS AT THE INTERSECTION OF 2ND AND "O" AND 3RD AND "O" AS SHOWN HEREON BEARS
NORTH 1°53'13" EAST

UTILITIES SHOWN HEREON ARE BASED ON FIELD OBSERVATION AND PRIVATE LOCATES COMPLETED IN 2014.
TELEPHONE LINES COULD ALSO BE T.V., CABLE OR INTERNET.

A.F.N. 9809040088 SKAGIT COUNTY
A.F.N. 9011020026 SKAGIT COUNTY
A.F.N. 9210140061 SKAGIT COUNTY
A.F.N. 8508270029 SKAGIT COUNTY
A.F.N. 200206260016 SKAGIT COUNTY
A.F.N. 9612190052 SKAGIT COUNTY

[illegible]

QUITE COVE TOPO
GUEMES CHANNEL
ANACORTIES, WA

1" = 30'
M.J.S.
M. WARE
5/75
05-07-2019

*TOPOGRAPHIC SURVEY
FOR
GEO ENGINEERS, INC.*

JOB NO.
17065
DRAWING NAME
18082 TOPO.dwg
SHEET
1 OF 1

ATTACHMENT 3
Tier 2 Sediment Sampling Letter

To: Arianne Fernandez and Susannah Edwards; Washington State Department of Ecology
From: Brian Tracy and John Herzog; GeoEngineers on behalf of Port of Anacortes
Date: April 17, 2018
File: 5147-024-05
Subject: Quiet Cove Remedial Investigation Tier 2 Sediment Sampling

The purpose of this memorandum is to document the detail on the scope and procedures for completing Tier 2 sediment sampling for the Remedial Investigation (RI) field study of the Quiet Cove Cleanup Site (Site) that was recently discussed and agreed to with the Washington State Department of Ecology (Ecology). These details provided herein, supplement the existing Remedial Investigation/Feasibility Study (RI/FS) Work Plan (GeoEngineers, 2017). GeoEngineers collected Tier 1 soil, sediment and groundwater samples in September and October 2017. Analytical results indicate that contaminants of potential concern (COPCs) exist at concentrations greater than preliminary screening levels in soil and sediment along the shoreline. In accordance with the RI/FS Work Plan, these analytical results trigger the need to collect and analyze additional sediment samples to determine the nature and extent of contamination related to historical Site operations. Ecology provided comment regarding the locations and methodology for the future sediment sampling and the Port collaborated with Ecology to refine the plans and procedures for the Tier 2 sediment sampling as described below.

Sampling and analysis procedures will be completed in accordance with the Sampling and Analysis Plan (SAP) included in the RI/FS Work Plan. The information below provides detail for collection and analysis for the Tier 2 sediment sampling effort.

SAMPLE COLLECTION

The Tier 2 sediment sampling locations included in the RI/FS Work Plan were preliminary, and the tiered approach in the work plan was designed to allow for modifying these sample locations based on the results of the Tier 1 study. Figure 1 provides the proposed locations for the Tier 2 sediment sampling study. Based on findings of the Tier 1 RI field study, the Tier 2 sediment sample locations have been modified to focus on the areas where data is needed to fully define the extent of contamination at the Site. As requested by Ecology, three additional locations were added for further coverage of the sediment area. In total nine sediment sample locations will be collected, SED-2 through SED-10, as presented in Figure 1.

Surface Sample Collection and Processing

Surface sediment samples will be collected via beach access at low tides or by a power-grab sampler off the vessel at higher tides. The preference is to collect surface samples via beach access. Sample locations SED-2, -3, -4 and -10 may not be accessible at low tides and will be collected from a vessel.

Surface sediment samples will be obtained using hand tool (stainless steel trowel or spoon) from the beach or power grab sampler from a vessel. Surface samples will be obtained from the upper 10 centimeters (cm) of sediment. Sampling equipment will be decontaminated and inspected before sampling. The procedures for collecting surface sediment samples are as follows:

1. Identify the sample location using a handheld global-positioning system (GPS) for locations accessible by the beach. Maneuver the vessel to the sampling location using a handheld GPS and/or the GPS location on the vessel and measure the depth of water to the mudline for samples collected from the water.
2. Record the location of the sample.
3. Use a stainless-steel spoon to collect the sediment from the top 10 cm and place in stainless steel bowl(s). Samples for volatile analysis will be collected from a discrete location prior to homogenization following the Ecology 5035A methodology
4. Visually classify sediment in accordance with ASTM International (ASTM) D 2488 methods and the Unified Soil Classification System (ASTM D 2487) and record on the field form. In addition to the visual classification, sediment samples shall be observed and field screened. Qualitative descriptive parameters including biota, debris, and presence of staining shall also be recorded.
5. The visual absence or presence of wood debris in the surface sediment sample will be recorded on the field form. If wood debris is present, the type or types of wood debris (i.e., saw dust, bark, chips, chunks, twigs, fibers, etc.), the estimated quantity (i.e., observed percent by volume) of each type of wood debris, and the depth interval where the wood is observed will be recorded on the field form.
6. Photograph the sediment sample. Include in the camera's field of view a sheet of paper or whiteboard with the sample name written in large print; use care not to touch the sediment with the paper/whiteboard or with hands contaminated with whiteboard ink.
7. To avoid cross-contamination, a clean hands/dirty hands approach to use of whiteboard pens and erasers and lab pens will be utilized during all sample collection activities where subsequent chemical analyses will be carried out on the samples collected. Gloves that have been in contact with lab pens and whiteboard pens will not be used for sample handling.
8. Homogenize the sediment to a uniform appearance (i.e., color and texture) to the extent practicable in accordance with Sediment Cleanup Users' Manual II (SCUM II) within a stainless-steel mixing bowl using a stainless-steel spoon and/or stainless-steel mixing paddle attached to a power drill.
9. Distribute the sample to designated sample containers and ensure that the samples are properly labeled and tightly closed. Sample containers will be filled to minimize headspace.
10. Clean the exterior of the sample containers and store them in a cooler with ice.
11. Decontaminate all equipment in accordance with the RI/FS Work Plan SAP.
12. Double check that field collection forms are completely filled out.

Surface sediment sampling, storage, transport and disposal will be completed in accordance with the RI/FS Work Plan.

Subsurface Sample Collection

Vibracore sampling methods will be used to extract the proposed sediment cores. Based on our field experience vibracores will provide opportunity to obtain high quality sediment cores for the conditions at the Site. The vibracores will be collected from a small research-type vessel at high tide to access the proposed sample areas located higher elevations of the beach.

Vibracoring technology is utilized to collect sediment cores by attaching a core tube to a source of mechanical vibration (power head). The vibration allows the core tube to be driven into sediment by the force of gravity minimizing disturbance of the core. Vibracores are driven into the sediment using an approximately 5-inch diameter lexan liner with a core catcher at the point of the tube. Cores will be completed to depths where native material is encountered or refusal. Note that vibracore methods are not likely to be effective in coring through hard native silt material. Based on upland geology, we expect the cores will be advanced to depths of about 5 feet below mudline.

The Port will subcontract the sediment sample collection vessel, captain and deckhand. GeoEngineers staff will oversee and direct the sample collection efforts. Acceptance of cores will be determined on the vessel as the cores are extracted. Upon extraction of the core barrel, the liner will be capped and the core will be examined relative to the following acceptance criteria:

- Overlying water is present and the surface is intact.
- Calculated linear compaction is not greater than 25 percent.
- The core tube appears intact without obstructions or blockage.

If any of the sediment acceptance criteria are not achieved, the sample will be rejected and the location resampled. If the proposed sampling location cannot be achieved after four deployments, the Project Manager will be notified. Ecology will be contacted for required review and approval if an alternative location is needed as described in the Contingency Measures for Coring section below.

If the core meets the acceptance criteria, then proceed with core processing. Core processing including geologic logging and sediment sampling will be completed in the upland (i.e., east of the beach). Core collection, processing, transport, and disposal will be completed in accordance with the sediment core procedures included in the SAP and the Health and Safety Plan (see Appendix C and Appendix D, respectively, of the RI/FS Work Plan).

The procedures for collecting and processing subsurface sediment samples are as follows:

1. Maneuver the vessel to the sampling location using a handheld GPS and/or the GPS location on the vessel (Note: the GPS device on the vessel provides precise coordinates of the core).
2. Record the location of the sample.
3. Measure the depth to mudline below the water using a lead line after the GPS location is recorded.
4. Record the time and the depth of water measurement.
5. Drive the sampler into the sediment surface to the target depth or until refusal.
6. Collect a continuous core to the specified target depth or until refusal.
7. For each core interval, record the penetration depth on the field form.
8. Extract the core barrel and open using a decontaminated core-opening device.
9. Visually classify sediment in accordance with ASTM D 2488 methods and the Unified Soil Classification System (ASTM D 2487) and record on the field form. In addition to the visual classification, sediment samples shall be observed and field screened. Qualitative descriptive parameters including biota, debris, and presence of product/staining shall also be recorded.

10. The visual absence or presence of wood debris in the subsurface sediment sample will be recorded on the field form. If wood debris is present, the type or types of wood debris (i.e., saw dust, bark, chips, chunks, twigs, fibers, etc.), the estimated quantity (i.e., observed percent by volume) of each type of wood debris, and the depth interval where the wood is observed will be recorded on the field form.
11. Photograph the sample. Include in the camera's field of view a sheet of paper or whiteboard with the sample name written in large black print; use care not to touch the sediment with the paper/whiteboard or with gloved hands in contact with whiteboards, pens or with whiteboard ink. It is likely several photos will be necessary to record the entire length of the core sample. Include the depth interval on the paper/whiteboard.
12. Collect sediment from the liner using a decontaminated stainless-steel spoon. Minimize collection of sediment that has been in contact with the sides of the core liner, or the core-opening device to the extent possible. Place the sediment into a decontaminated stainless-steel homogenization bowl. Cover the container with a new sheet of aluminum foil and dispose after use.
13. Homogenize the sediment to a uniform appearance (i.e., color and texture) to the extent practicable in accordance with SCUM II within a stainless-steel mixing bowl using a stainless-steel spoon and/or stainless-steel mixing paddle attached to a power drill.
14. Distribute the sample to appropriate sample containers and ensure that the samples are properly labeled and tightly closed.
15. Clean the exterior of the sample containers and store them in a cooler with ice.
16. Decontaminate all equipment as described in accordance with the RI/FS Work Plan SAP.
17. Double check that field collection forms are completely filled out.

If adequate sample volume cannot be obtained in a particular interval(s) in cores or the location, additional cores will be attempted within a 10-foot radius of the original core location.

Drill cuttings from borings completed for the sediment sampling activities will be placed in labeled and sealed 55-gallon drums. The drums will be stored temporarily at a secure location on Port property pending receipt of analytical results and off-site disposal at a permitted facility.

Contingency Measures for Coring

Vibracoring is expected to be successful in areas where water is at least 2 to 3 feet deep during drilling and where obstructions such as large cobbles, bedrock or hard silt are not present. If the first attempt is unsuccessful due to refusal we will make up to 3 additional attempts within an approximately 10-foot radius of the proposed sampling location in attempt to drive a successful core. This 10-foot radius is consistent with Ecology and Dredged Material Management Program (DMMP) protocols. If a core location is unsuccessful, we will notify Ecology and attempt to discuss in real time whether to move or abandon the location while the sampling vessel is still onsite, to maximize the use of the sampling mobilization. In areas with less than approximately 3 feet of water during drilling, there is a higher likelihood that the vibracore will heat up the liner resulting in an unsuccessful core. If this occurs, the location will be moved in consultation with Ecology to deeper water, while remaining as close to the original location as possible. Alternatively, sampling may be completed during a more advantageous tide, to the extent practical, to re-attempt coring.

In the case that Vibracoring is not successful, an alternative coring method using a portable beach rotary impact corer at low tides will be utilized. The vessel would be beached, the corer unloaded and moved into place. The corer would be powered by the vessel. This equipment drives an approximately 3-inch diameter core tube using a pneumatic rotary hammer.

SAMPLE ANALYSIS

Surface and subsurface sediment samples would be collected at the nine locations shown in the attached figure (SED-2 to -10). Subsurface samples would extend a minimum of 2-feet into the native geologic layer. The following analyses are proposed for these sediment samples based on the observed contamination in the adjacent upland:

- Gasoline-range total petroleum hydrocarbons (TPH-Gx), diesel-range total petroleum hydrocarbons (TPH-Dx), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs) and metals would be analyzed at locations SED-5, -6, -7, -8, -9 and -10 from one sample interval each. TPH and VOCs analyses will be completed on a rush turnaround time so that follow-up analysis can be completed within the hold time, if necessary. The remaining samples collected will be archived.
- Selection of sample interval for analysis would be based on field evidence of contamination. In the absence of field evidence, the sample interval on top of the native layer would be analyzed.
- Additional analysis of archived samples would only be triggered if exceedances are found in SED-5 through -10 and weight of evidence indicates contamination has passed into the marine environment. These additional analyses would be determined in consultation with Ecology.
- The remainder of the sample intervals collected would be archived.

Laboratory method requirements and protocols are provided in the RI/FS Work Plan.

SCHEDULE

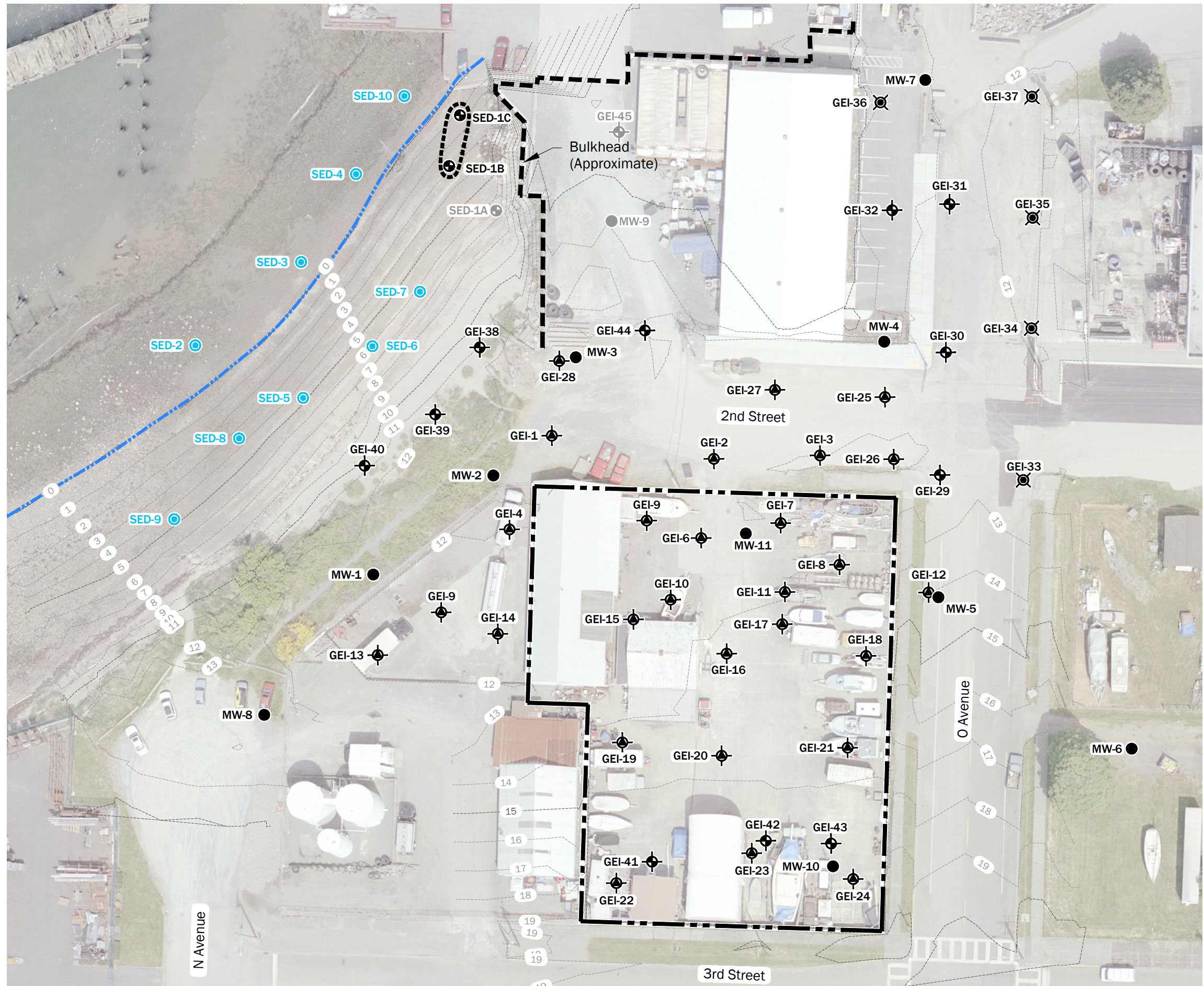
The Tier 2 sediment sampling field work will be planned for the end of July. The specific schedule dates will be determined based on predicted tides and contractor availability. The specific schedule for field work will be communicated to Ecology when dates are confirmed and prior to implementation of the work. It is our understanding that Ecology may be present to oversee the field sample collection.

Attachments:

Figure 1. Revised Tier 2 Sampling Locations

Disclaimer: Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

\\geoengineers.com\WAN\Projects\5147024\CAD\05 Upland Soil Data Figures\514702405_FOX_ Revised Tier 2 Sampling Locations.dwg TAB:FOX Date Exported: 03/14/18 - 10:44 by mwwoods



Legend

Site Boundary

GEI-31 Tier 1 Soil Boring

GEI-36 Tier 2 Soil Boring

SED-1A Tier 1 Sediment Sample

SED-2 Proposed Tier 2 Sediment Sample Location

GEI-1 Integrated Planning Grant Soil Boring Location, 2014

MW-10 Monitoring Well

Composite Sediment Sample Grab Area (SED-1)

10 Contour (Feet, NAVD 88)

GEI-45 Proposed Sampling Location Not Completed Due to Refusal

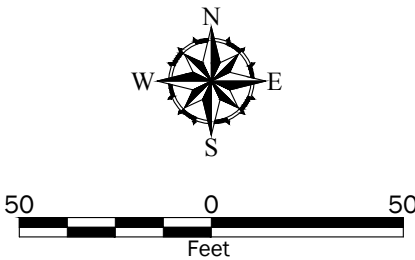
Approximate Elevation of native geologic Layer based on borings at GEI-38, -39 and -40

- Notes:
1. The locations of all features shown are approximate.

2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Base survey by Sound Development Group on 10-11-2017

Projection: NAD83 WA State Planes, N Zone, US Foot



Revised Tier 2 Sampling Locations

Quiet Cove Property
Anacortes, Washington

Figure 1

ATTACHMENT 4
Hydrogeological Investigation

Prepared For: Arianne Fernandez – Washington State Department of Ecology**Date:** August 1, 2018**Prepared By:** GeoEngineers, Inc. on Behalf of Port of Anacortes**GEI File No.:** 5147-024-05**Subject:** Hydrogeologic Evaluation
Quiet Cove Property
Anacortes, Washington
Ecology Agreed Order No. DE 11346

INTRODUCTION

This technical memorandum presents the results of hydrogeologic testing completed to evaluate tidal influence, groundwater flow directions and aquifer hydraulic parameters for the Quiet Cove Property (Site) located along the southeast shoreline of Guemes Channel at 202 O Avenue (at the intersection of 2nd Street and O Avenue) in Anacortes, Washington. The hydrogeologic testing described in this memorandum was completed at the Site in November 2017 and consisted of a tidal study and hydraulic conductivity testing that included slug testing. The tidal study was completed on ten groundwater monitoring wells and slug testing was completed on six groundwater monitoring wells.

Figure 1 identifies the approximate locations used for hydrogeologic testing. The results of the tidal study and hydraulic conductivity testing are presented in the following sections.

TIDAL STUDY

Purpose and Objectives

The purpose of the tidal study was to evaluate the influence of water level fluctuations in Guemes Channel on groundwater conditions at the Site to support development of a hydrogeologic conceptual site model and evaluation of contaminant fate and transport in groundwater. Water level fluctuations in Guemes Channel in the vicinity of the Site were due to tidal fluctuations in Puget Sound during the tidal study.

The tidal study was conducted to achieve the following objectives:

- To identify and analyze the extent of tidal response and evaluate Site groundwater conditions.
- To provide a better understanding of measured groundwater levels, groundwater gradients, and their relative degree of variation under tidal influence at the Site.
- To estimate values for groundwater unit apparent hydraulic diffusivity (T/S) and transmissivity (T). The estimated values were combined with the results of slug testing to estimate average hydraulic conductivity (K) where appropriate.

The objectives were achieved by performing a tidal study using selected monitoring wells as representative indicators of the groundwater response at the Site. Monitoring wells used to evaluate the influence of water level fluctuations in Guemes Channel on groundwater conditions at the Site are shown on Figure 1.

Puget Sound Water Level Fluctuations

Puget Sound experiences daily tides that feature complex double highs and lows of uneven magnitude during each full tidal cycle. This pattern is caused by dominant diurnal and semidiurnal lunar/solar cycles that combine to create what is known as a mixed tide (also called a bichromatic tide). This pattern features a continuously changing pattern of primarily high and low tides, with smaller secondary high and low tides mixed in the cycle through each month. The pattern strongly affects the surface water level of Puget Sound. A portion of the monthly pattern can be seen in the measured tidal data collected for this study from the water-level sensor installed in Guemes Channel. All elevations that were measured are relative to the North American Vertical Datum 1988 (NAVD 88).

Methodology

Aquifers or groundwater units that are hydraulically connected to tidal surface waters typically show a progressively attenuated and delayed tidal response with increasing distance from the shoreline. In order to evaluate tidal-groundwater hydraulic connection at the Site, monitoring wells MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7, MW-8, MW-10, and MW-11 were selected to provide a representative hydrogeologic cross-section. Well construction details and the soil type for the screened intervals for the monitoring locations used for the tidal study are presented in Table 1.

Each of the tidal study wells was equipped with a water level sensor consisting of a piezoelectric pressure transducer and automated data logger (transducer/data logger) programmed to record water pressure (head) above the sensor every minute over a period of three days from November 6 through 9, 2017. In addition, tidal fluctuations in Guemes Channel were also recorded during this time period using a transducer/data logger attached to a pile situated beneath Curtis Wharf (located north of the Site). To correct for changes in barometric pressure during the tidal study, a transducer/data logger was positioned on-site and secured within a well monument box that was allowed to vent to the atmosphere.

Prior to installation, the transducer/data loggers were pre-programmed to record pressure head at every 60 seconds from 12:30 pm on November 6 until 12:30 pm on November 9, 2017 (three days). Programming was performed using a single computer to ensure that each transducer/data logger was time-synced to the same clock. As a check on the transducer/data logger data, and to account for instrument drift, water level was measured in each monitoring well at the beginning and end of the tidal study using a decontaminated electronic water level indicator ("e-tape"). All measurements were made from a surveyed reference mark on the top of each casing. At the conclusion of the study, all transducers/data loggers were removed and returned to GeoEngineers for data processing.

Mean Groundwater Elevations

Mean groundwater elevations for the tidal study were calculated for each monitoring location and the tidal gauge using the Serfes (1991) method, which gives the mean of a subset of 25-point moving averages (Y_i) calculated from 48, 24-point moving averages (X_i). The mean groundwater elevations for the monitoring wells ranged between 10.39 and 6.57 feet NAVD 88. The mean tidal elevation during the tidal study was 3.59 feet

NAVD 88. Based on the results of the tidal study, the average groundwater flow direction at the Site was from the interior of the Site to the northwest toward Guemes Channel (Figure 2).

Hydrographs showing mean groundwater elevations for each location and the mean surface water elevation calculated from the tidal study using the Serfes (1991) method are shown on Figures 3 through 13 over the full period of the tidal study.

Tidal Influence on Groundwater

The groundwater level data collected at each of the tidal study monitoring well locations are presented in elevation relative to the Site survey datum (NAVD 88) and plotted along with the measured surface water elevations in Guemes Channel during the tidal study period for comparison of groundwater elevation and tidal trends. Comparative plots showing hydrographs for each tidal study monitoring well plotted along with the water level in Guemes Channel over the full period of the tidal study are shown on Figures 3 through 13. Three monitoring wells (MW-6, MW-7 and MW-10) were observed to be tidally influenced (Table 2; Figures 9, 10 and 12). The remaining monitoring wells exhibited little to no response to tidal changes as shown in Figures 4 through 8, 11, and 13.

As shown in these figures, the transducer monitoring tidal changes during the tidal study (shown in blue) recorded apparently anomalous fluctuations at times during the study that may be the result of equipment malfunction. To check the accuracy of the tidal transducer data, the predicted tidal fluctuations for Anacortes (NOAA Station 9448794, Anacortes, Fidalgo Island) were plotted in Figures 3 through 12 (shown in green) along with the tidal fluctuations recorded during the tidal study. Predicted tidal elevations for NOAA Station 9448794 were converted from Mean Lower Low Water (MLLW) to NAVD 88 or direct comparison to measured tidal elevations at the Site using the Port of Anacortes conversion factor (NAVD 88=MLLW-0.66 feet) published by the Port of Anacortes by WHPacific. A review of the predicted versus recorded tidal elevations (Figure 3) indicate the tidal elevations recorded at the Site during the tidal study are generally close to the predicted tides for Anacortes and therefore are considered appropriate for use in the tidal match analysis.

For each tidal study monitoring well, the time lag and stage ratio were evaluated. The time lag represents the time for propagation of the tidal effect through the groundwater unit from Guemes Channel to the monitoring well while the stage ratio represents the relative degree of groundwater level change resulting from tidal changes in Guemes Channel. Stage ratio and lag time were determined using the following procedures:

- **Time Lag** was determined by shifting the Date/Time scale (x-axis) of the groundwater record backwards relative to the tidal record from Guemes Channel until the respective peaks and troughs matched. The value of time (in hours and minutes) indicated on the secondary axis represents the time lag or phase shift.
- **Stage Ratio** was determined by expanding and shifting the elevation scale (y-axis) of the groundwater plot relative to the tidal plot from Guemes Channel, until the respective amplitudes matched. The value of stage ratio is calculated as the ratio of secondary axis length (in feet), divided by the primary axis length (20 feet) and expressed as a percentage.

The time lag and stage ratio for each tidal study monitoring well was determined over a period of two full tidal cycles (Figures 14 through 23). The observed tidal effects on monitoring locations used for the tidal study are presented in Table 2. Tidal study data for the monitoring wells indicating the most tidal influence are summarized in the table below and are organized by shortest to longest time lag in hours.

Monitoring Well	Distance from Shoreline (ft)	Mean Groundwater Elevation (ft NAVD 88)	Time Lag (hours)	Stage Ratio (%)
MW-10	300	10.39	1.9	5.00
MW-6	380	10.37	2.4	8.75
MW-7	240	6.57	2.4	4.3

Notes:

Ft = feet

NAVD 88 = North American Vertical Datum 1988

% = percent

HYDRAULIC CONDUCTIVITY TESTING

Hydraulic conductivity testing that included slug testing was performed on selected monitoring locations at the Site on November 16, 2017. The purpose of the slug testing was to use the data, in combination with data gathered during the tidal study, to estimate hydraulic conductivity (K) within the aquifer in the vicinity of the test locations. Slug testing was performed at monitoring well locations MW-2, MW-3, MW-4, MW-6, MW-7, and MW-11. Field procedures, as well as the procedure for data analysis from the slug testing are described below. The locations selected for slug testing are shown on Figure 2. Plots of the slug test results are presented on Figures 24 through 29.

Field Procedures

Each slug test was performed in two stages; a falling head stage followed by a rising head stage. At each location two replicates (i.e., two falling head and two rising head tests) were performed. For each test, the water level in the monitoring location was measured and recorded at 0.25-second intervals using a decontaminated, submerged water-level sensor consisting of a piezoelectric pressure transducer and automated datalogger (transducer/datalogger) programmed to record water pressure (head) above the sensor. The water level was also measured using a decontaminated electronic water level indicator (“e-tape”) as a check on the transducer/data logger.

Prior to slug testing, the pre-test static water level was measured in each well from a surveyed reference mark on top of the well casing. For the falling head stage, a slug (weighted 5-foot length of sealed PVC casing) of known volume was rapidly lowered into the well, causing displacement of the water, which rose rapidly above its initial water level. The water level in the well was then monitored until it returned (fell) to the approximate pre-test water level. For the rising-head stage, the slug was rapidly removed from the well, causing the water level to drop below its pre-test static water level, and the water level in the well was monitored until it returned (rose) to the approximate pre-test static water level.

Data Analysis

The data from all slug tests were downloaded from the transducer/datalogger, processed using spreadsheet software, and then plotted to identify the type of hydraulic response. Data from all wells that were slug tested were analyzed using the method of Bouwer and Rice (1976).

Both the falling head stage and rising-head stage data can be used only in wells where the screened interval is under the water table during all portions of the test. In wells where the screened interval extends above the water table, only the rising-head stage data is used, because some of water displaced during the falling head stage portion of the test is dispersed into the unsaturated zone above the water table. The screen interval extended above the water table in all monitoring wells that were slug tested, so only the rising head data were analyzed. The results of slug test analysis and the type of analysis are presented in Table 3.

The wells generally exhibited an over-damped response typical of moderately permeable formations. Inspection of the rising head response shows an early period of rapid head change during some tests, which was interpreted as drainage of the filter pack into the well during the first few seconds of each rising head slug test. A volumetric analysis using the method of Binkhorst & Robbins (1998) confirmed that rapid drainage of the filter pack would explain this portion of the data, with a calculated specific yield or drainable porosity for the filter pack material of around 20 percent (± 4 percent). This second phase in each rising head test following drainage of the filter pack during the first few seconds of each test was interpreted to represent inflow to the well from the surrounding aquifer formation and was selected for analysis to provide an estimate of the hydraulic conductivity.

ESTIMATION OF HYDRAULIC PARAMETERS

The time lag and stage ratio data from the tidal study were analyzed to estimate diffusivity (T/S) of the aquifer. A method originally developed by Ferris (1951) was used to estimate the diffusivity of the shallow and deep groundwater units whereby time lag and stage ratio is plotted against the horizontal distance between the monitoring location and the shoreline. The calculations are predicated on the validity of the Ferris (1951) method and the presumed dominance of the diurnal tidal effect, with a period of just under 24 hours, representing the main lunar-solar diurnal tide component in Guemes Channel.

Diffusivity

The diffusivity (T/S) for the aquifer could not be estimated using time lag data and stage ratio data because the timing and degree of tidal influence observed in the monitoring wells was not proportional to distance from shoreline, resulting in a poor fit for the diffusivity analysis. The three monitoring wells that were observed to be tidally-influenced during the tidal study (MW-6, MW-7 and MW-10) were located between 80 and 380 feet from the shoreline, which is further from the shoreline than the other monitoring wells used for the tidal study, with the exception of MW-7. The remaining monitoring wells, including monitoring wells MW-1, MW-2, and MW-3, located between 35 and 80 feet from the shoreline, were not tidally-influenced. These results suggest heterogeneity in the materials comprising the Site aquifer, the presence of buried structures (i.e., historical foundations and/or bulkheads) and/or preferential flow pathways through backfill material surrounding utilities present in portions of O Avenue and 3rd Street.

Because the timing and degree of tidal influence observed in the monitoring wells was not proportional to distance from shoreline, the diffusivity could not be calculated, therefore the results of slug testing were used instead to estimate hydraulic parameters for the aquifer.

Hydraulic Conductivity

The hydraulic conductivity for the aquifer was estimated using the results of slug testing in six monitoring wells (MW-2, MW-3, MW-4, MW-6, MW-7, and MW-11). As stated above, diffusivity could not be used to estimate the hydraulic parameters due to the unproportional timing and degree of the observed tidal influence. Based on the slug test results, hydraulic conductivity for the aquifer ranges between 0.02 and 4.11 feet/day with a mean value of 1.25 feet/day. Slug test results and calculated hydraulic conductivities for each monitoring well are shown on Figures 24 through 29.

Groundwater Flow Direction and Gradient

The groundwater flow direction and gradient during the tidal study was determined using the mean groundwater elevations. The mean groundwater flow direction based on the results of the tidal study is generally to the north and northwest toward Guemes Channel (Figure 2). Mean hydraulic gradient was calculated using two monitoring well pairs (MW-10/MW-2 and MW-5/MW-4). The calculated groundwater gradients for the selected well pairs are presented in Table 4. In the western portion of the Site, the calculated hydraulic gradient is 0.013 feet per foot (ft/ft) between monitoring wells MW-10 and MW-2. In the eastern portion of the Site, the calculated hydraulic gradient is 0.023 ft/ft between monitoring wells MW-5 and MW-4.

Groundwater Velocity

The average linear groundwater velocity between monitoring wells MW-10 and MW-2 is 0.07 feet per day (ft/day) with a flow direction to the northwest. The average linear groundwater velocity between monitoring locations MW-5 and MW-4 is 0.09 ft/day with a groundwater flow direction toward the north.

REFERENCES

- Bouwer, H. and Rice, R.C. (Bouwer and Rice), 1976. A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells. *Water Resources Research*, 12(3), 423-428.
- Bouwer, 1989. The Bouwer and Rice Slug Test – An Update. *Ground Water*, Volume 27, Number 3. Pages 304-309.
- Butler Jr., J.J., 1998. *The Design, Performance, and Analysis of Slug Tests*. CRC Press, Boca Raton, FL. 252 p.
- Butler, Jr. J.J., and Garnett, E.J., 2000. Simple procedures for analysis of slug tests in formations of high hydraulic conductivity using spreadsheet and scientific graphics software. *Kansas Geological Survey Open-File Rept. 2000-40*.
- Ferris, J.G. (1951). Cyclic Fluctuations of Water Levels as a Basis for Determining Aquifer Transmissibility. *International Union of Geodesy and Geophysics, Assoc. Sci. Hydrology Assembly, Publication 33, Brussels V.2:148-155*.
- Neville, C. J., 2011. Critical Thinking in Aquifer Test Interpretation. Short Course Presented in Conjunction with the 8th Washington Hydrogeology Symposium, Tacoma, Washington, April 28, 2011.

Serfes, M.E. (1991). Determining the Mean Hydraulic Gradient of Groundwater affected by Tidal Fluctuations. Ground Water 29 (4): 549-555.

Van Der Kamp, G., 1976. Determining Aquifer Transmissivity by Means of Well Response Tests: The Underdamped Case. Water Resources Research 12, No. 1:71-77.

LIMITATIONS

We have prepared this technical memorandum for use exclusive use of the Port of Anacortes, their authorized agents and regulatory agencies for the Quiet Cove Property located at 202 O Avenue in Anacortes, Washington. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood. No other party may rely on the product of our services unless we agree in advance and in writing to such reliance.

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

Attachments:

Table 1. Test Well Construction Details

Table 2. Observed Tidal Effect on Test Wells

Table 3. Slug Test Results

Table 4. Average Linear Groundwater Velocities Between Selected Wells

Figure 1. Hydrogeologic Investigation Locations

Figure 2. Mean Groundwater and Tidal Elevations, 72-Hour Tidal Study

Figures 3 through 13. Serfes Tidal Analysis

Figures 14 through 23. Ferris Tidal Analysis

Figures 24 through 29. Aquifer Slug Test

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Table 1
Test Well Construction Details
 Quiet Cove Property
 Anacortes, Washington

Monitoring Well Identification	Well Screen Depth (feet bgs)		Top of Casing Elevation (feet NAVD 88)	Well Screen Elevation (feet NAVD 88)		Soil Type Across Screened Interval	Hydrogeologic Evaluation Performed
	Top	Bottom		Top	Bottom		
MW-1	3.7	11.7	12.27	8.57	0.57	Sand, silty sand and gravel	Tidal Study
MW-2	3.7	13.7	11.93	8.23	-1.77	Silty sand	Tidal Study, Slug Test
MW-3	3.7	15.7	12.97	9.27	-2.73	Sand and gravel	Tidal Study, Slug Test
MW-4	3.7	14.7	12.43	8.73	-2.27	Silty sand and peat	Tidal Study, Slug Test
MW-5	3.7	11.7	14.74	11.04	3.04	Silty sand	Tidal Study
MW-6	5	15	15.96	10.96	0.96	Sand with silt and peat	Tidal Study, Slug Test
MW-7	5	10	13.10	8.10	3.10	Sand, gravel and silty sand	Tidal Study, Slug Test
MW-8	3	13	13.58	10.58	0.58	Sand and silty sand	Tidal Study
MW-10	5	15	14.50	9.50	-0.50	Silt and silty sand	Tidal Study
MW-11	5	15	12.69	7.69	-2.31	Sand with silt and peat	Tidal Study, Slug Test

Notes:

bgs = below ground surface

NAVD 88 = North American Vertical Datum 1988

Table 2
Observed Tidal Effect on Test Wells
 Quiet Cove Property
 Anacortes, Washington

Monitoring Well Identification	Approximate Distance from Shoreline ¹ (feet)	Tidal Study Results ²		
		Mean Groundwater Elevation (feet NAVD 88)	Time Lag (hours)	Stage Ratio (percent)
MW-1	35	8.06	Indeterminate ³	<3
MW-2	40	7.04	Indeterminate ³	<3
MW-3	45	6.77	Indeterminate ³	<3
MW-4	190	7.25	Indeterminate ³	<3
MW-5	260	10.27	Indeterminate ³	<3
MW-6	380	10.37	2.4	8.8
MW-7	240	6.57	2.4	4.3
MW-8	80	8.52	Indeterminate ³	<3
MW-10	300	10.39	1.9	5.0
MW-11	160	9.36	Indeterminate ³	<3

Notes:

¹ Distance is from the well to the nearest shoreline area.

² The tidal study was performed November 6 through 9, 2017.

³ Tidal effects below the threshold of significance for the Ferris analytical method.

NAVD 88 = North American Vertical Datum 1988

Table 3
Slug Test Results¹
 Quiet Cove Property
 Anacortes, Washington

Monitoring Well Identification	Type of Slug Test ²	Estimated Hydraulic Conductivity ³ (K)	
		feet/day	centimeters/second
MW-2	Rising Head 1	0.58	2.0E-04
	Rising Head 2	0.47	1.7E-04
	Geometric Mean	0.52	1.8E-04
MW-3	Rising Head 1	3.99	1.4E-03
	Rising Head 2	4.24	1.5E-03
	Geometric Mean	4.11	1.5E-03
MW-4	Rising Head 1	0.75	2.6E-04
	Rising Head 2	0.76	2.7E-04
	Geometric Mean	0.75	2.7E-04
MW-6	Falling Head 1	0.02	7.1E-06
	Falling Head 2	0.03	1.1E-05
	Geometric Mean	0.02	8.6E-06
MW-7	Rising Head 1	1.67	5.9E-04
	Rising Head 2	1.49	5.3E-04
	Geometric Mean	1.58	5.6E-04
MW-11	Rising Head 1	0.54	1.9E-04
	Rising Head 2	0.58	2.0E-04
	Geometric Mean	0.56	2.0E-04

Notes:

¹ Slug tests were performed November 16, 2017.

² Two replicates were performed for the slug tests conducted in each well. Slug test results are calculated from rising head tests due to the water table occurring within the screened interval in all wells. The geometric mean calculated from the results for the two replicates is used to characterize the hydraulic conductivity for each well that was tested.

³ Hydraulic conductivities were calculated for slug tests using Bouwer and Rice (1976).

Table 4
Average Linear Groundwater Velocities Between Selected Wells
 Quiet Cove Property
 Anacortes, Washington

Well Pair Used for Velocity Calculation				Representative Area	General Soil Type ¹	Effective Porosity by Soil Type ² (n _e)	Hydraulic Conductivity ³ (K)	Groundwater Gradient ⁴ (i)	Average Linear Groundwater Velocity ^{5,6} (feet/day)
Upgradient Well	Well 1 Groundwater Elevation (ft NAVD 88)	Downgradient Well	Well 2 Groundwater Elevation (ft NAVD 88)					Tidal Study ⁷	Tidal Study ⁷
MW-10	10.39	MW-2	7.04	Western Portion of Site	Silt and fine silty sand	0.10	0.52	0.0130	0.07
MW-5	10.27	MW-4	7.25	Eastern Portion of Site	Fine to medium silty sand	0.20	0.75	0.0230	0.09

Notes:

¹ Soil type based on visual classification during well installation.

² Average effective porosity (n_e) values by soil type from Argonne National Laboratory Environmental Science Division website, U.S. Department of Energy.

³ Presents average hydraulic conductivity for the well pair.

⁴ Hydraulic gradients (i) are calculated from mean groundwater elevations observed during the tidal study between the two wells noted.

⁵ Horizontal groundwater velocity calculation: $v = K/n_e \cdot i$.

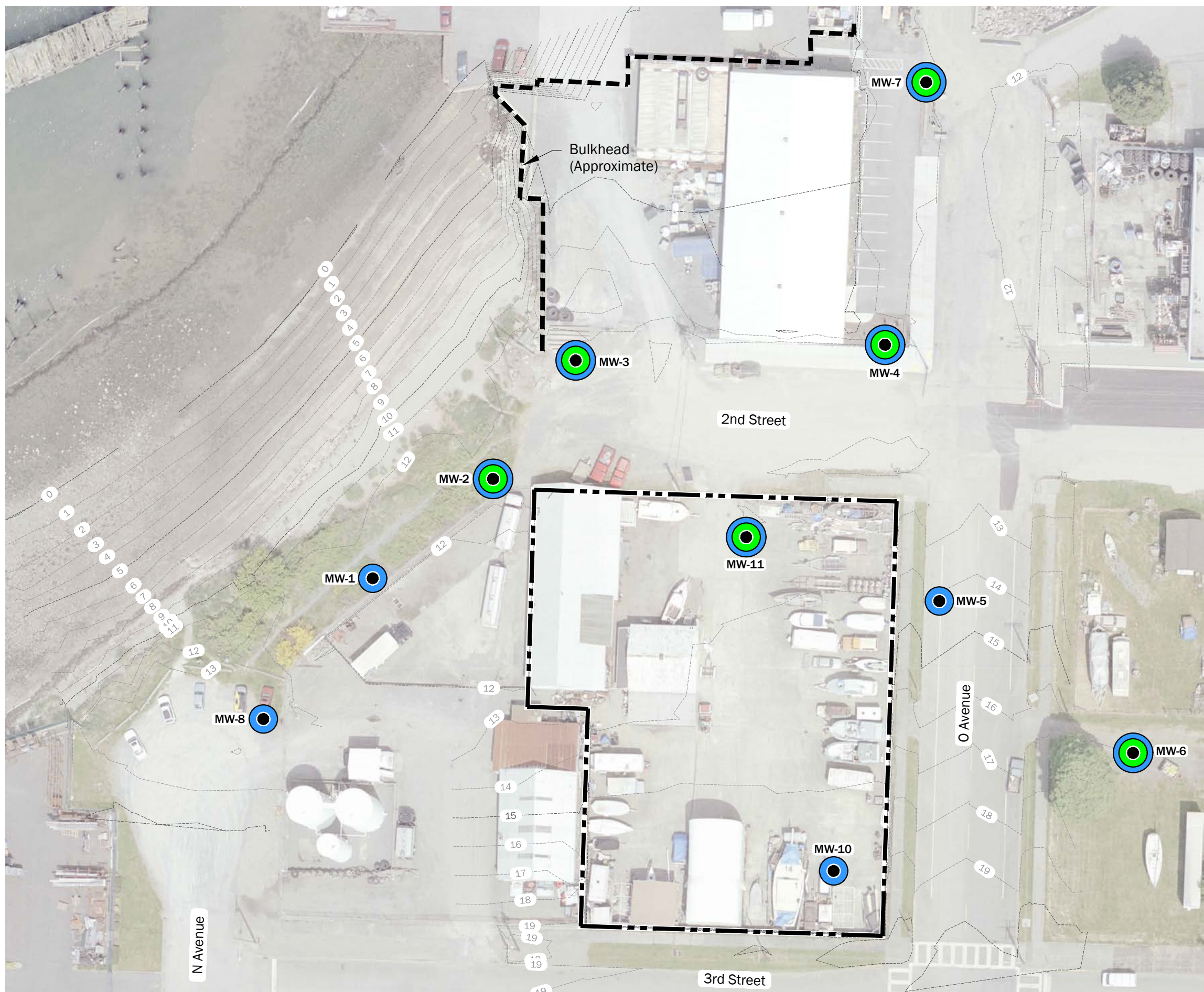
⁶ Groundwater velocities are based on literature values for effective porosity by soil type and hydraulic gradients are calculated from a limited set of data points. Groundwater velocities should therefore be considered estimates.

⁷ The 72-hour tidal study was performed November 6 through 9, 2017.

NAVD 88 = North American Vertical Datum 1988

ft = feet

P:\5147024\CAD\05\Hydrogeological Testing Memo\514702405_F01_Hydrogeologic Investigation Locations.dwg TAB:F01 Date Exported: 12/11/17 - 12:54 by hmar



Legend

--- Site Boundary

MW-10 ● Monitoring Well

-----10----- Contour (Feet, NAVD 88)

● Slug Test Location

● 72-Hour Tidal Study Location

Notes:

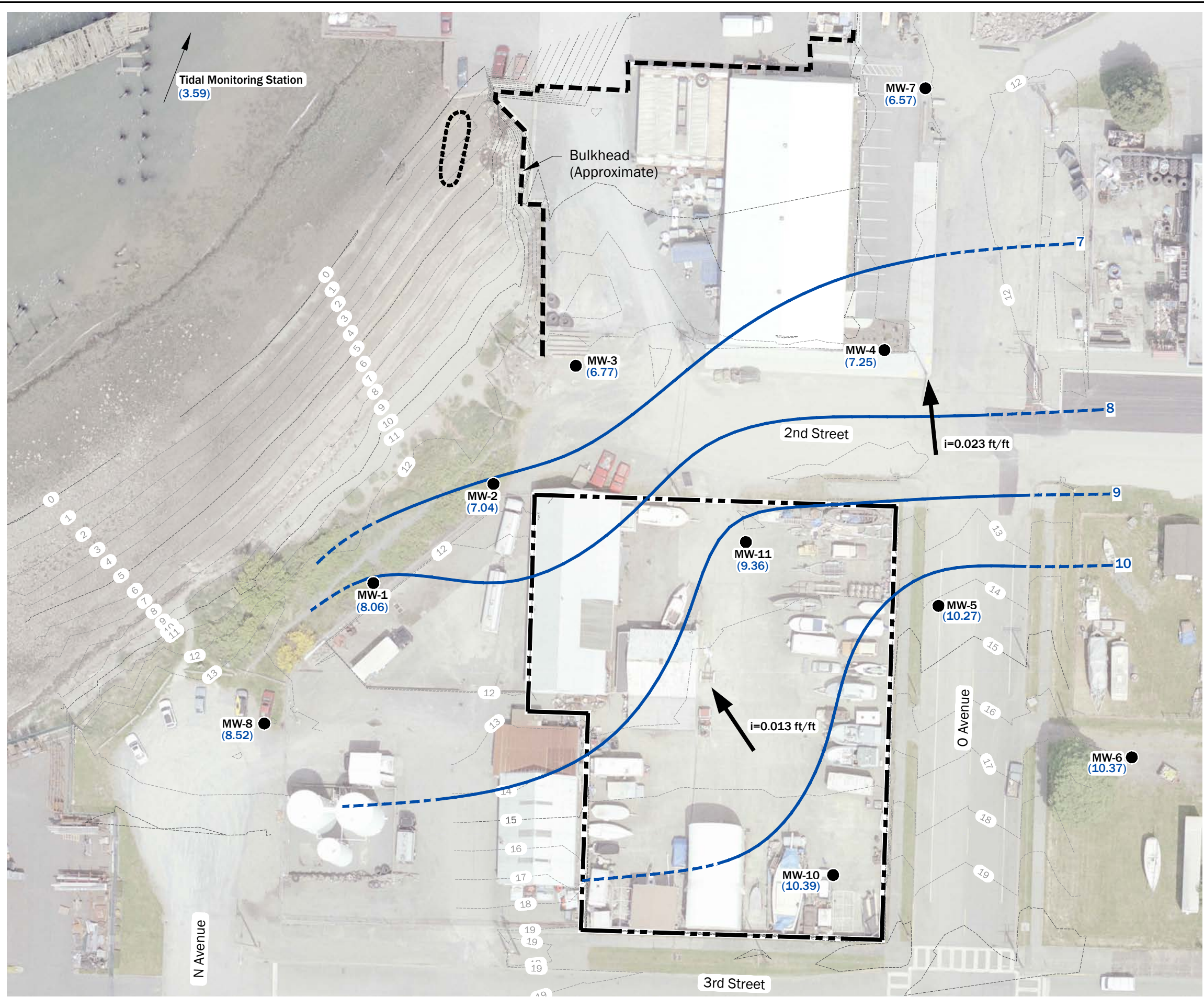
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2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Base survey by Sound Development Group on 10-11-2017

Projection: NAD83 WA State Planes, N Zone, US Foot

Hydrogeologic Investigation Locations	
Quiet Cove Property Anacortes, Washington	
	Figure 1

P:\5147024\CAD\05\Hydrogeological Testing Memo\514702405_F02_Mean GW and Tidal Elevations.dwg TAB:F02 Date Exported: 12/11/17 - 12:55 by hmara



Legend

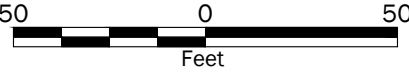
- Site Boundary
- Monitoring Well and Mean Groundwater Elevation, 72-Hour Tidal Study
- Composite Sediment Sample Grab Area (SED-1)
- Ground Surface Elevation Contour (Feet, NAVD 88)
- Groundwater Elevation Contour, Mean Elevations 72-Hour Tidal Study. Dashed Where Inferred.
- Inferred groundwater flow direction and groundwater gradient in feet per foot calculated between monitoring wells MW-10 and MW-2, and between monitoring wells MW-5 and MW-4

Notes:

- 72-hour tidal study conducted between 12:30 November 6 and 12:30 November 9, 2017.
- The locations of all features shown are approximate.
- This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Base survey by Sound Development Group on 10-11-2017

Projection: NAD83 WA State Planes, N Zone, US Foot

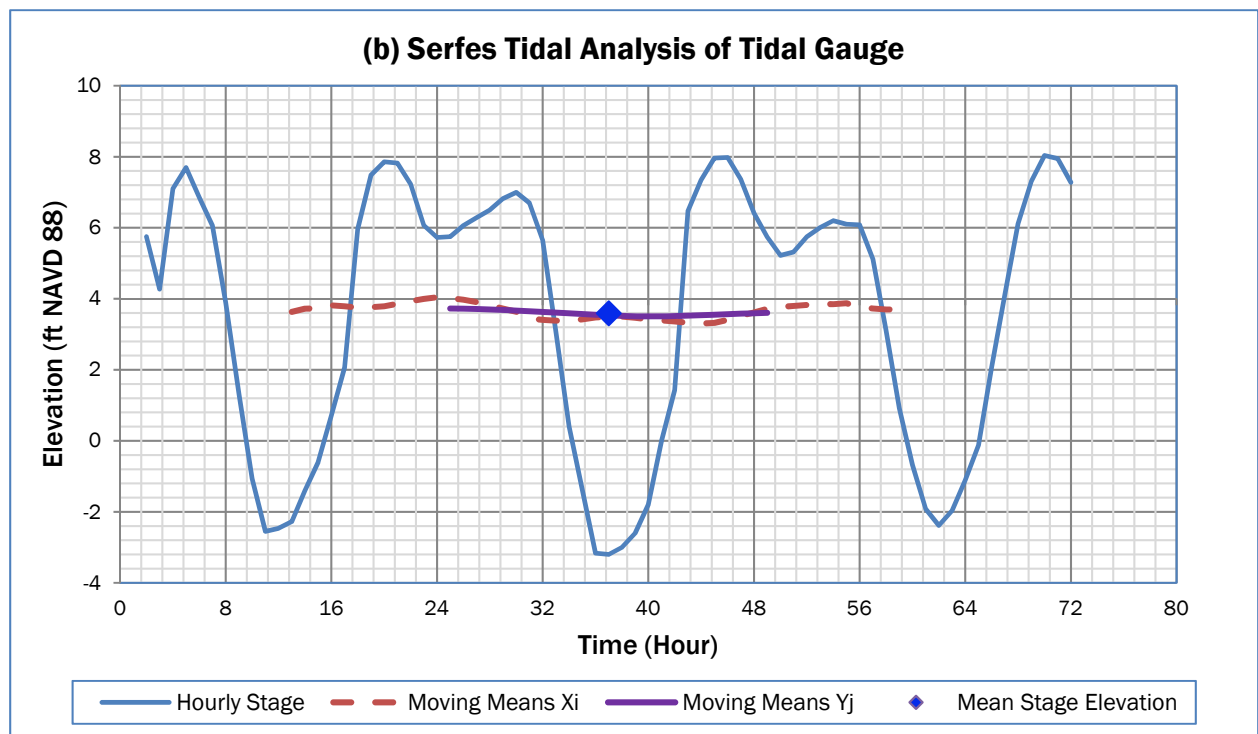
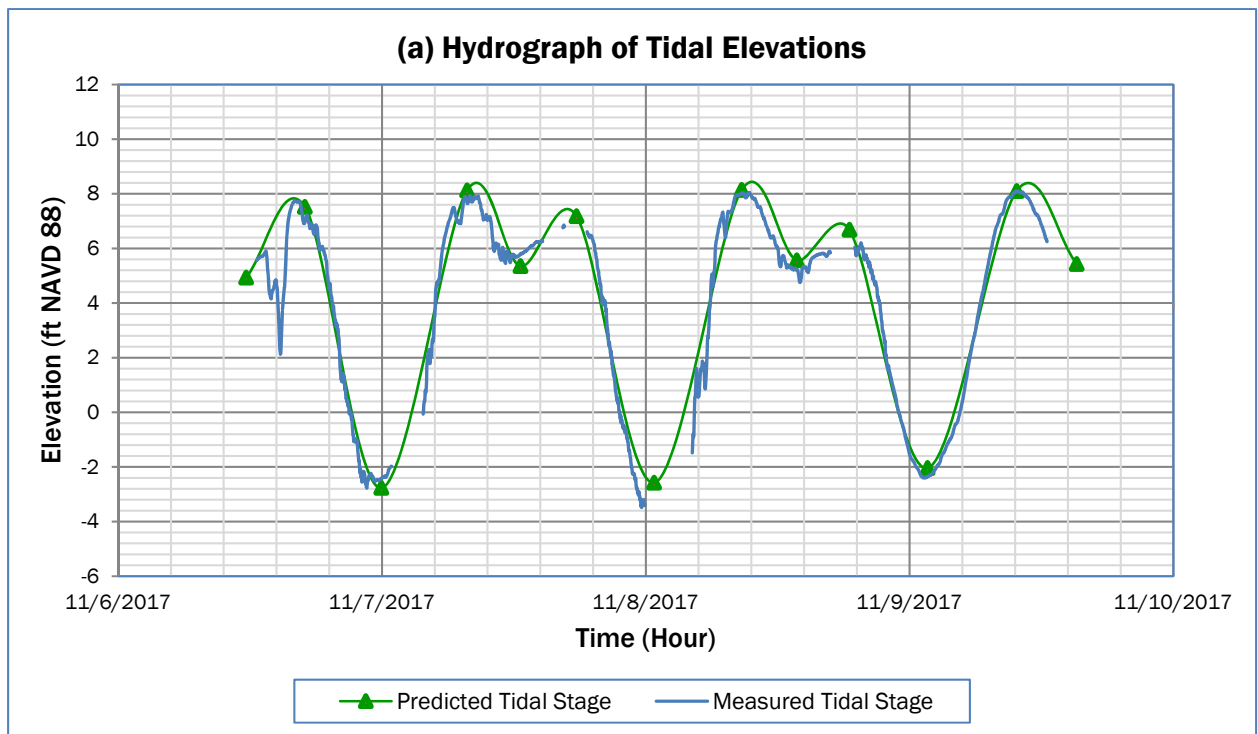


Mean Groundwater and Tidal Elevations, 72-Hour Tidal Study

Quiet Cove Property
Anacortes, Washington



Figure 2



Notes:

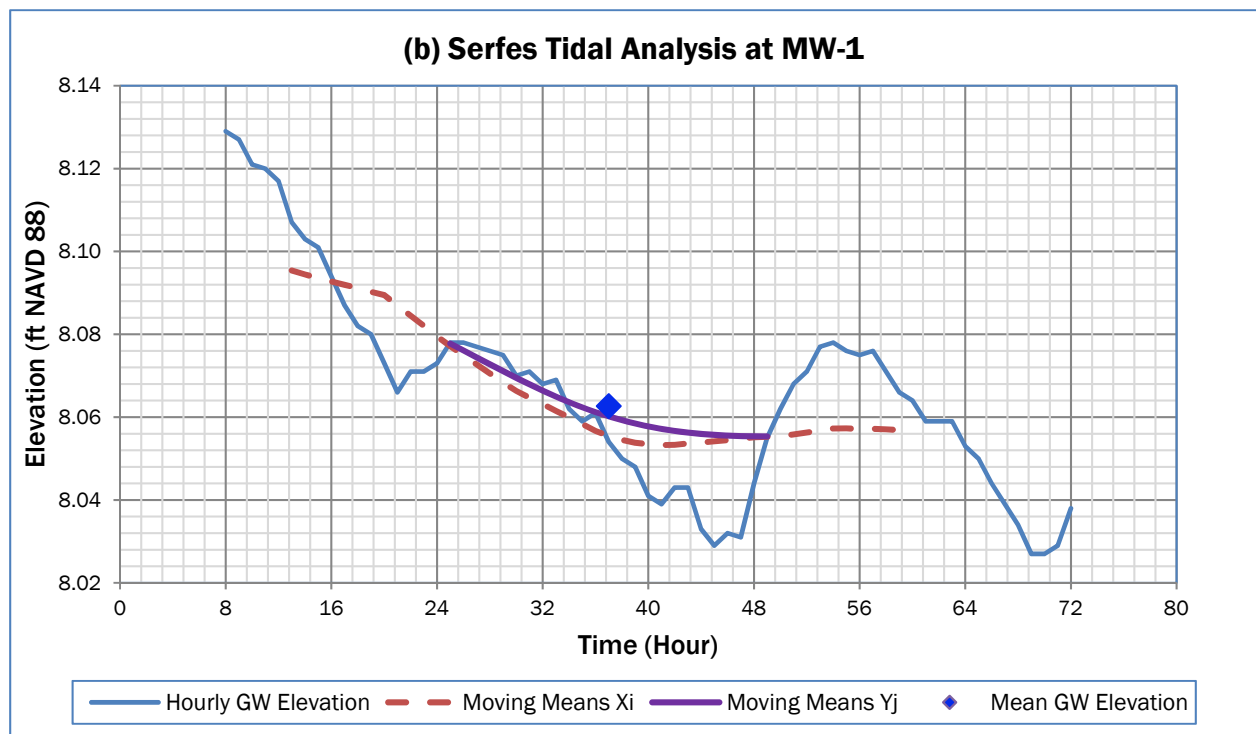
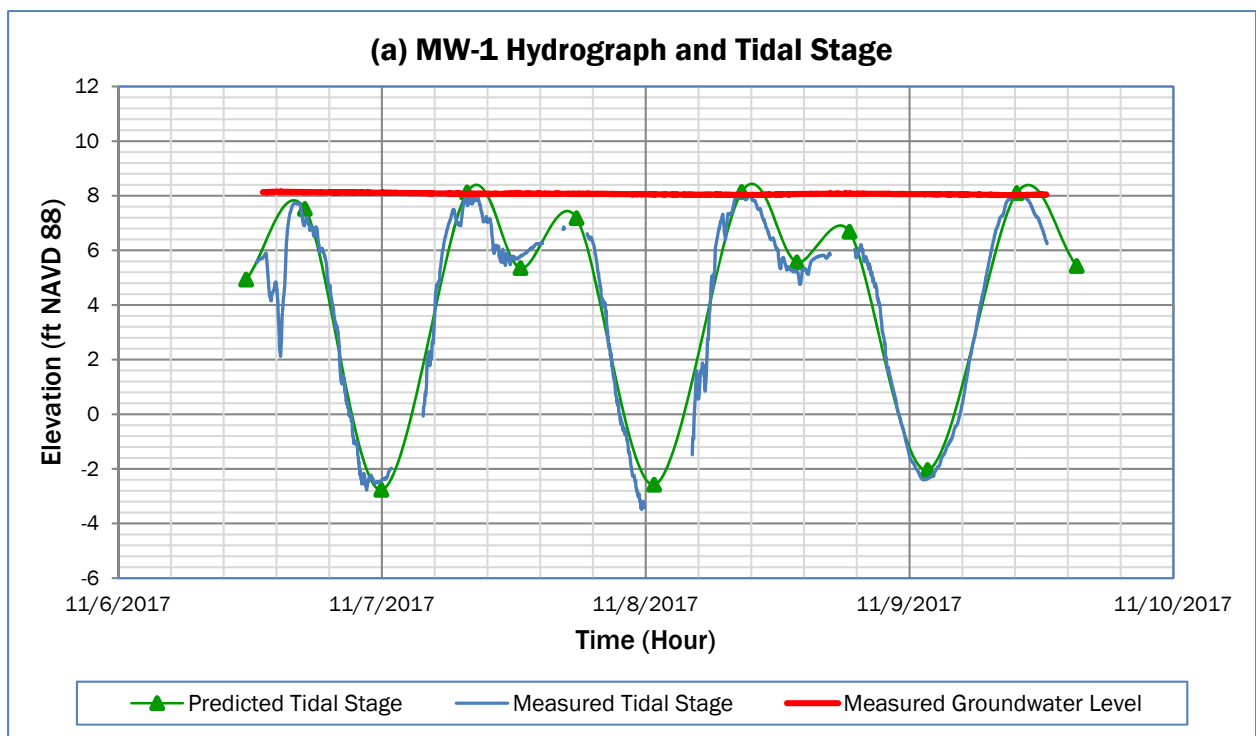
1. Method based on Serfes (1991).
 2. Xi: 48 means from moving average of 24 hourly tidal elevation.
 3. Yj: 25 means from moving average of 24 means over the 48 Xi.
 4. Time in hours is from 12:30 on 11/6/2017.
 5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
- Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/
Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at Tidal Gauge

Quiet Cove Property
Anacortes, Washington



Figure 3



Notes:

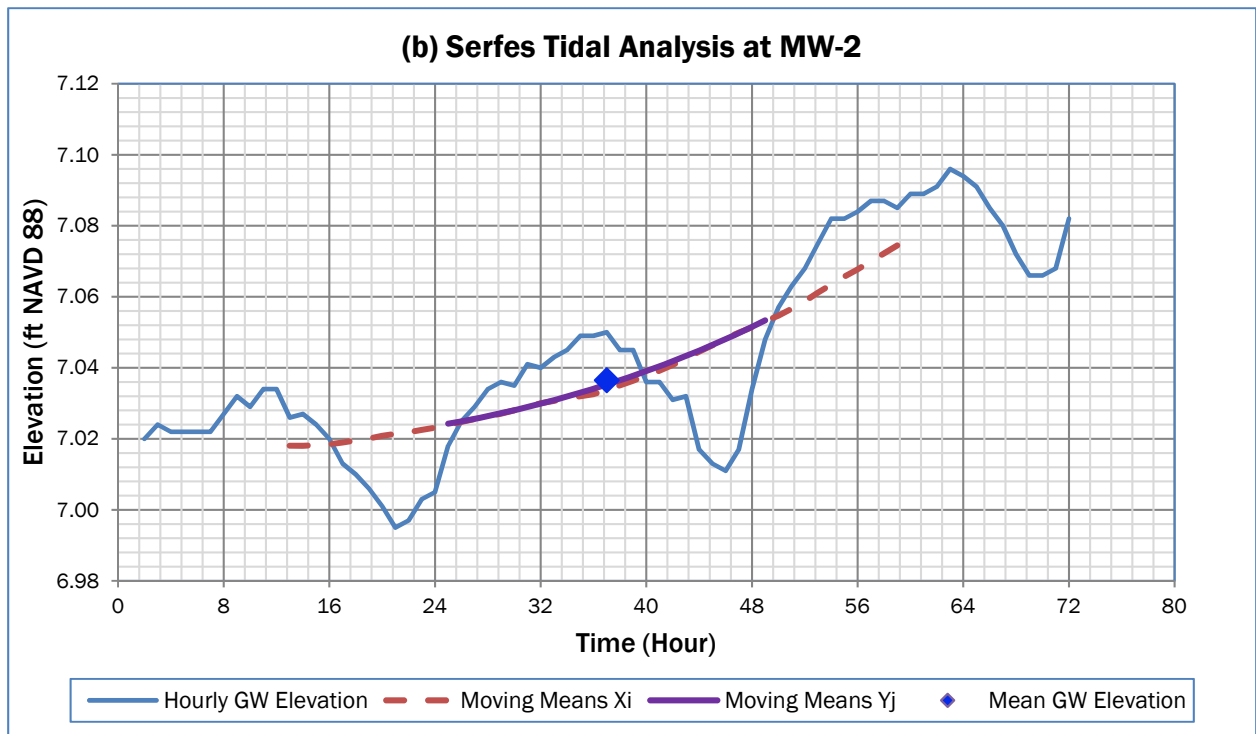
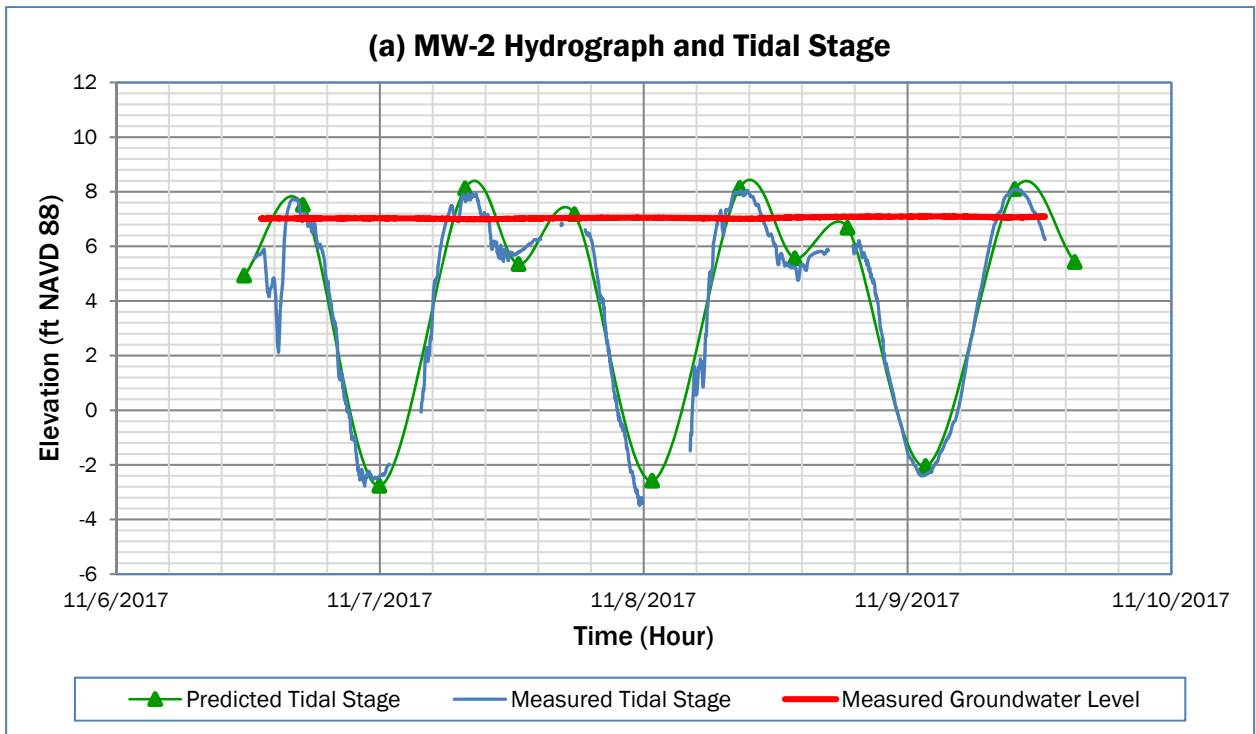
1. Method based on Serfes (1991).
2. Xi: 48 means from moving average of 24 hourly tidal elevation.
3. Yj: 25 means from moving average of 24 means over the 48 Xi.
4. Time in hours is from 12:30 on 11/6/2017.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication. Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at MW-1

Quiet Cove Property
Anacortes, Washington



Figure 4



Notes:

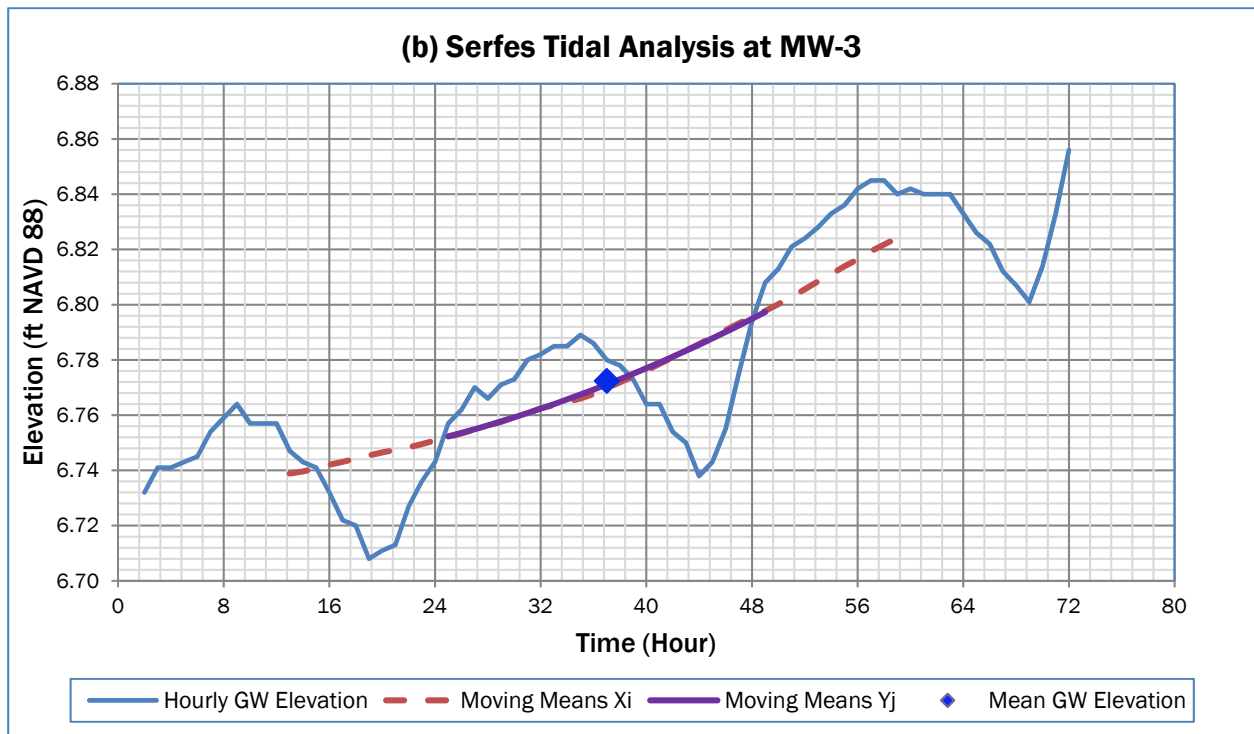
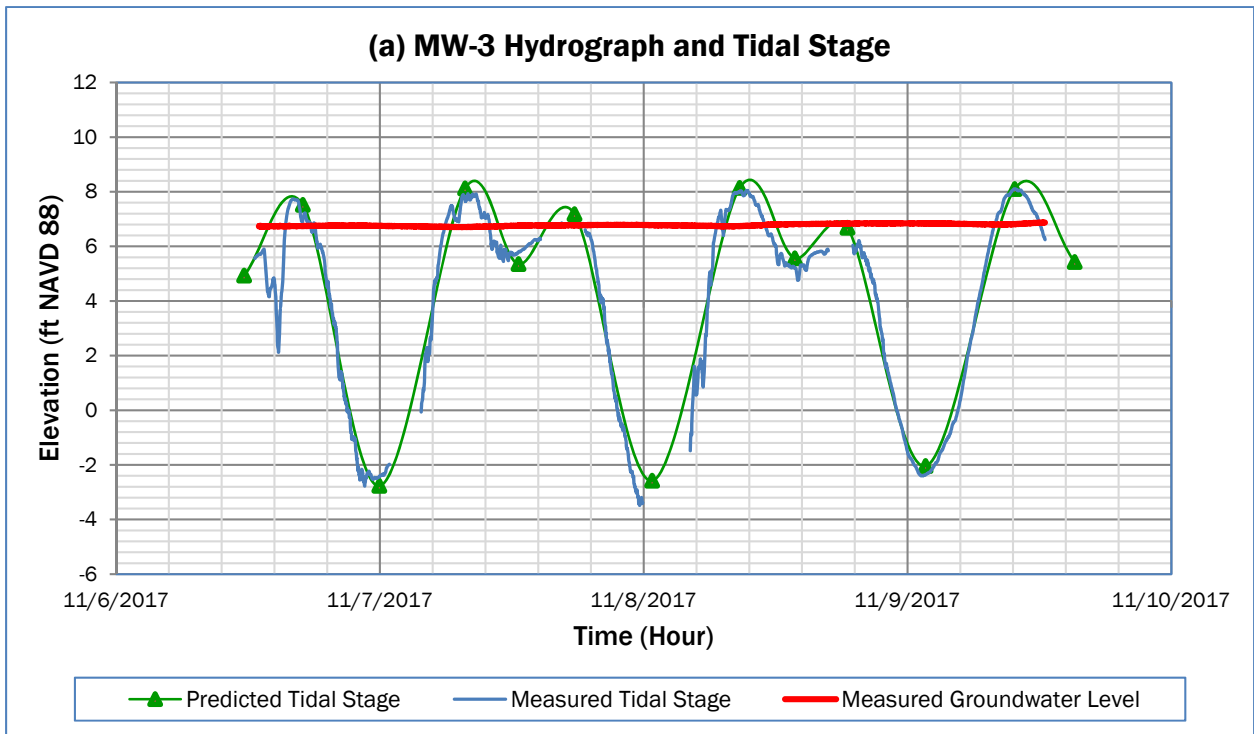
1. Method based on Serfes (1991).
 2. Xi: 48 means from moving average of 24 hourly tidal elevation.
 3. Yj: 25 means from moving average of 24 means over the 48 Xi.
 4. Time in hours is from 12:30 on 11/6/2017.
 5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
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Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at MW-2

Quiet Cove Property
Anacortes, Washington



Figure 5



Notes:

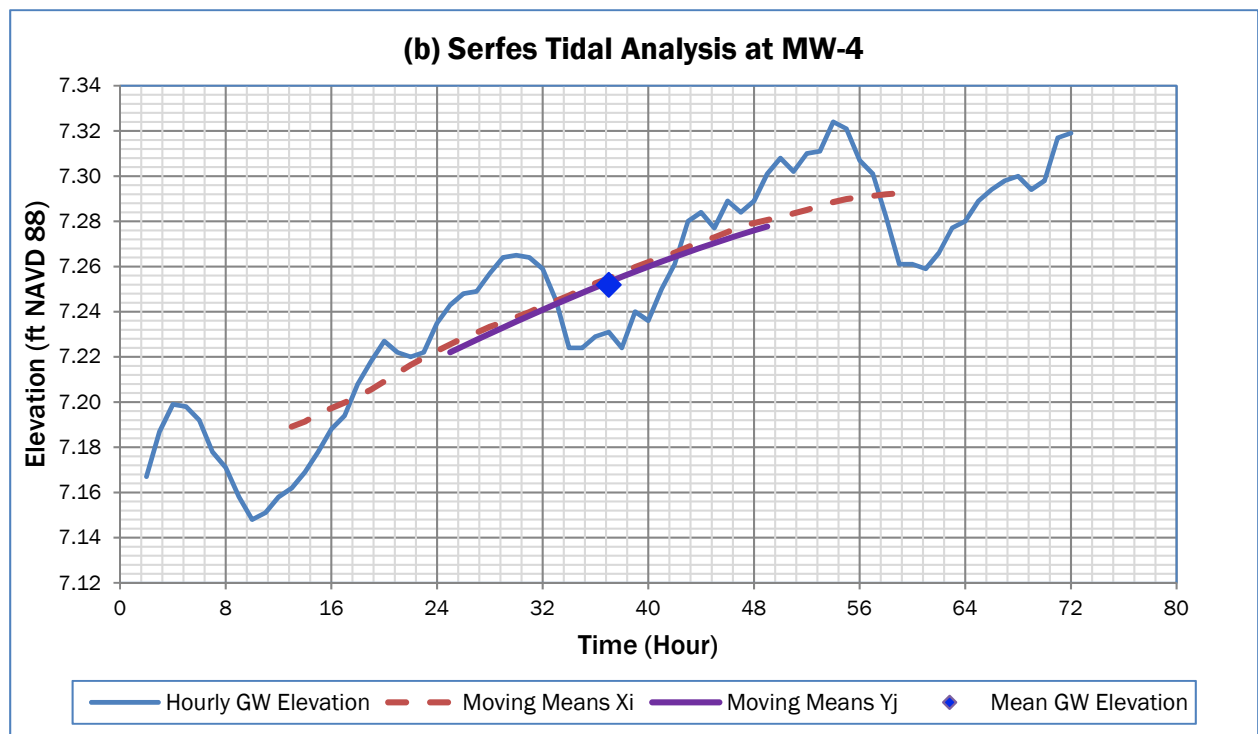
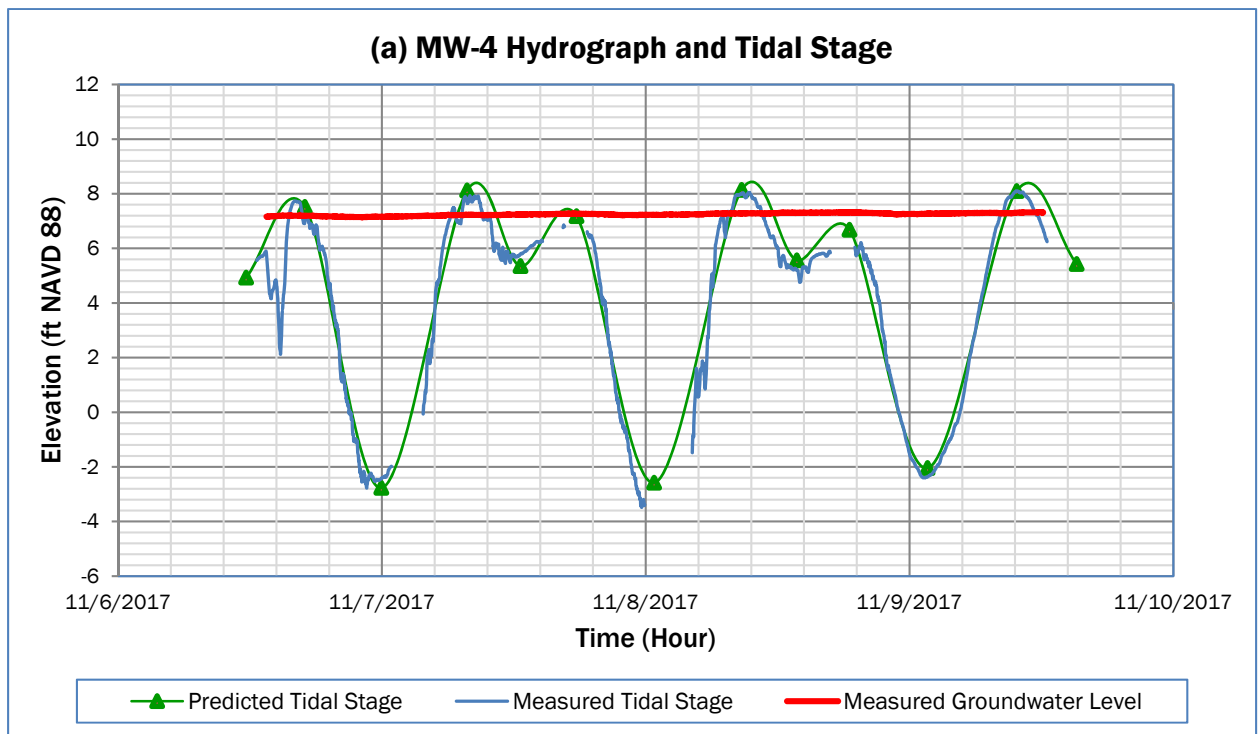
1. Method based on Serfes (1991).
 2. Xi: 48 means from moving average of 24 hourly tidal elevation.
 3. Yj: 25 means from moving average of 24 means over the 48 Xi.
 4. Time in hours is from 12:30 on 11/6/2017.
 5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
- Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/
Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at MW-3

Quiet Cove Property
Anacortes, Washington



Figure 6



Notes:

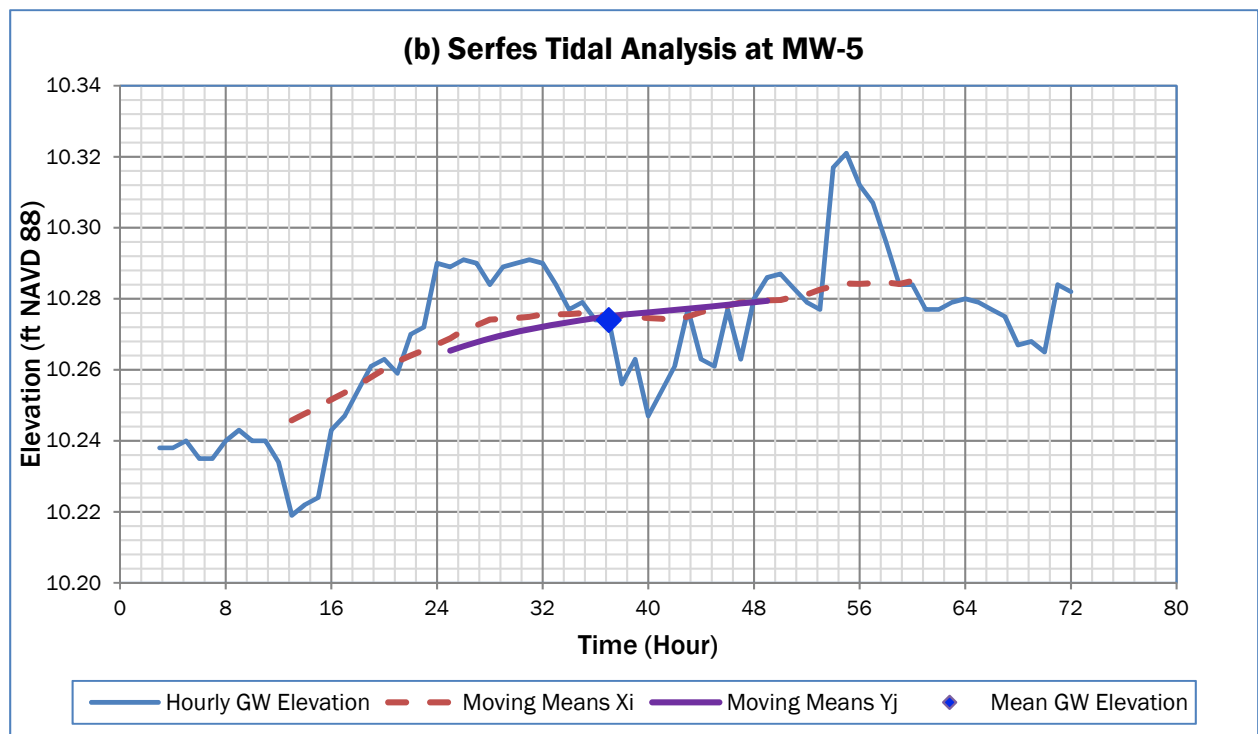
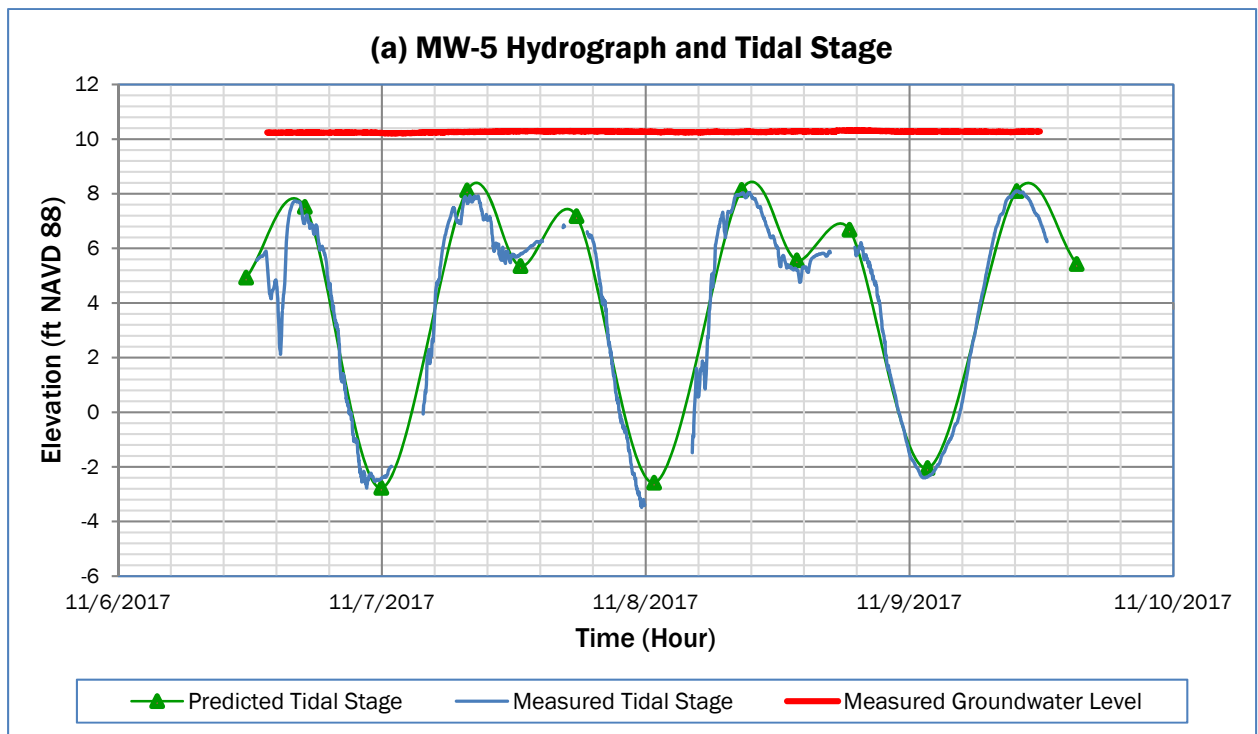
1. Method based on Serfes (1991).
 2. Xi: 48 means from moving average of 24 hourly tidal elevation.
 3. Yj: 25 means from moving average of 24 means over the 48 Xi.
 4. Time in hours is from 12:30 on 11/6/2017.
 5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
- Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/
Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at MW-4

Quiet Cove Property
Anacortes, Washington



Figure 7



Notes:

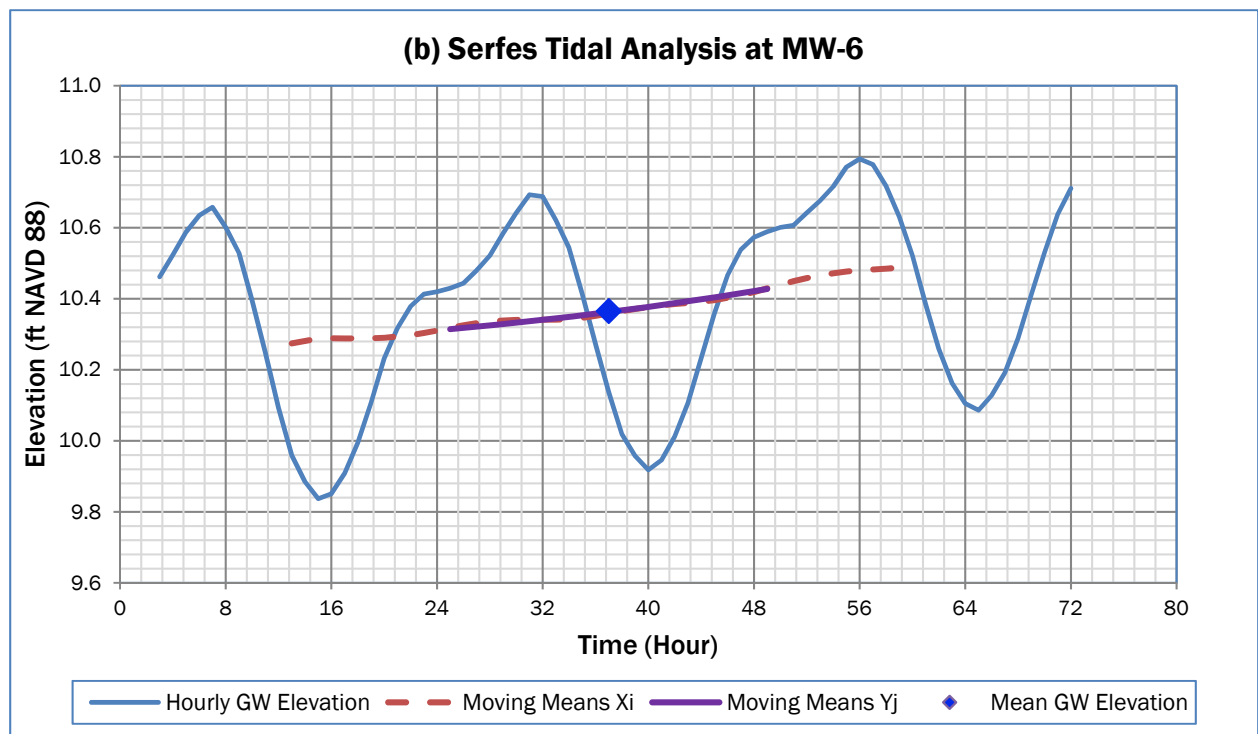
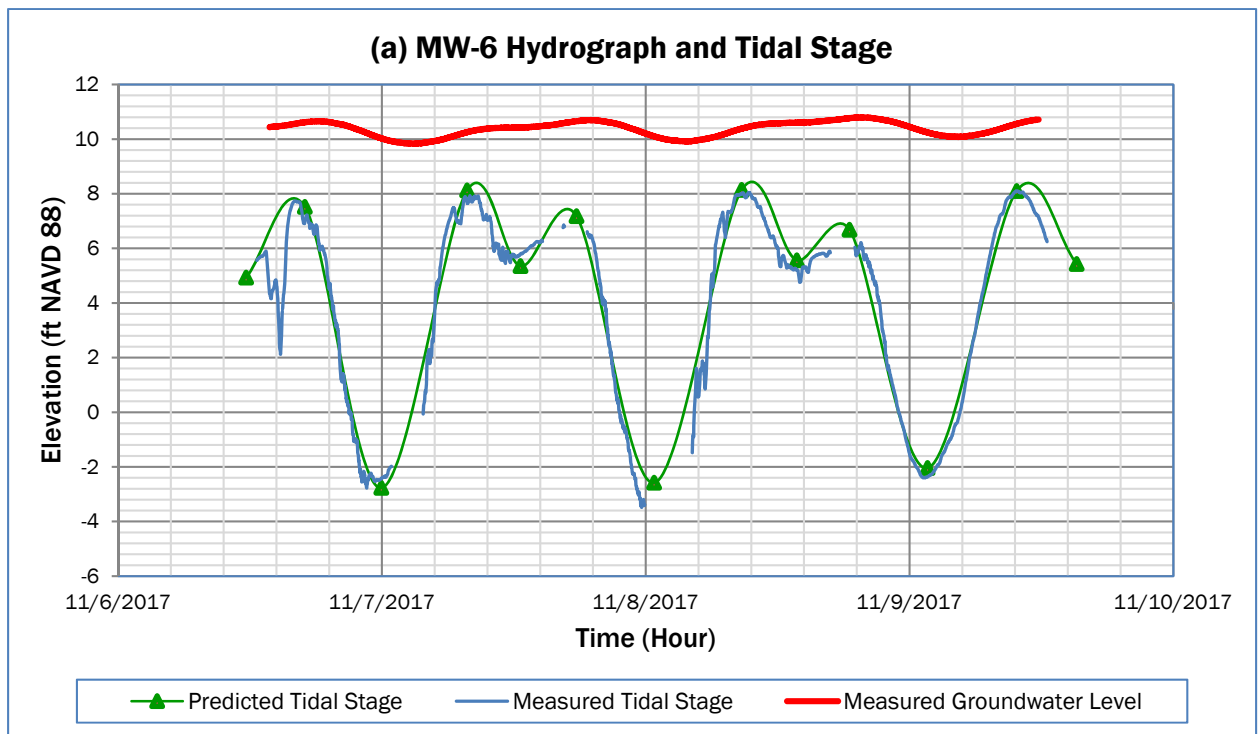
1. Method based on Serfes (1991).
2. Xi: 48 means from moving average of 24 hourly tidal elevation.
3. Yj: 25 means from moving average of 24 means over the 48 Xi.
4. Time in hours is from 12:30 on 11/6/2017.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication. Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at MW-5

Quiet Cove Property
Anacortes, Washington



Figure 8



Notes:

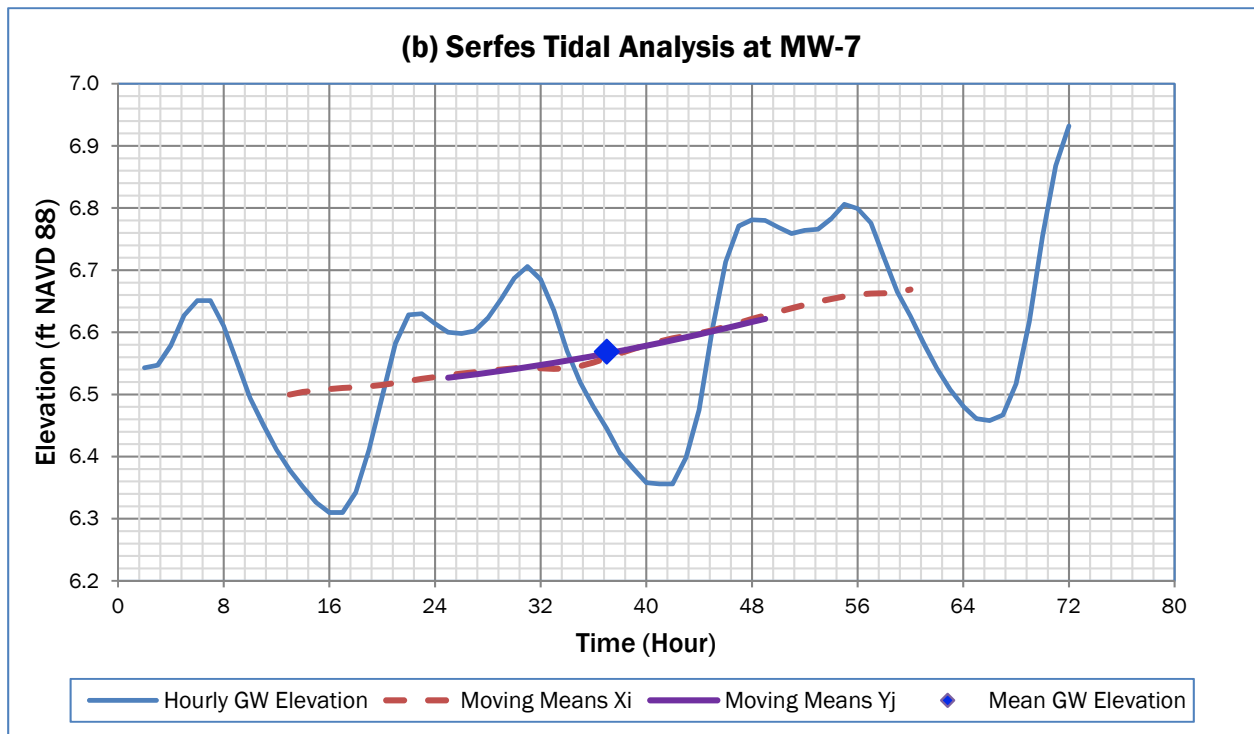
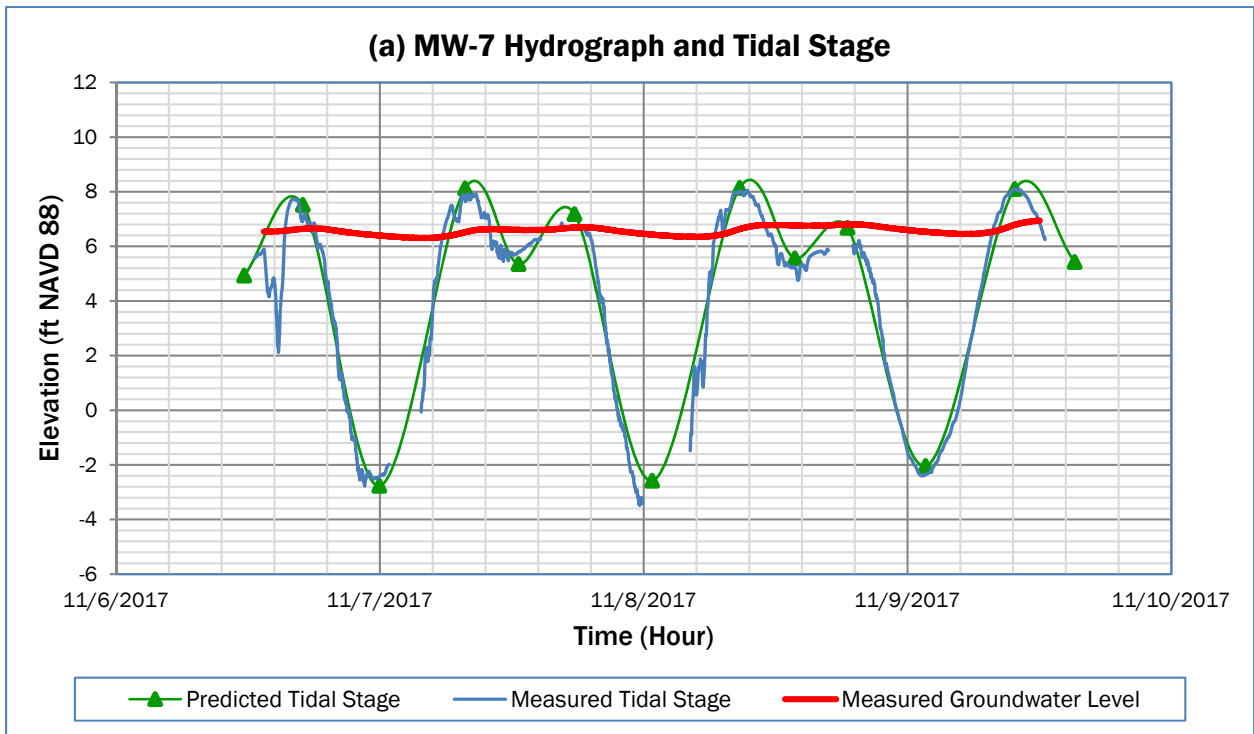
1. Method based on Serfes (1991).
 2. Xi: 48 means from moving average of 24 hourly tidal elevation.
 3. Yj: 25 means from moving average of 24 means over the 48 Xi.
 4. Time in hours is from 12:30 on 11/6/2017.
 5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
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Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at MW-6

Quiet Cove Property
Anacortes, Washington



Figure 9



Notes:

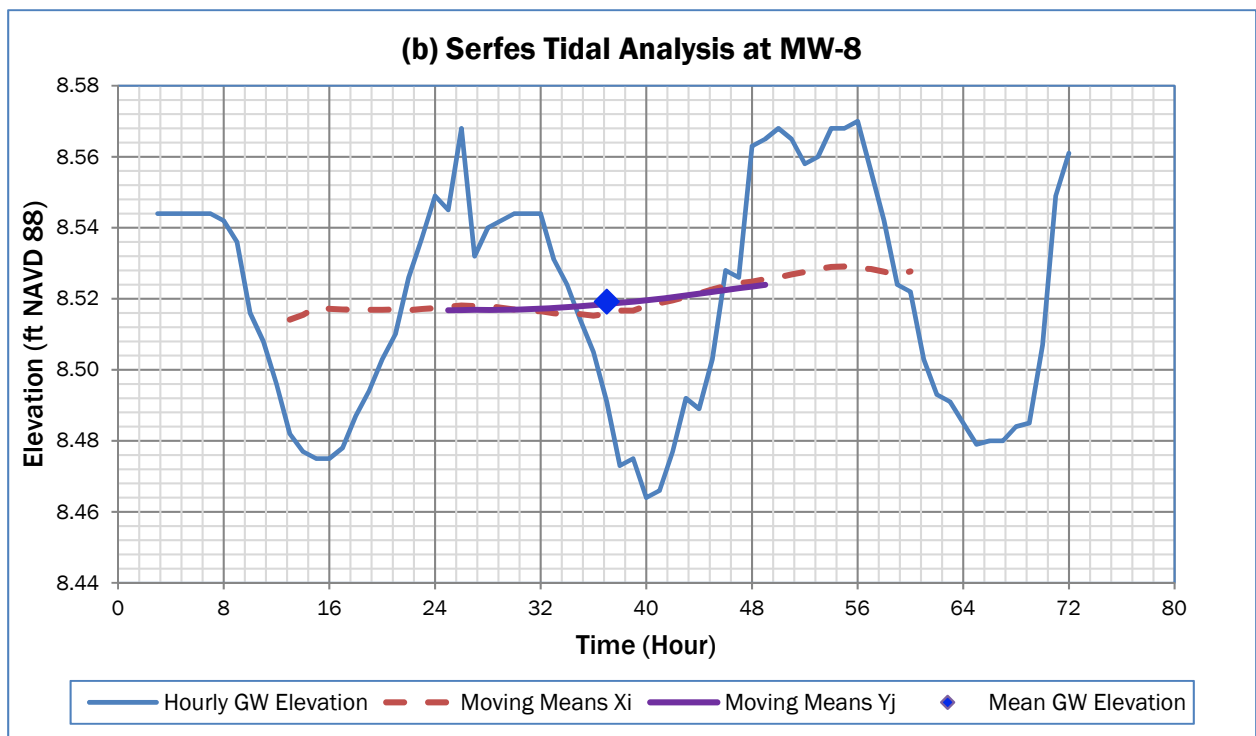
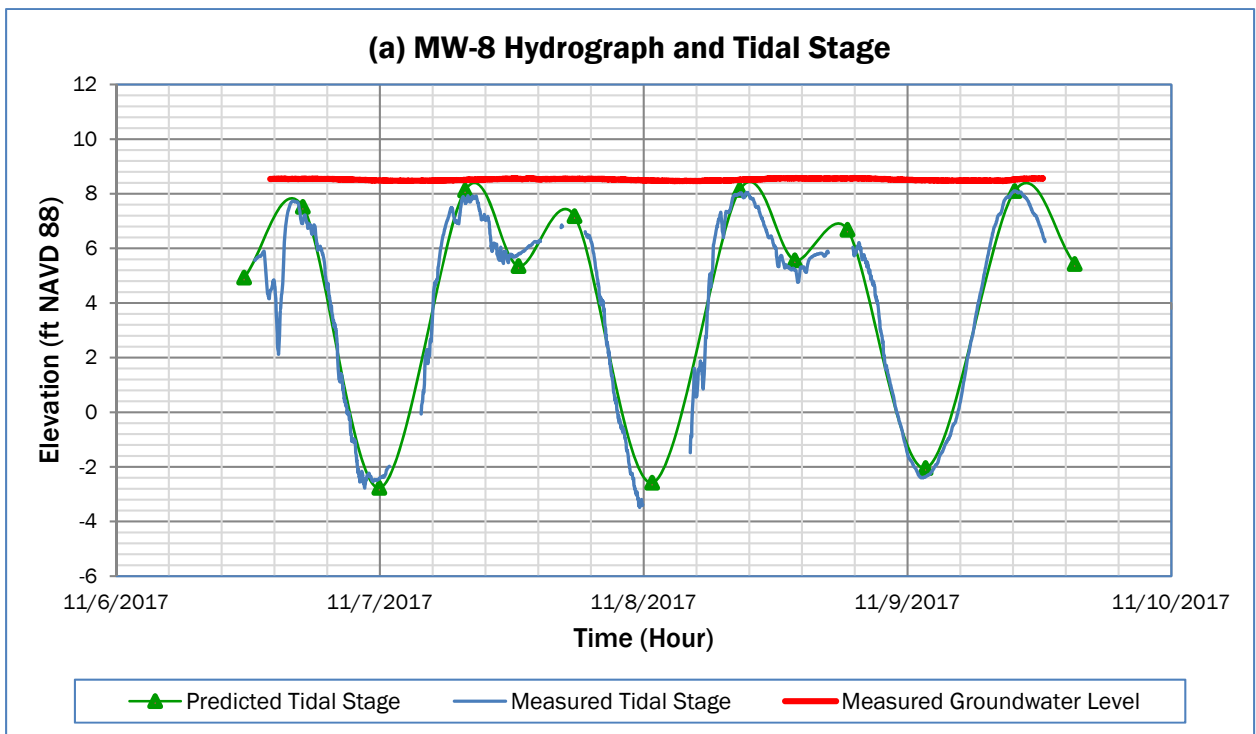
1. Method based on Serfes (1991).
 2. Xi: 48 means from moving average of 24 hourly tidal elevation.
 3. Yj: 25 means from moving average of 24 means over the 48 Xi.
 4. Time in hours is from 12:30 on 11/6/2017.
 5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
- Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/
Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at MW-7

Quiet Cove Property
Anacortes, Washington



Figure 10



Notes:

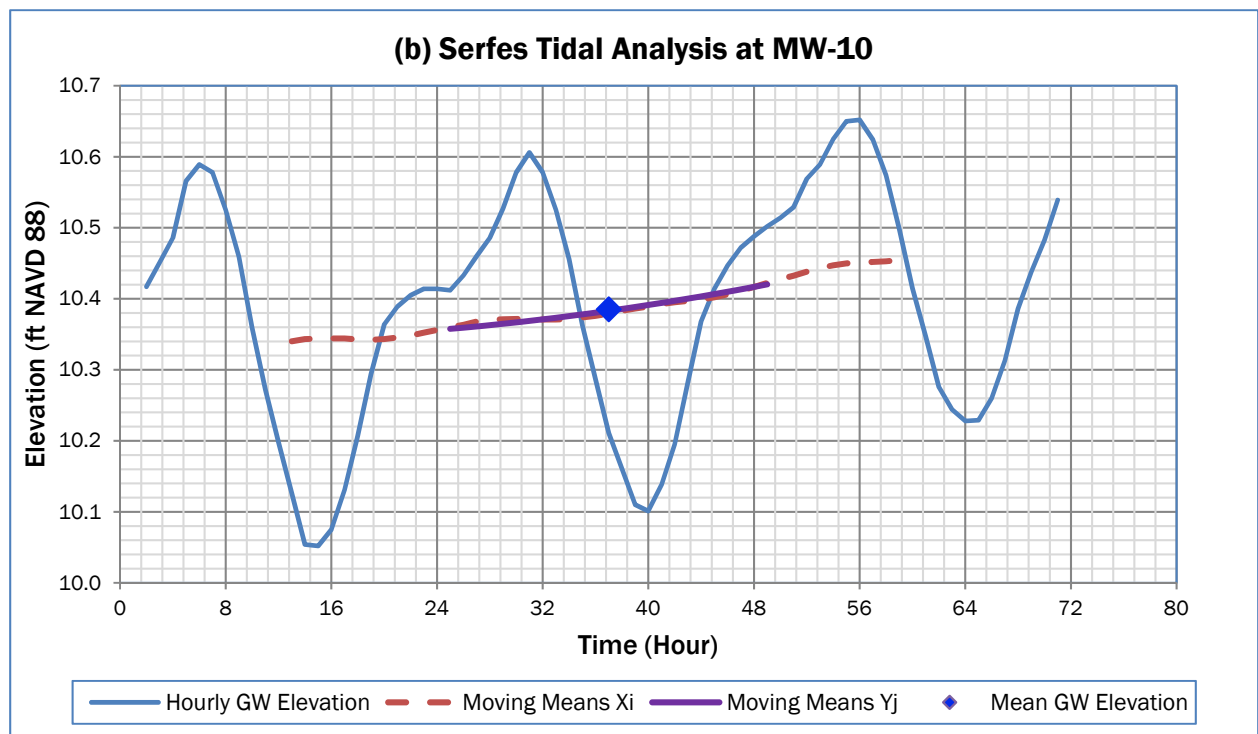
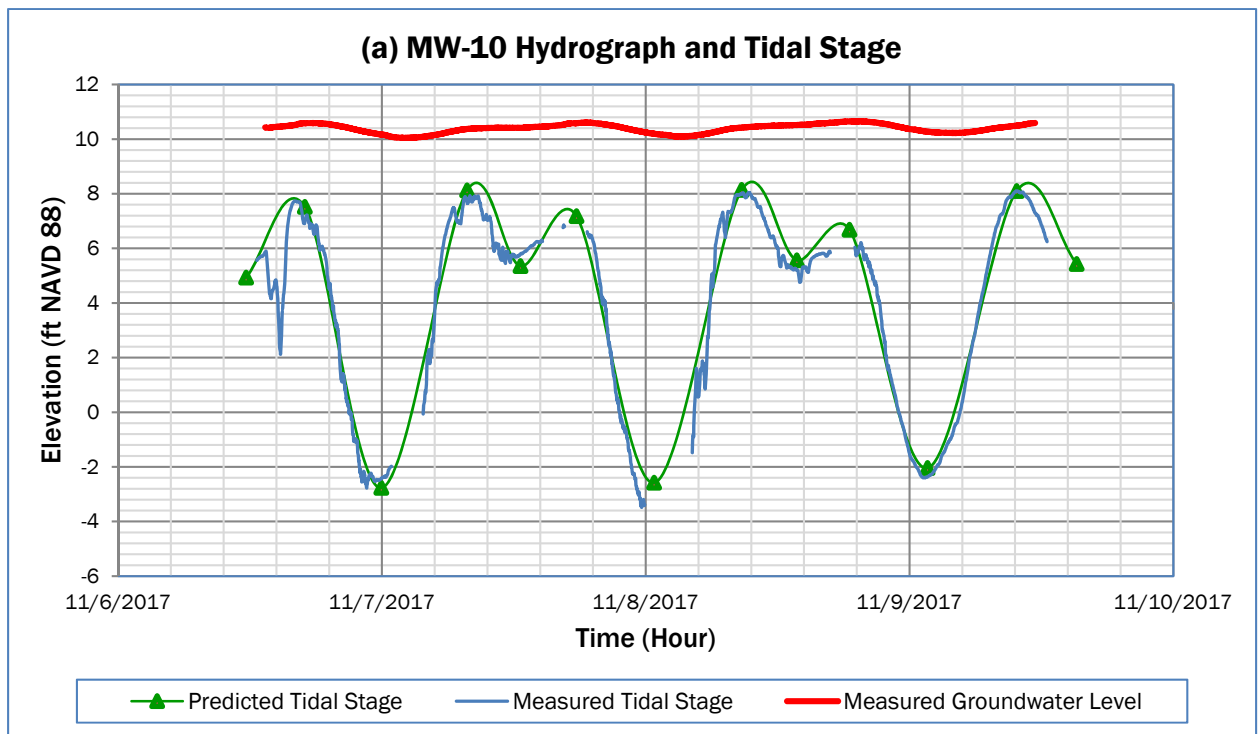
1. Method based on Serfes (1991).
2. Xi: 48 means from moving average of 24 hourly tidal elevation.
3. Yj: 25 means from moving average of 24 means over the 48 Xi.
4. Time in hours is from 12:30 on 11/6/2017.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/
Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at MW-8

Quiet Cove Property
Anacortes, Washington



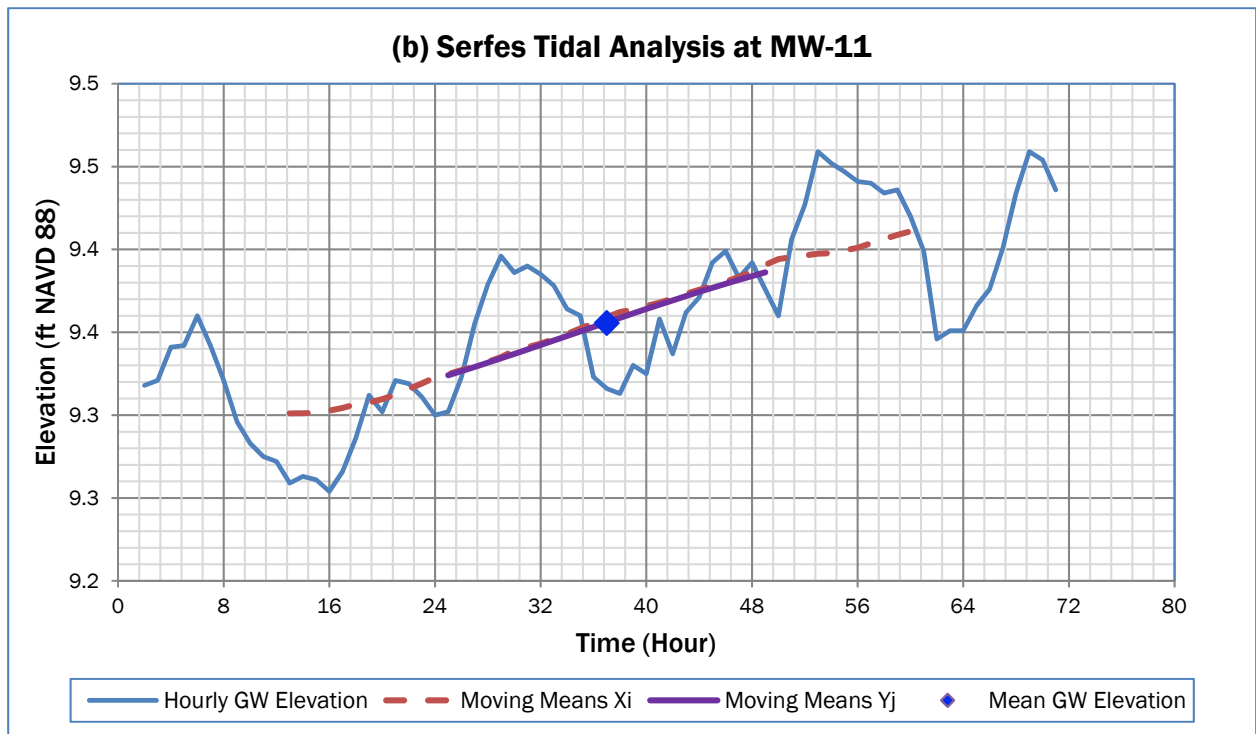
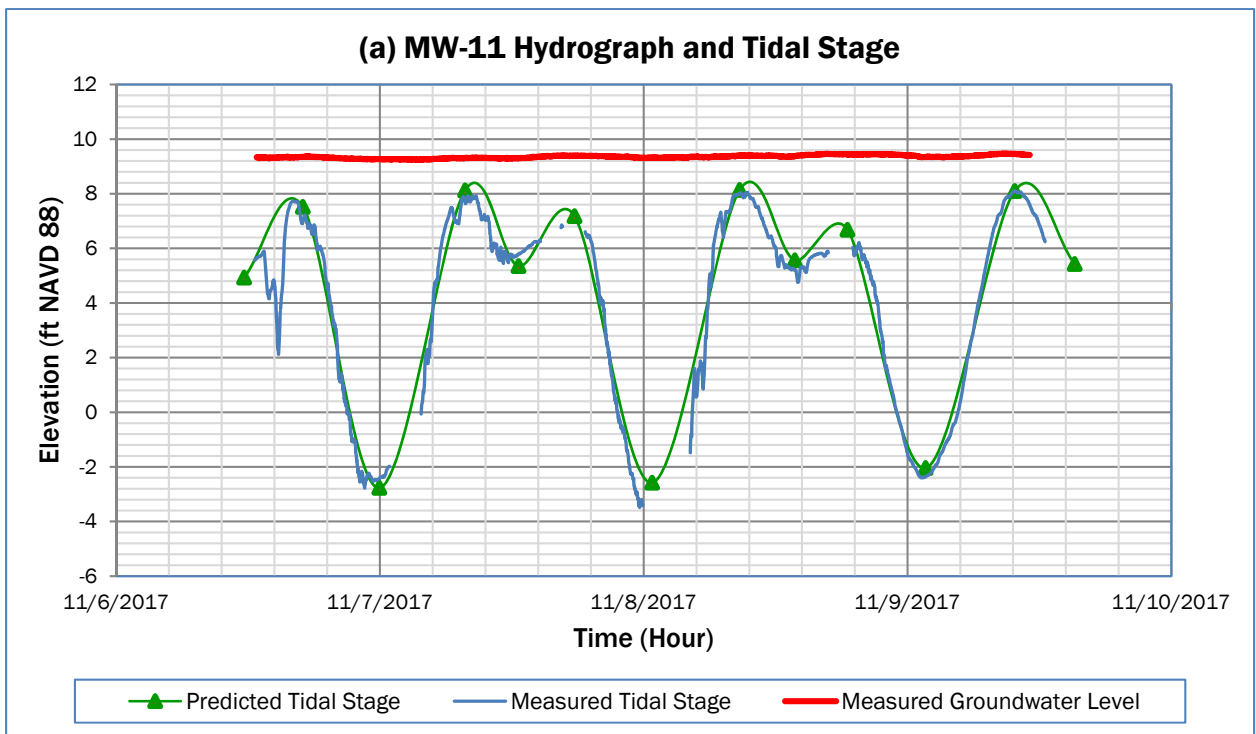
Figure 11



Notes:

1. Method based on Serfes (1991).
 2. Xi: 48 means from moving average of 24 hourly tidal elevation.
 3. Yj: 25 means from moving average of 24 means over the 48 Xi.
 4. Time in hours is from 12:30 on 11/6/2017.
 5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
- Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/
Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at MW-10	
Quiet Cove Property Anacortes, Washington	
	Figure 12



Notes:

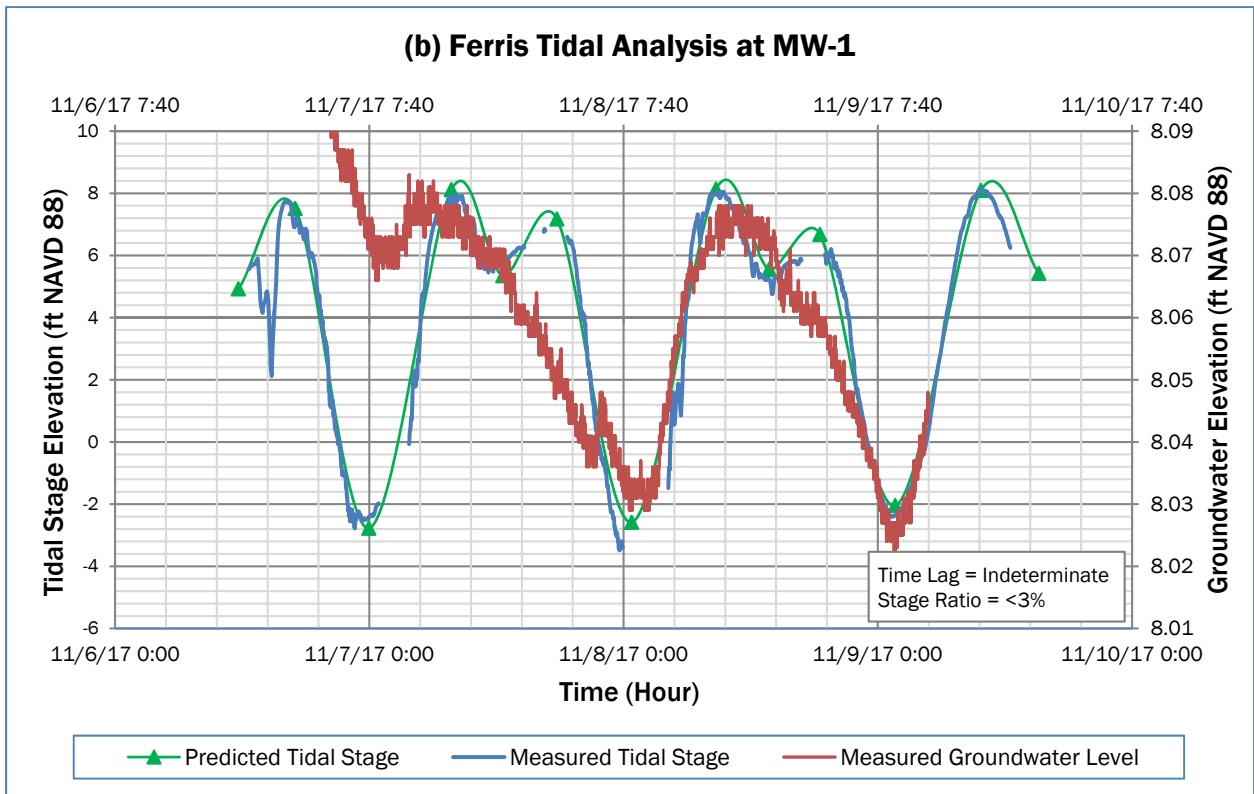
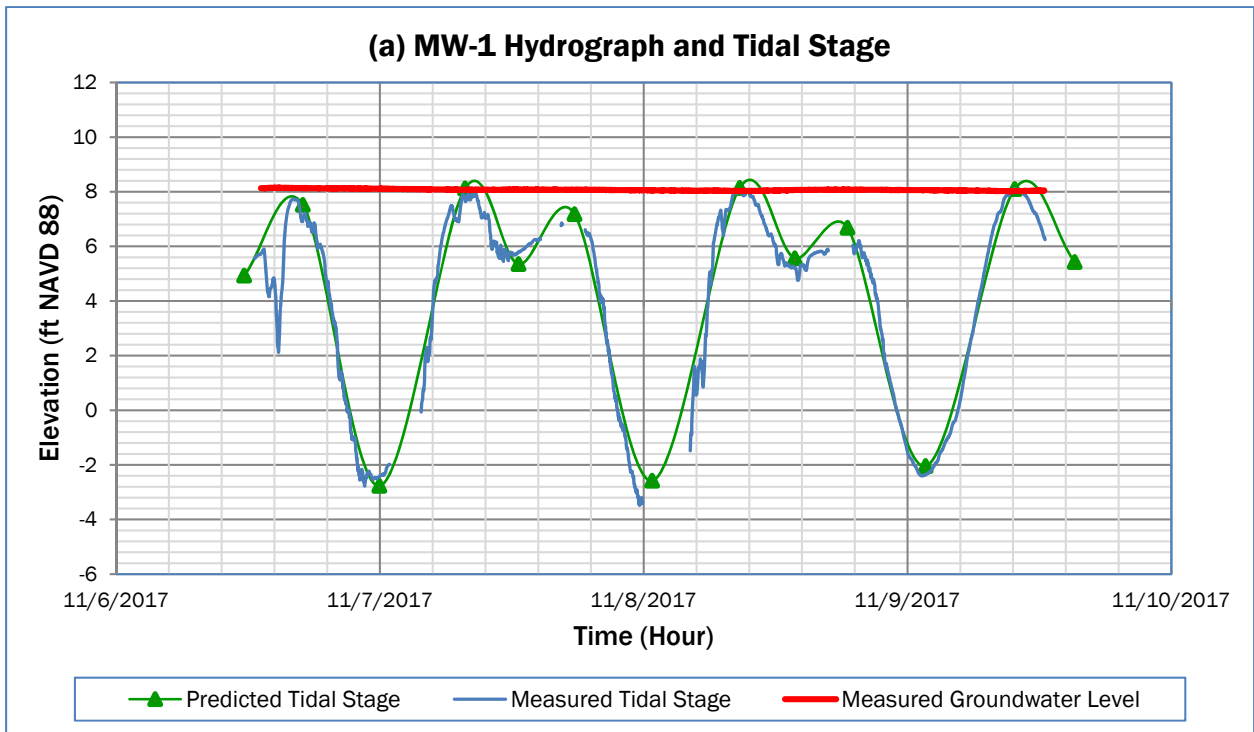
1. Method based on Serfes (1991).
 2. Xi: 48 means from moving average of 24 hourly tidal elevation.
 3. Yj: 25 means from moving average of 24 means over the 48 Xi.
 4. Time in hours is from 12:30 on 11/6/2017.
 5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
- Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/
Mean GW Elev_Quiet Cove.xlsx.

Serfes Tidal Analysis at MW-11

Quiet Cove Property
Anacortes, Washington



Figure 13

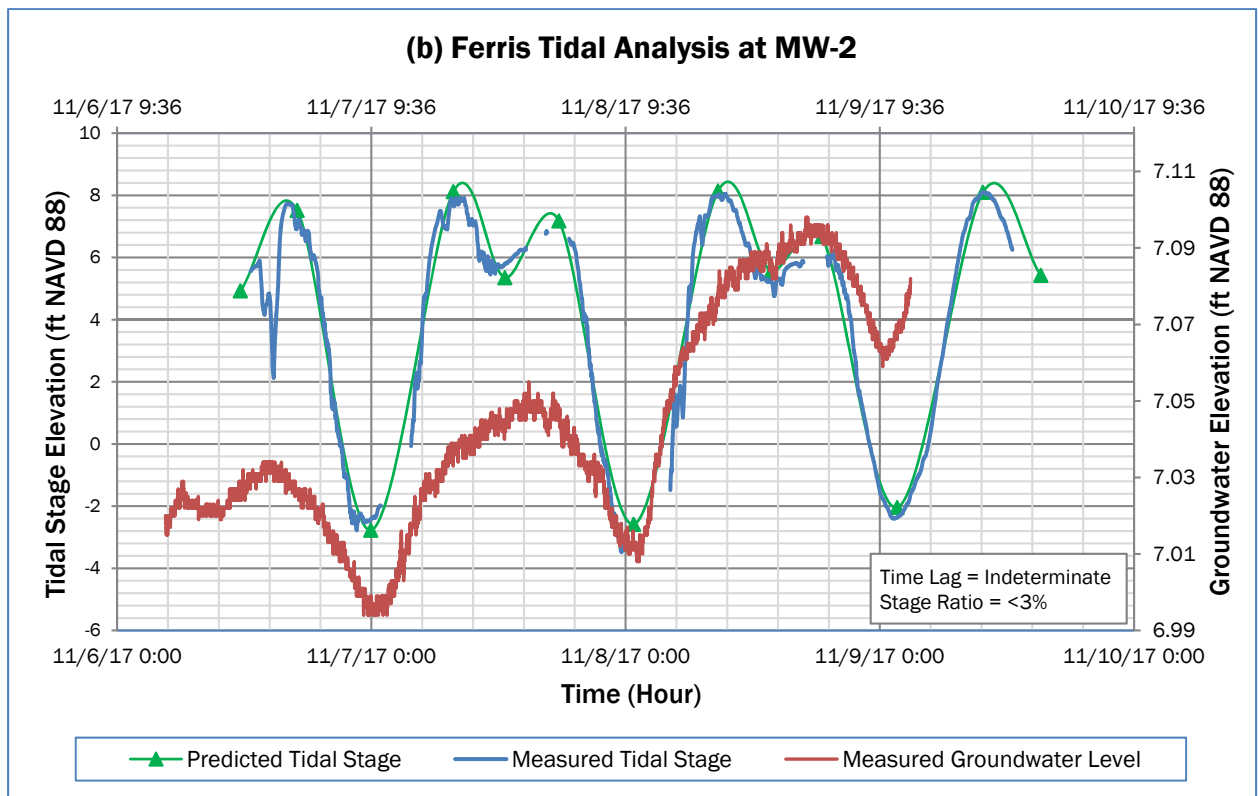
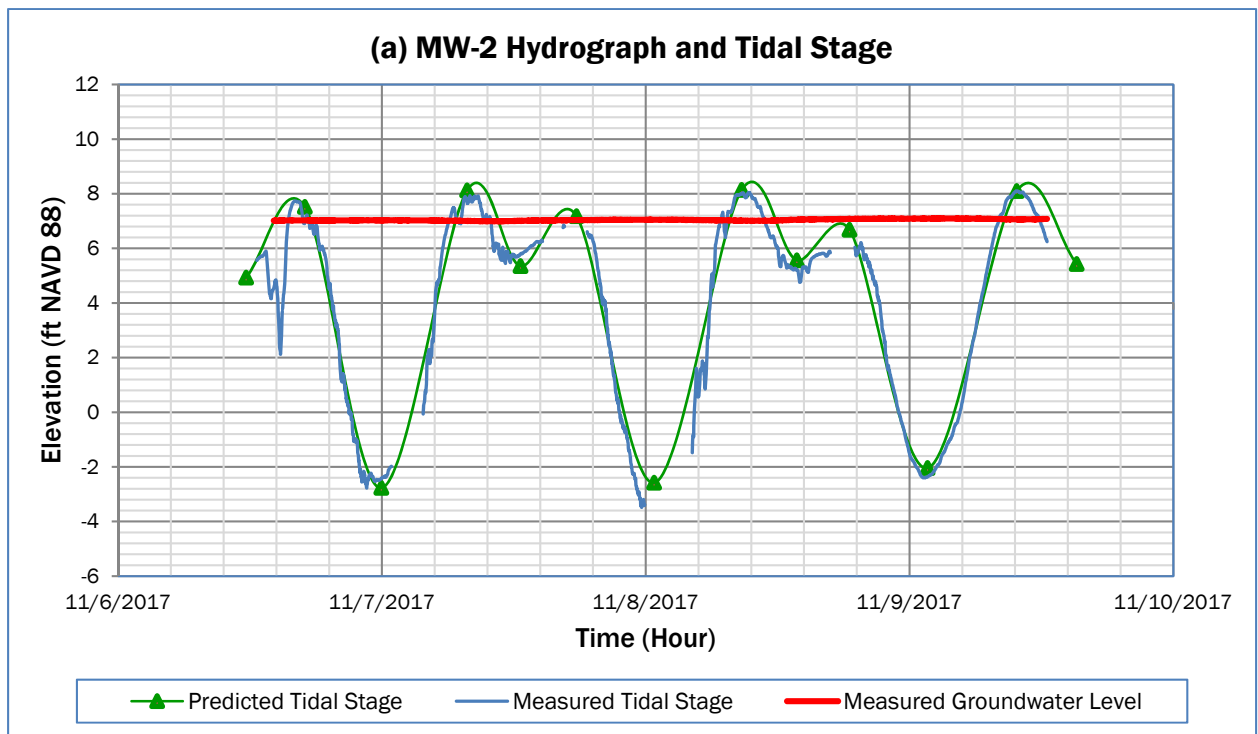


Notes:

1. Method based on Ferris (1951).
2. Distance to Shoreline: 35 feet
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/Tidal Match_Quiet Cove.xlsx.

Ferris Tidal Analysis at MW-1	
Quiet Cove Property Anacortes, Washington	
	Figure 14

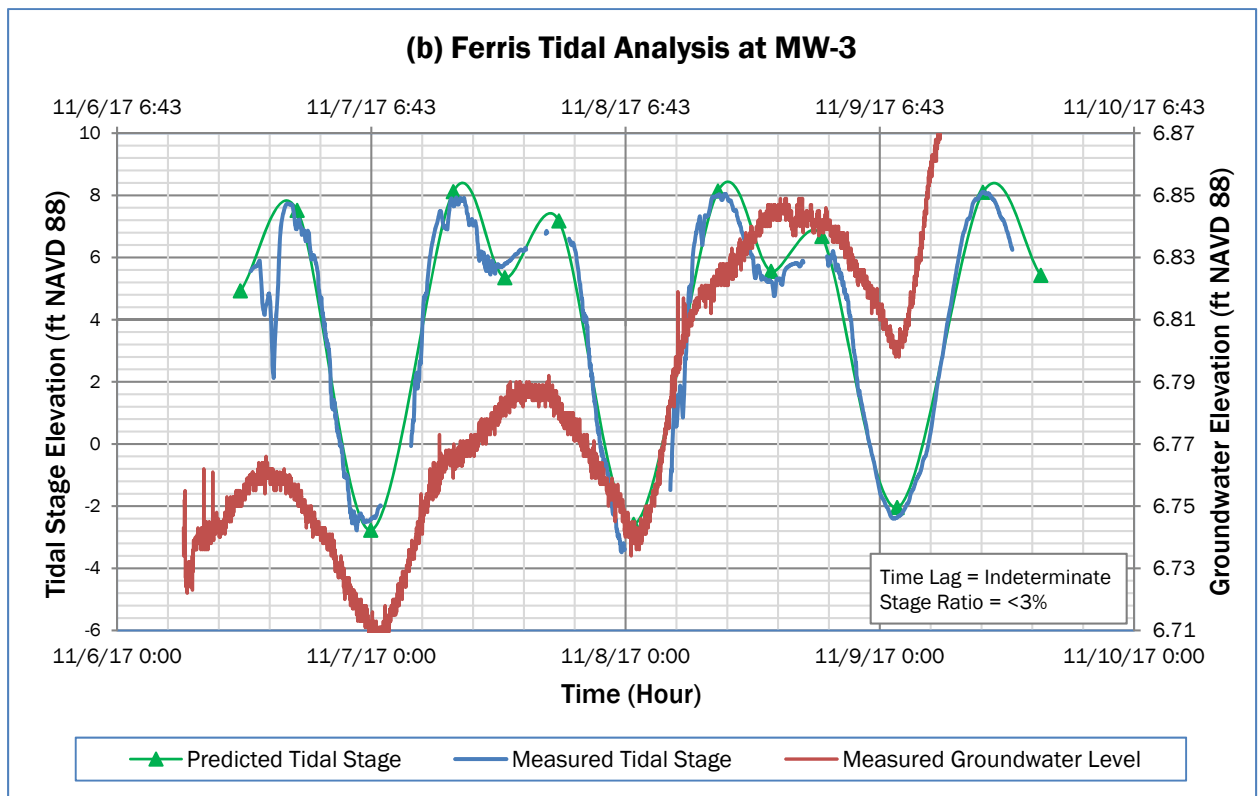
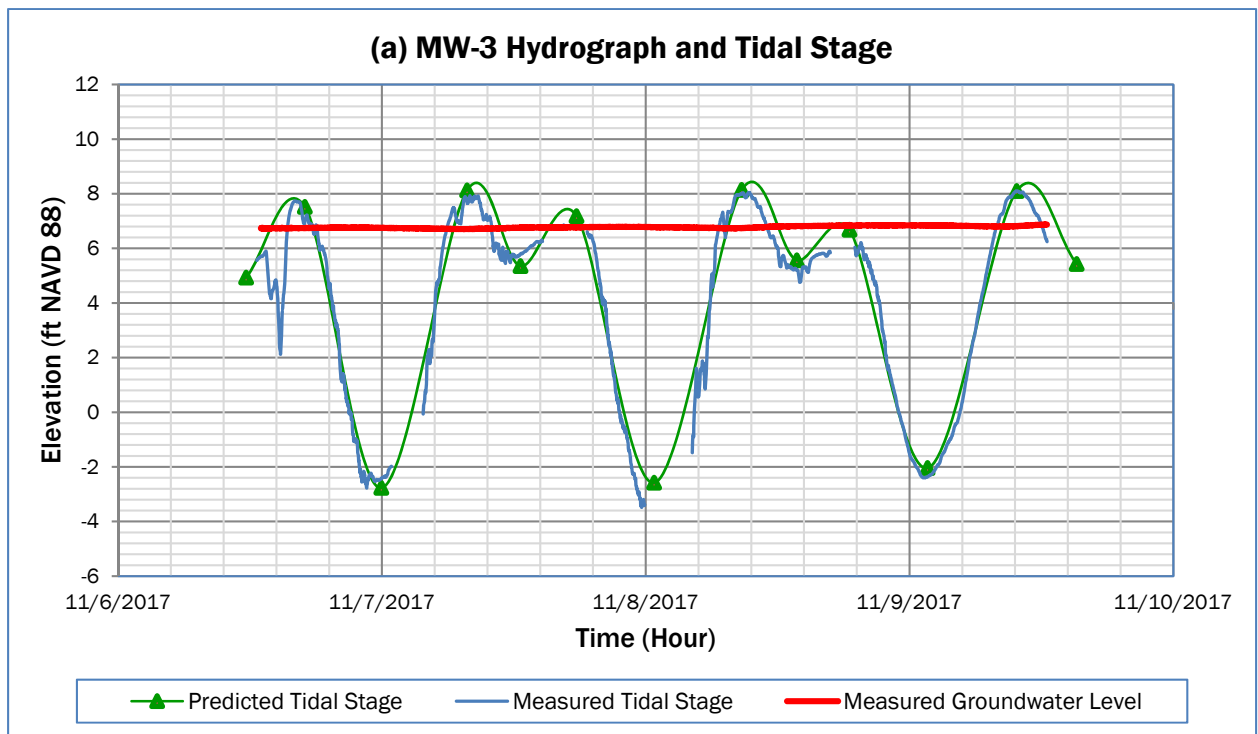


Notes:

1. Method based on Ferris (1951).
2. Distance to Shoreline: 40 feet
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/Tidal Match_Quiet Cove.xlsx.

Ferris Tidal Analysis at MW-2	
Quiet Cove Property Anacortes, Washington	
	Figure 15

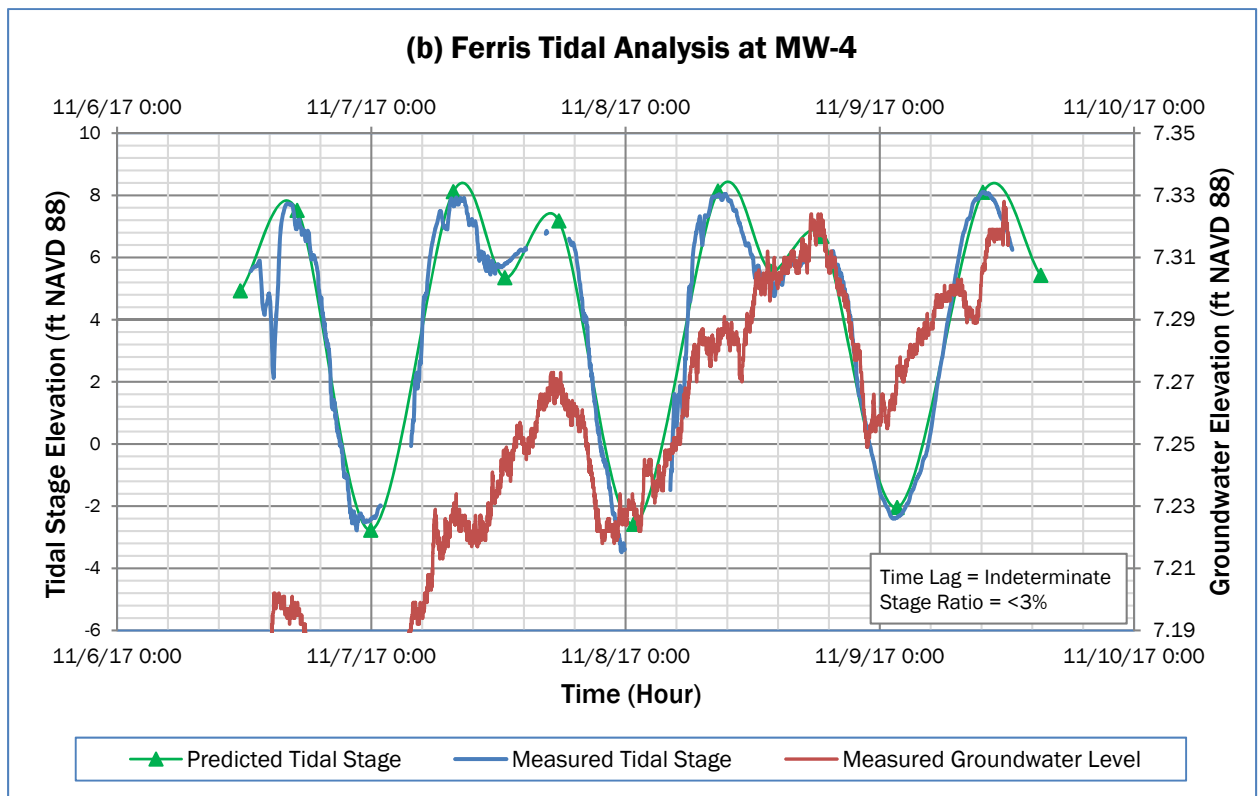
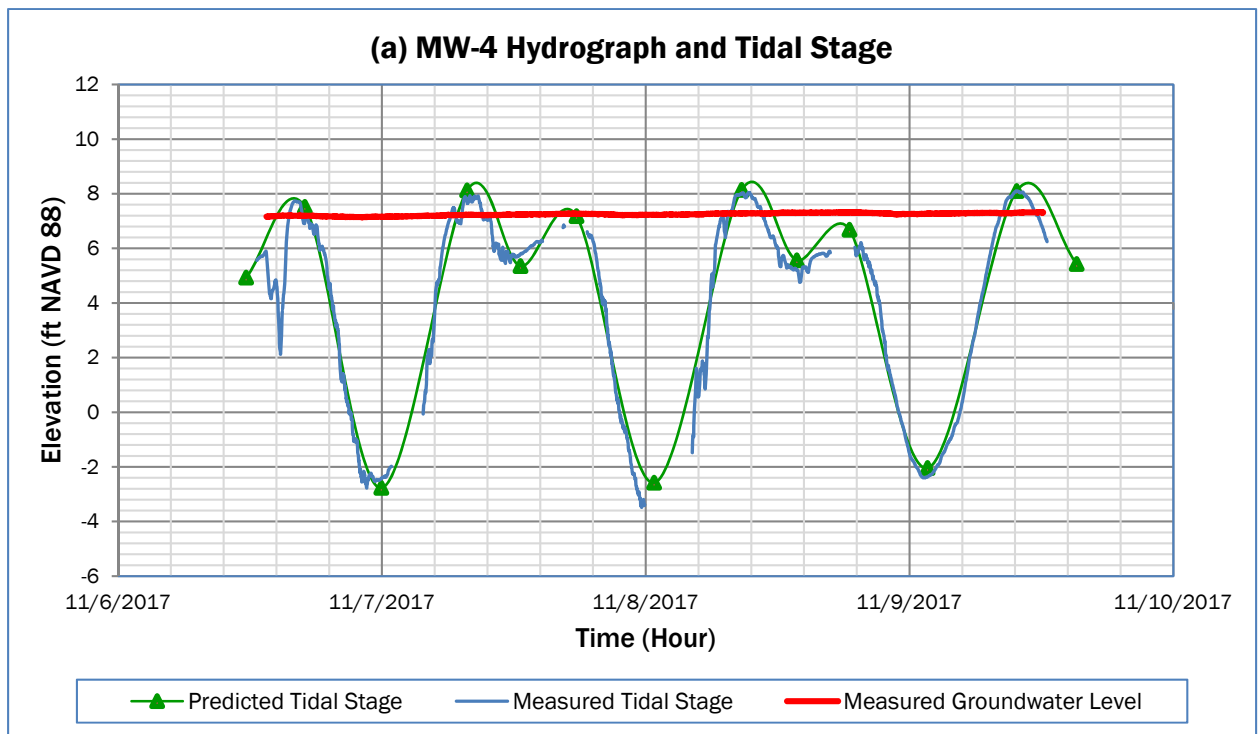


Notes:

1. Method based on Ferris (1951).
2. Distance to Shoreline: 45 feet
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/Tidal Match_Quiet Cove.xlsx.

Ferris Tidal Analysis at MW-3	
Quiet Cove Property Anacortes, Washington	
	Figure 16



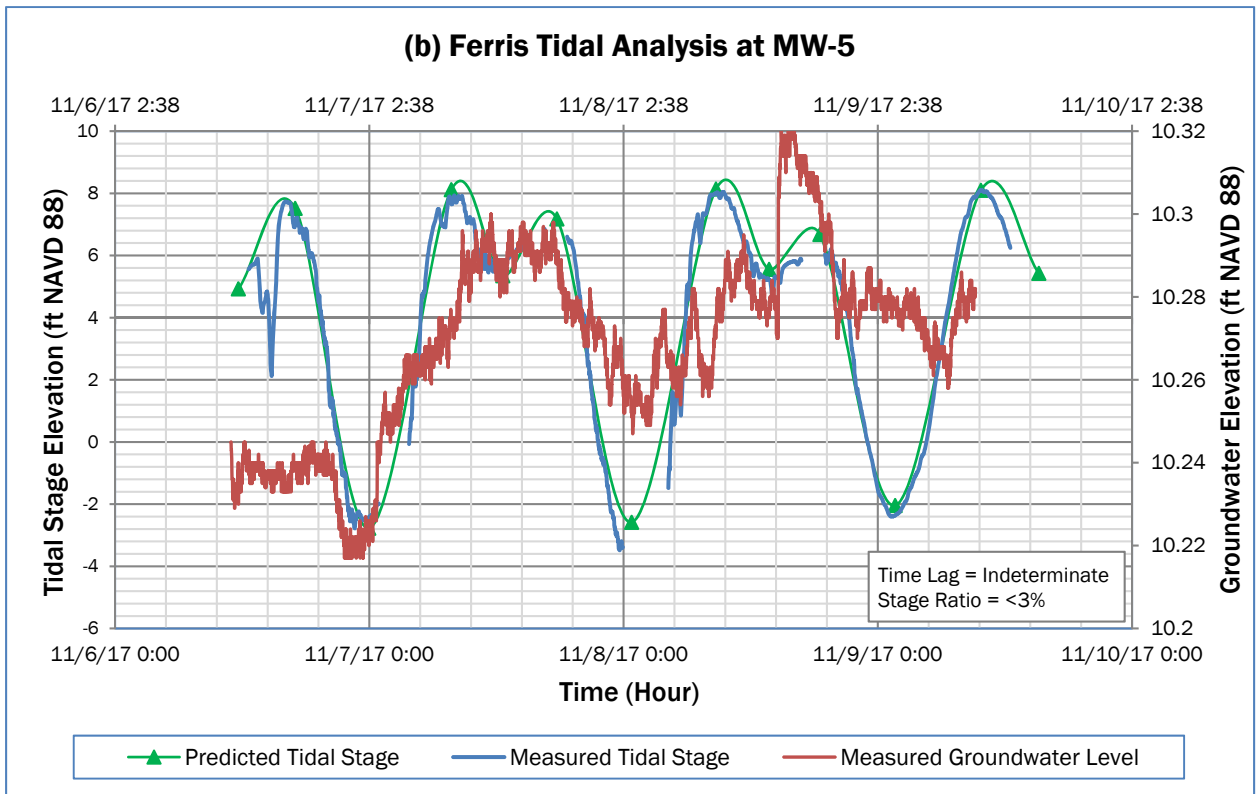
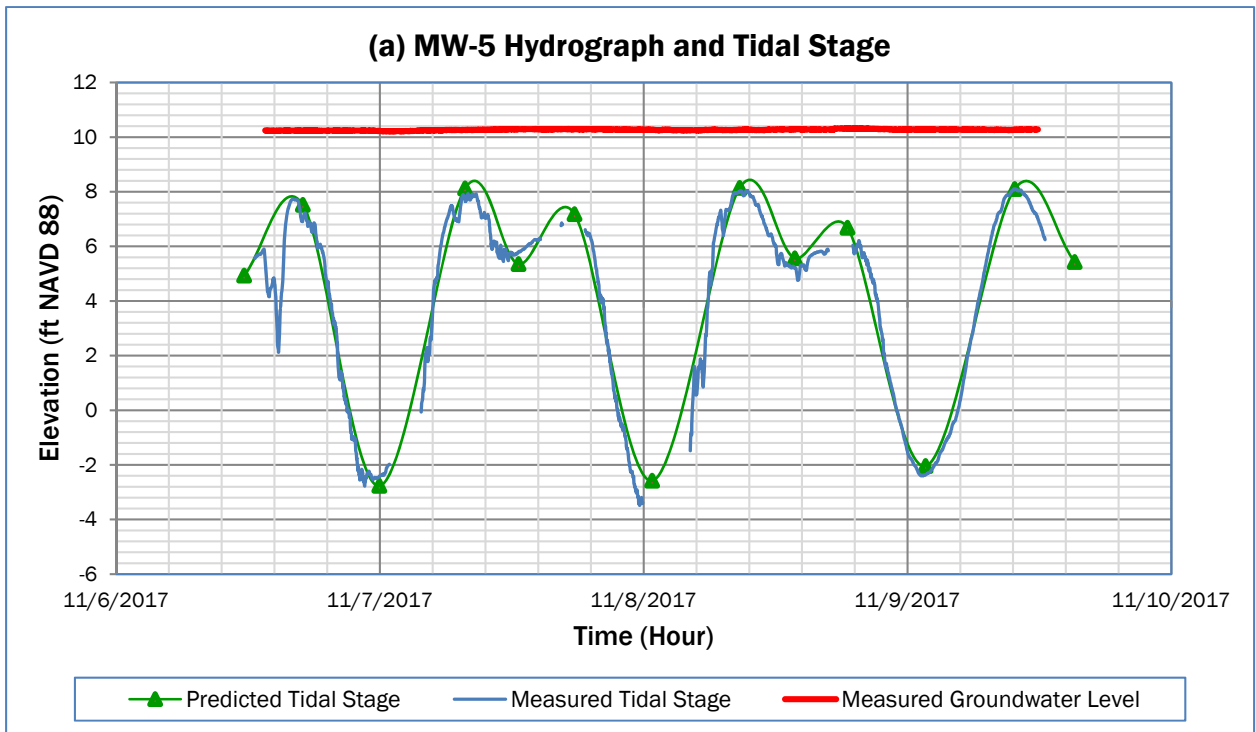
Notes:

1. Method based on Ferris (1951).
2. Distance to Shoreline: 190 feet
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/Tidal Match_Quiet Cove.xlsx.

Ferris Tidal Analysis at MW-4	
Quiet Cove Property Anacortes, Washington	
	Figure 17

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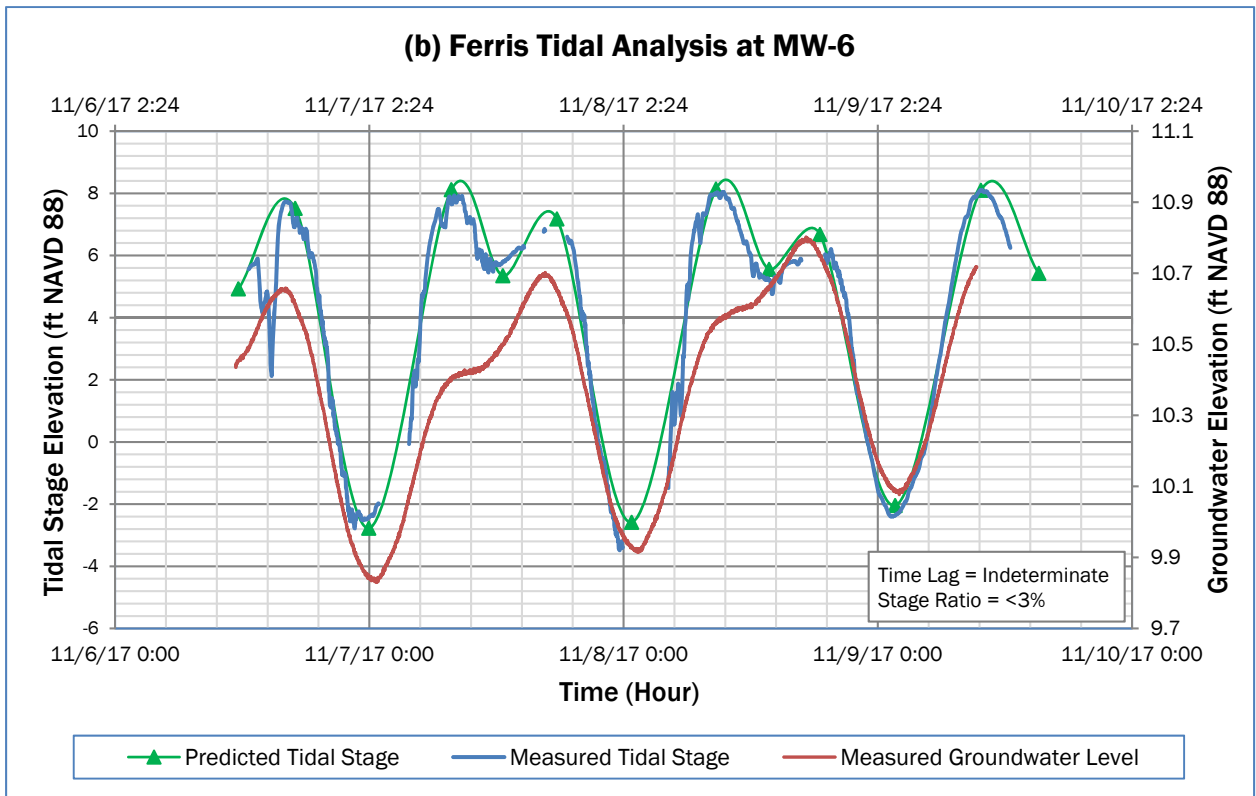
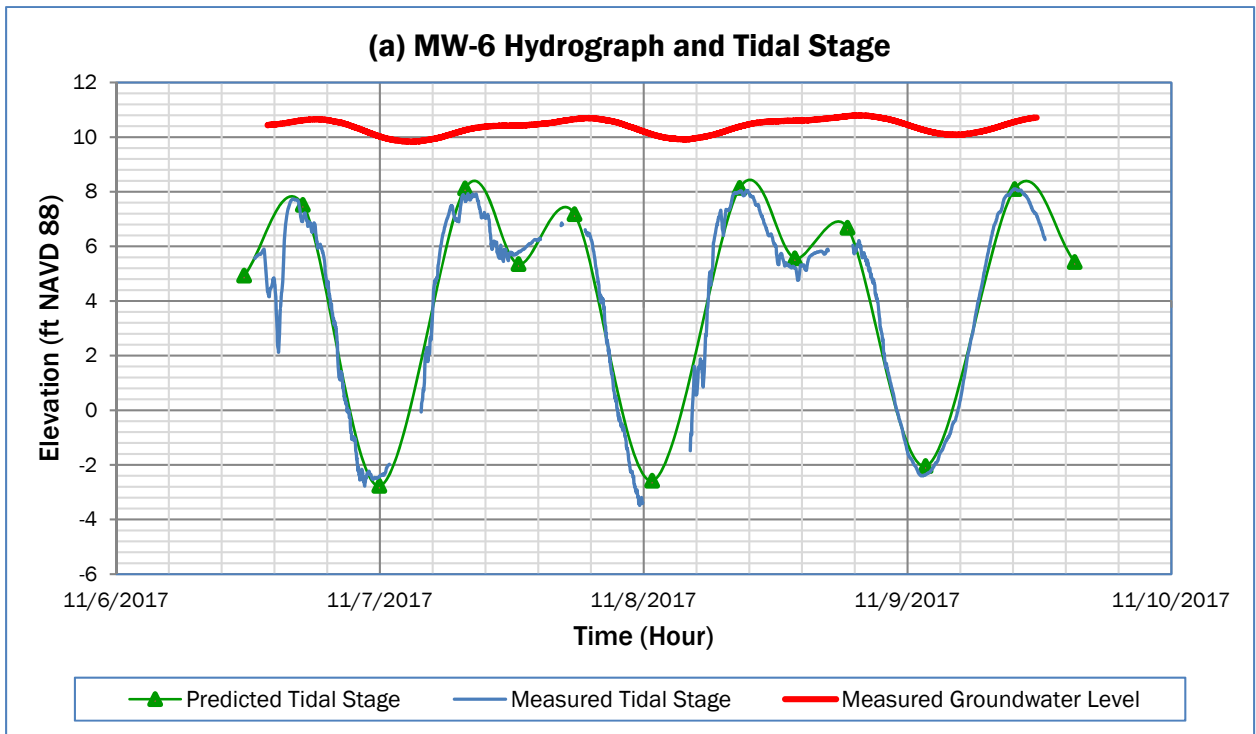


Notes:

1. Method based on Ferris (1951).
2. Distance to Shoreline: 260 feet
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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Tidal Match_Quiet Cove.xlsx.

Ferris Tidal Analysis at MW-5	
Quiet Cove Property Anacortes, Washington	
	Figure 18

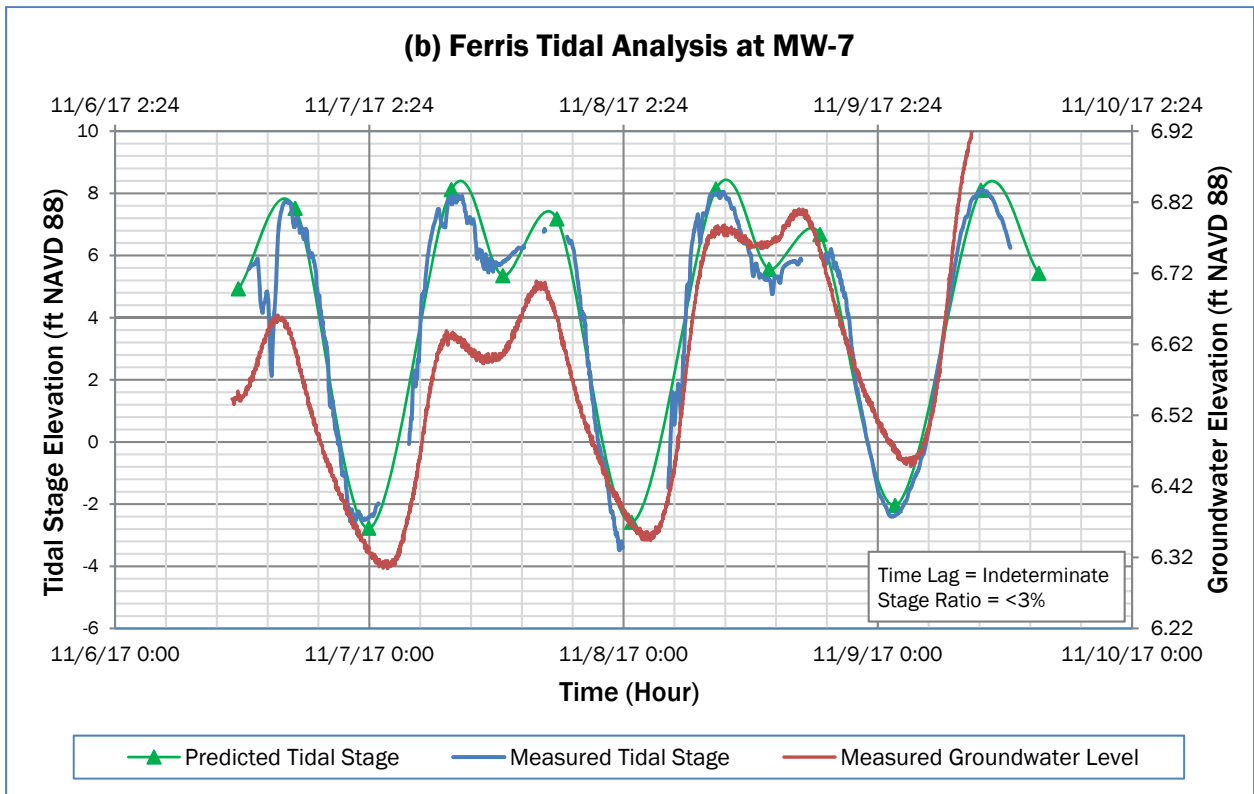
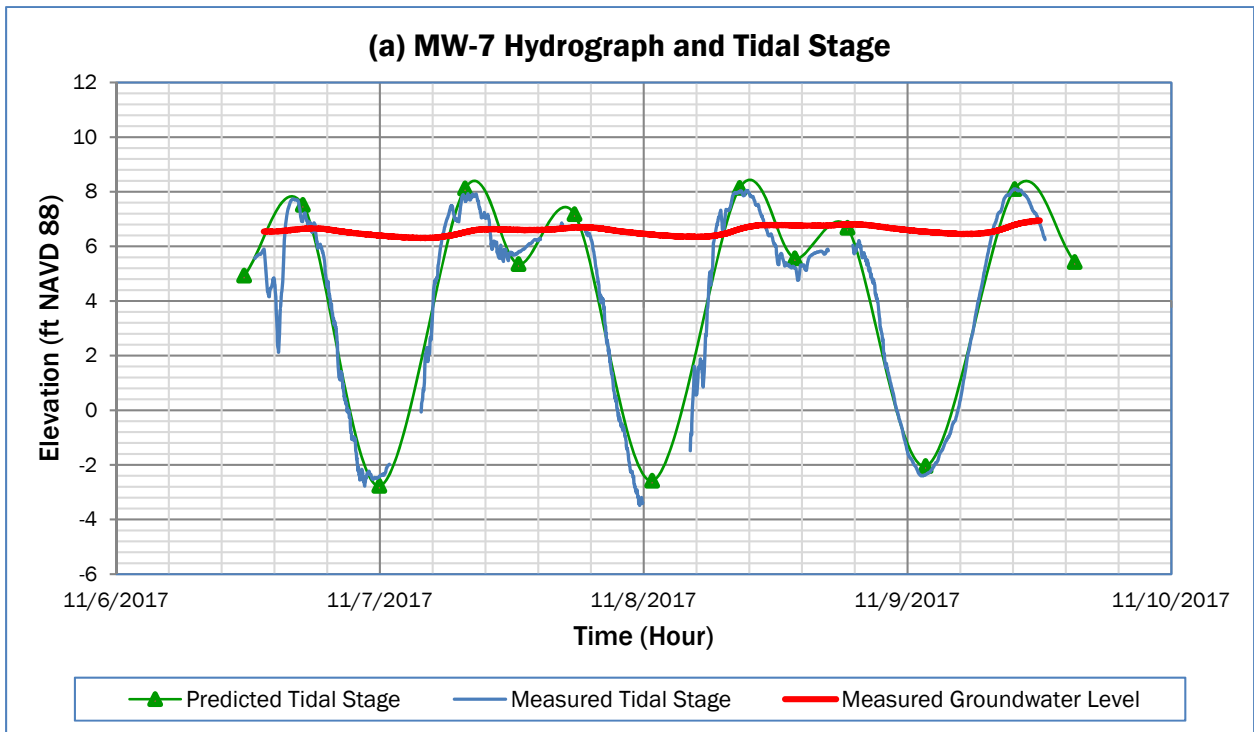


Notes:

1. Method based on Ferris (1951).
2. Distance to Shoreline: 380 feet
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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Ferris Tidal Analysis at MW-6	
Quiet Cove Property Anacortes, Washington	
	Figure 19



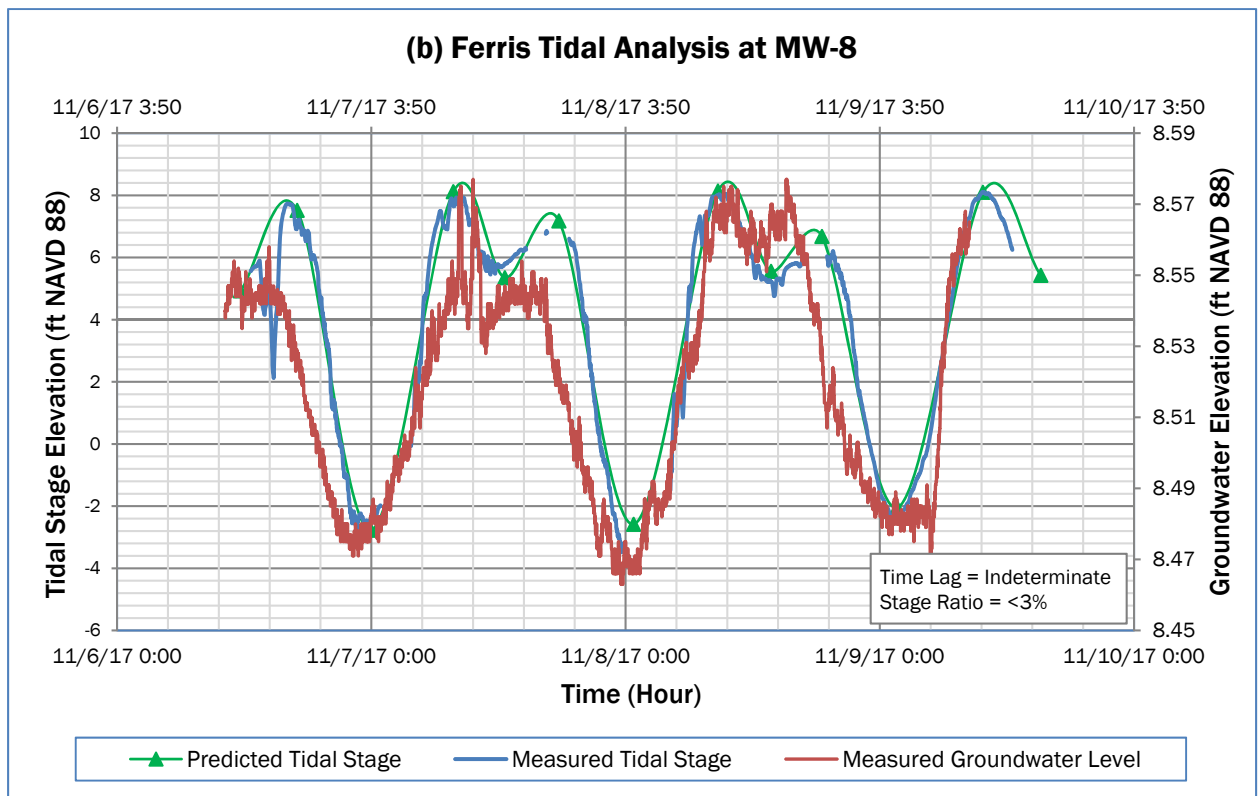
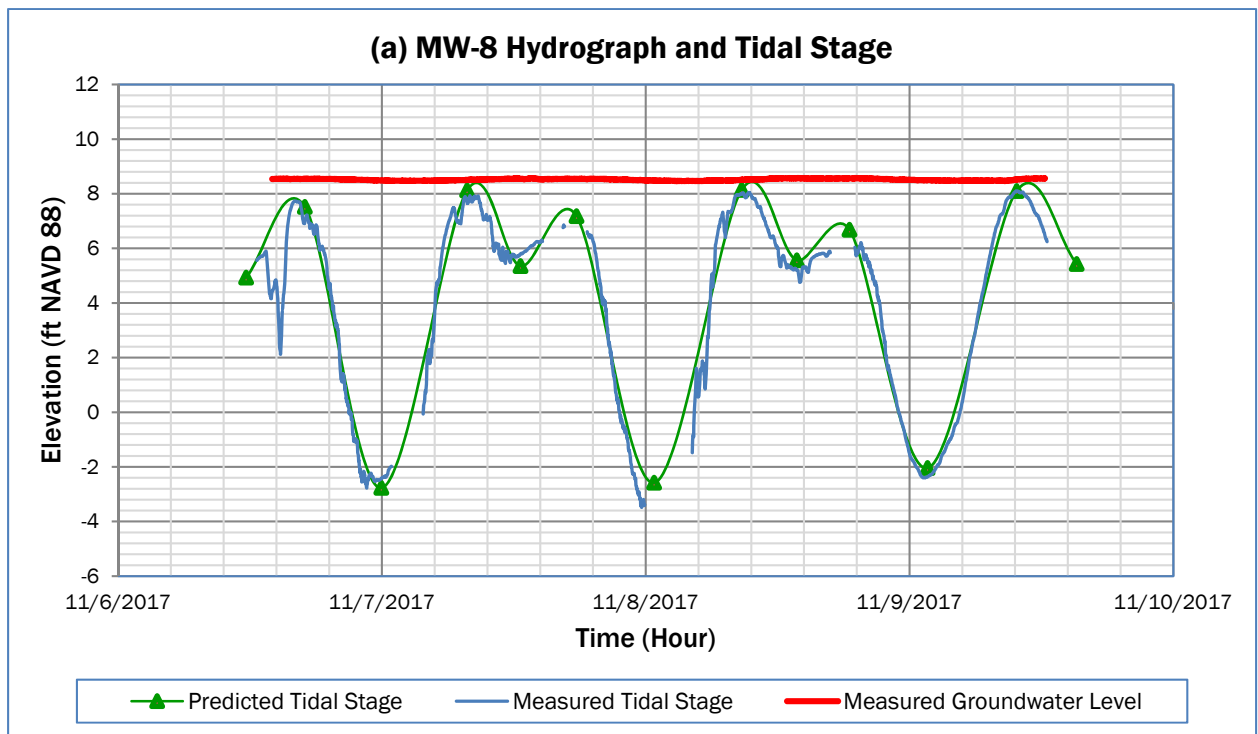
Notes:

1. Method based on Ferris (1951).
2. Distance to Shoreline: 240 feet
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/Tidal Match_Quiet Cove.xlsx.

Ferris Tidal Analysis at MW-7	
Quiet Cove Property Anacortes, Washington	
	Figure 20

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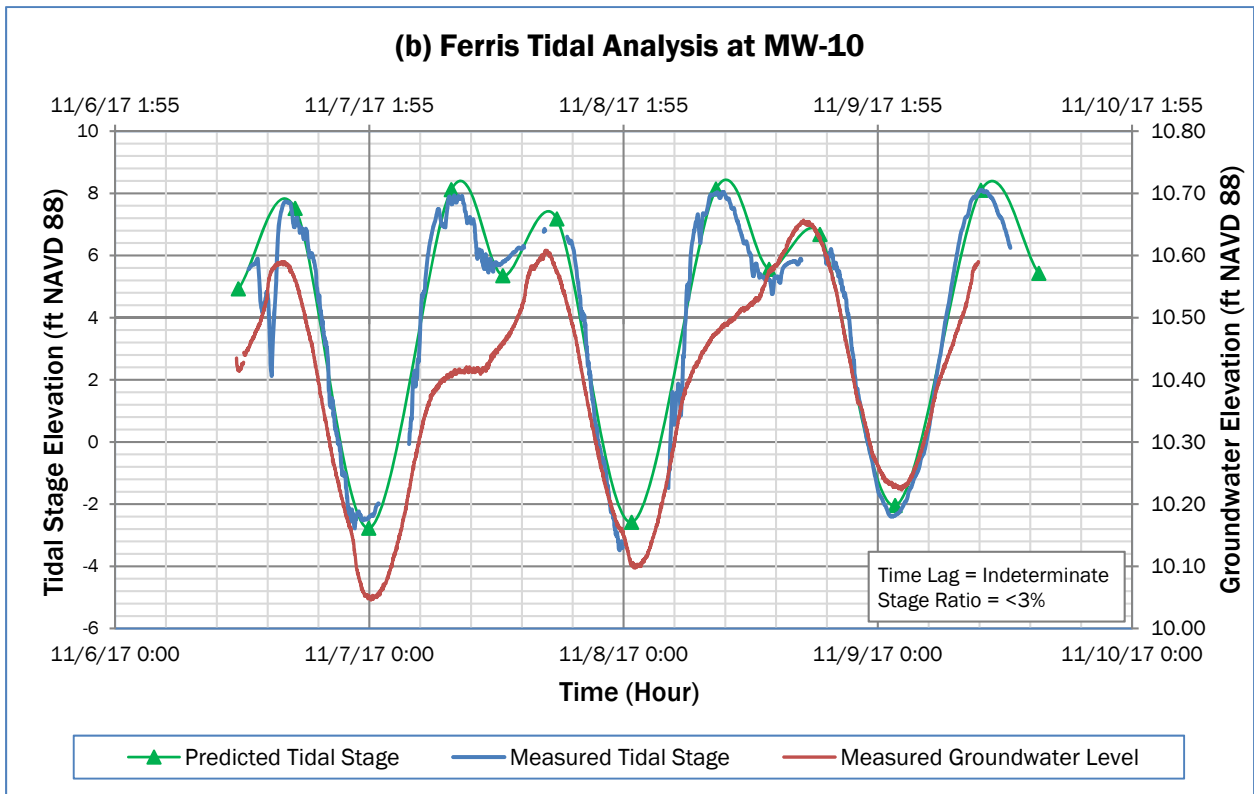
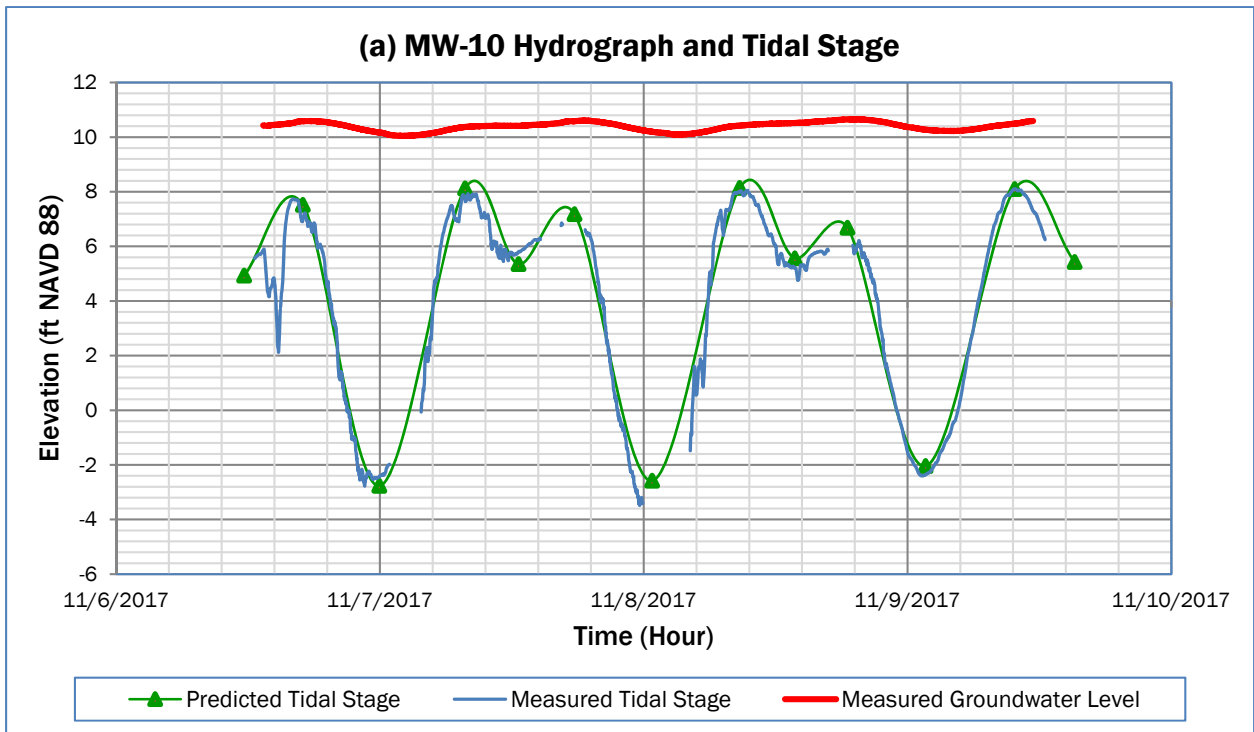
Notes:

1. Method based on Ferris (1951).
2. Distance to Shoreline: 80 feet
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/
Tidal Match_Quiet Cove.xlsx.

Ferris Tidal Analysis at MW-8	
Quiet Cove Property Anacortes, Washington	
	Figure 21

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Notes:

1. Method based on Ferris (1951).
2. Distance to Shoreline: 300 feet
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/
Tidal Match_Quiet Cove.xlsx.

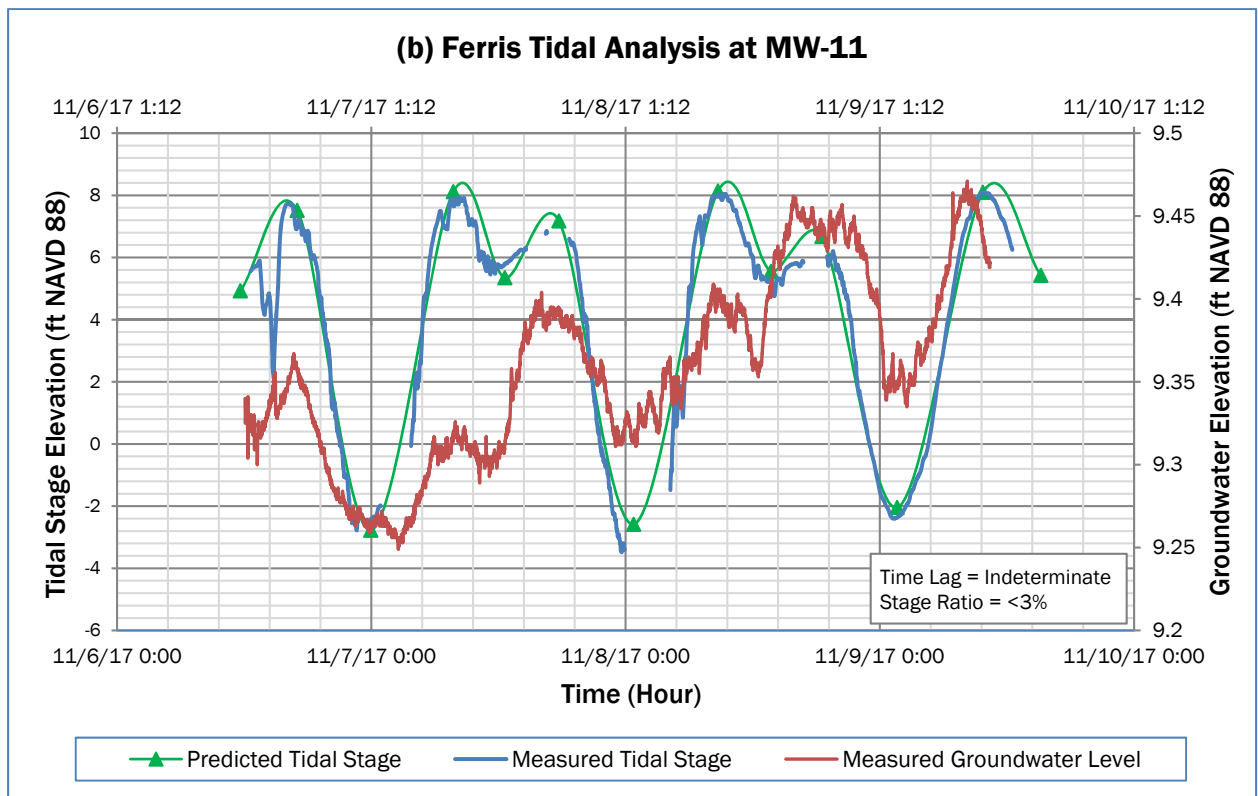
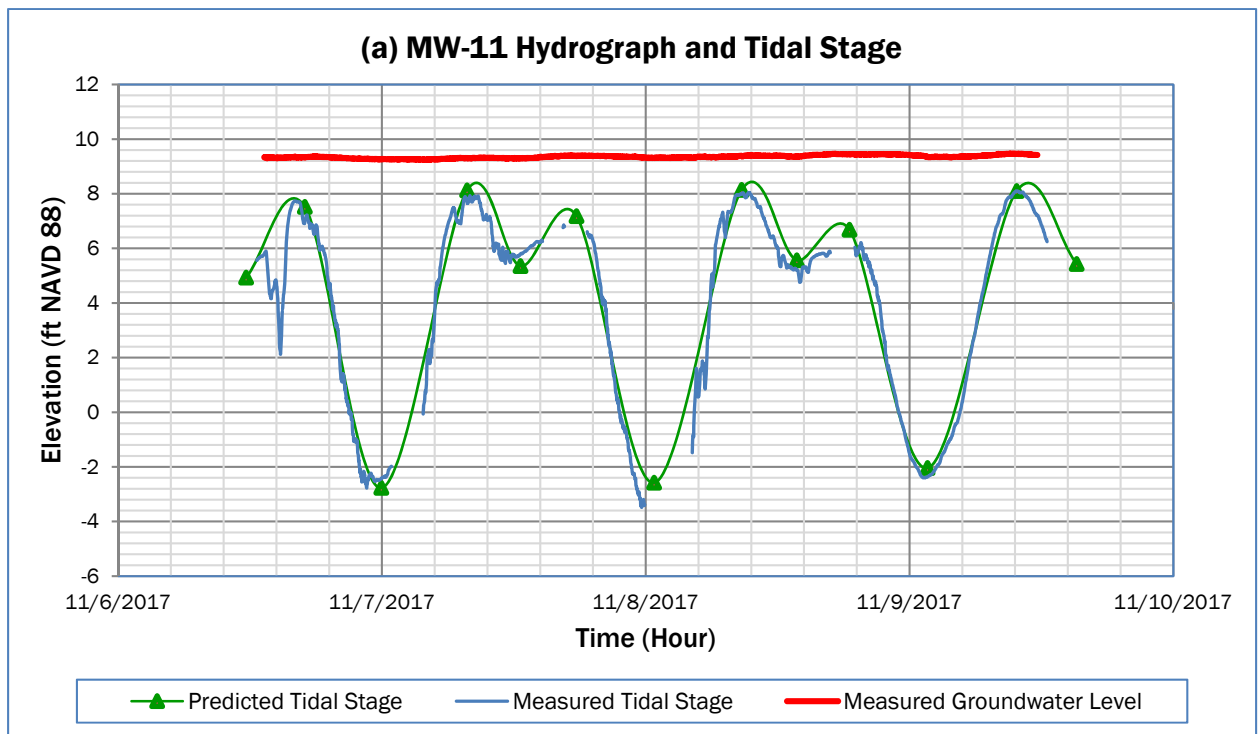
Ferris Tidal Analysis at MW-10

Quiet Cove Property
Anacortes, Washington



Figure 22

Project:Geoengineers.com/Working/DRAFT FINAL Tech Memo Hydrogeological Evaluation/Draft Final Quiet Cove Hydro Study Tech Memo Figs 14-23 Date Exported: 04/18/18



Notes:

1. Method based on Ferris (1951).
2. Distance to Shoreline: 160 feet
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

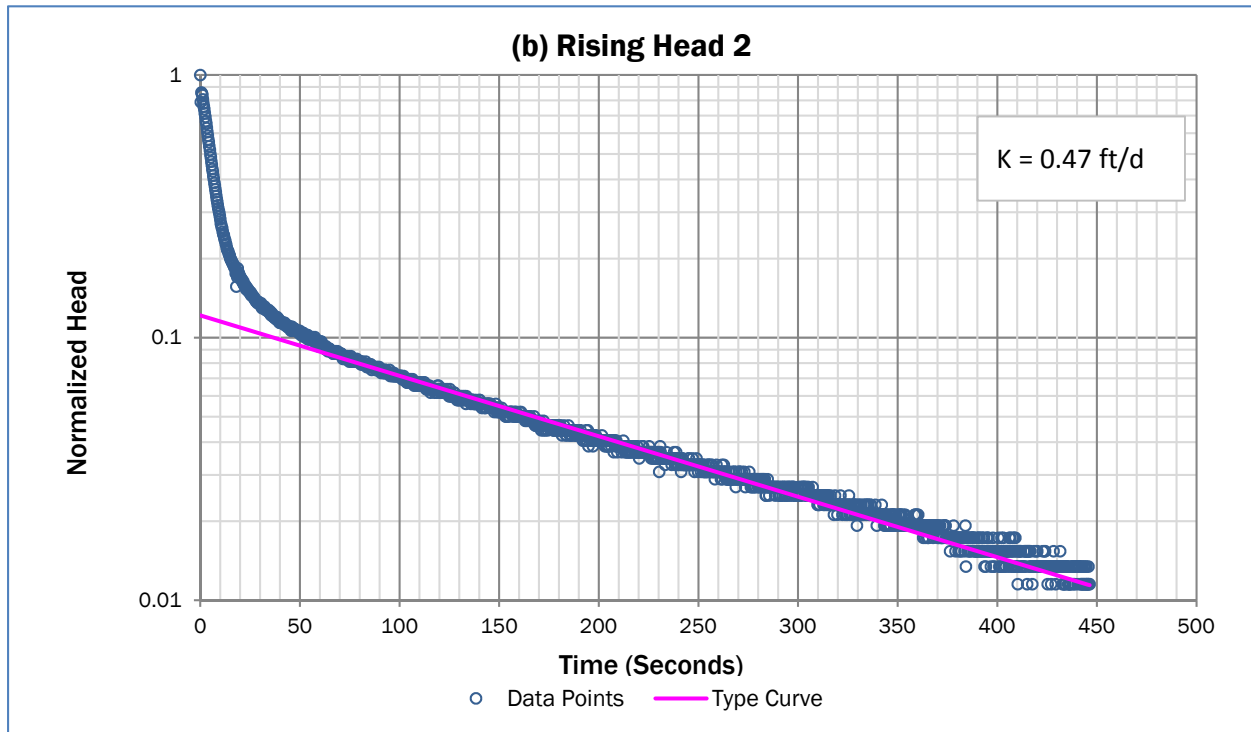
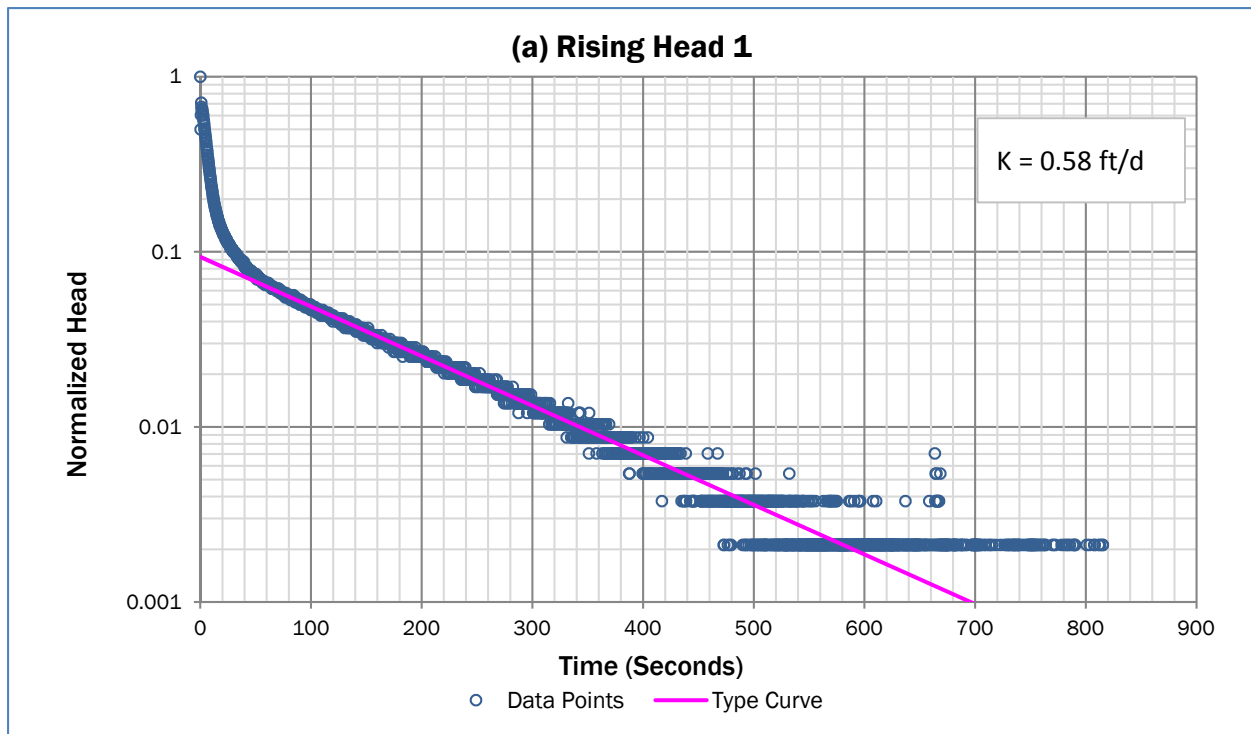
Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study Analysis/
Tidal Match_Quiet Cove.xlsx.

Ferris Tidal Analysis at MW-11

Quiet Cove Property
Anacortes, Washington



Figure 23



Notes:

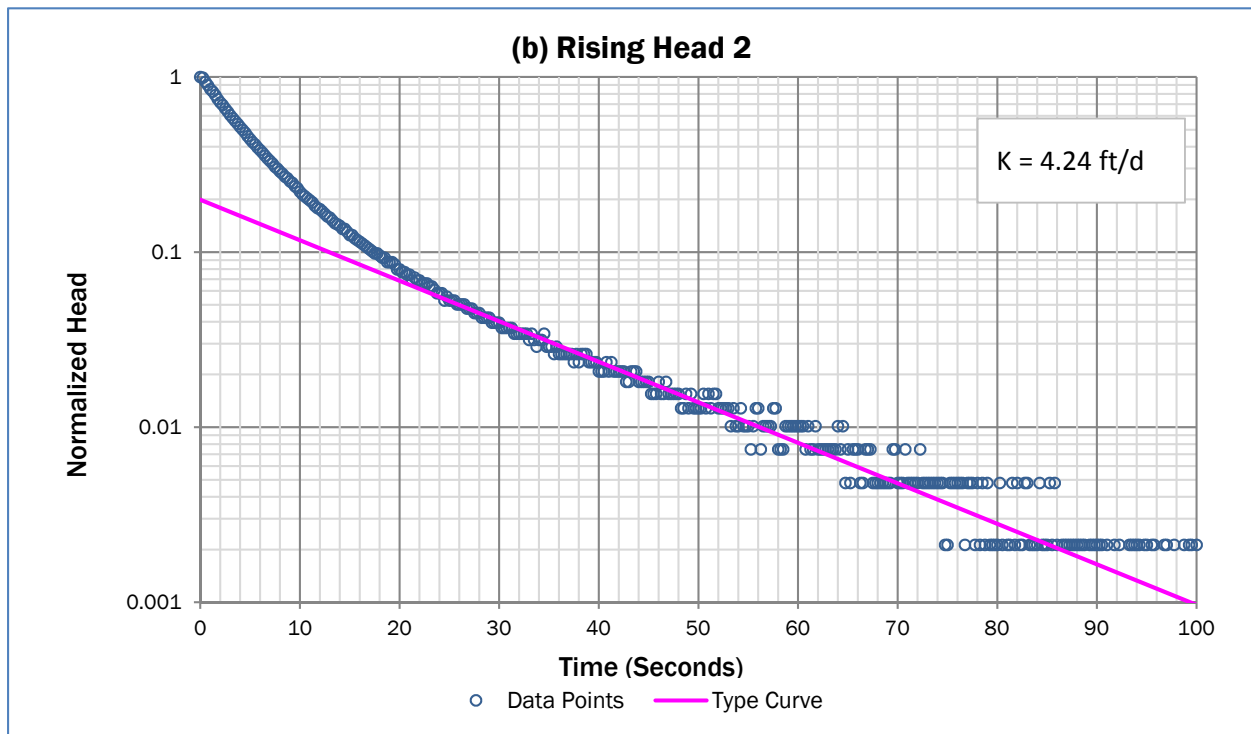
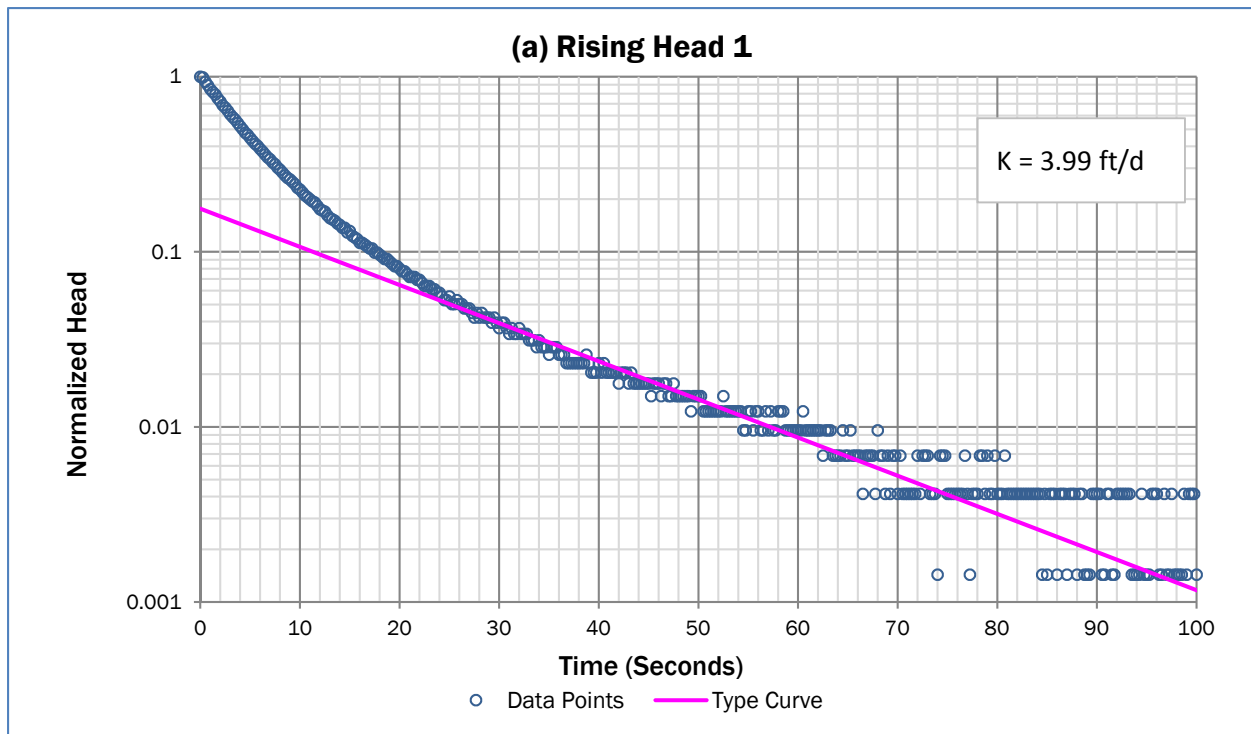
1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
 2. Well is screened across the water table.
 3. Aquifer is assumed to be unconfined.
 4. Saturated thickness is assumed to be 7.6 feet.
 5. Well is screened from 3.7 to 11.7 feet below ground surface.
 6. Static water level was 6.37 feet below ground surface.
 7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
- Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study and Slug Testing/Slug Tests/MW-2_BouwerRice1976.xls

Aquifer Slug Test at MW-2

Quiet Cove Property
Anacortes, WA



Figure 24



Notes:

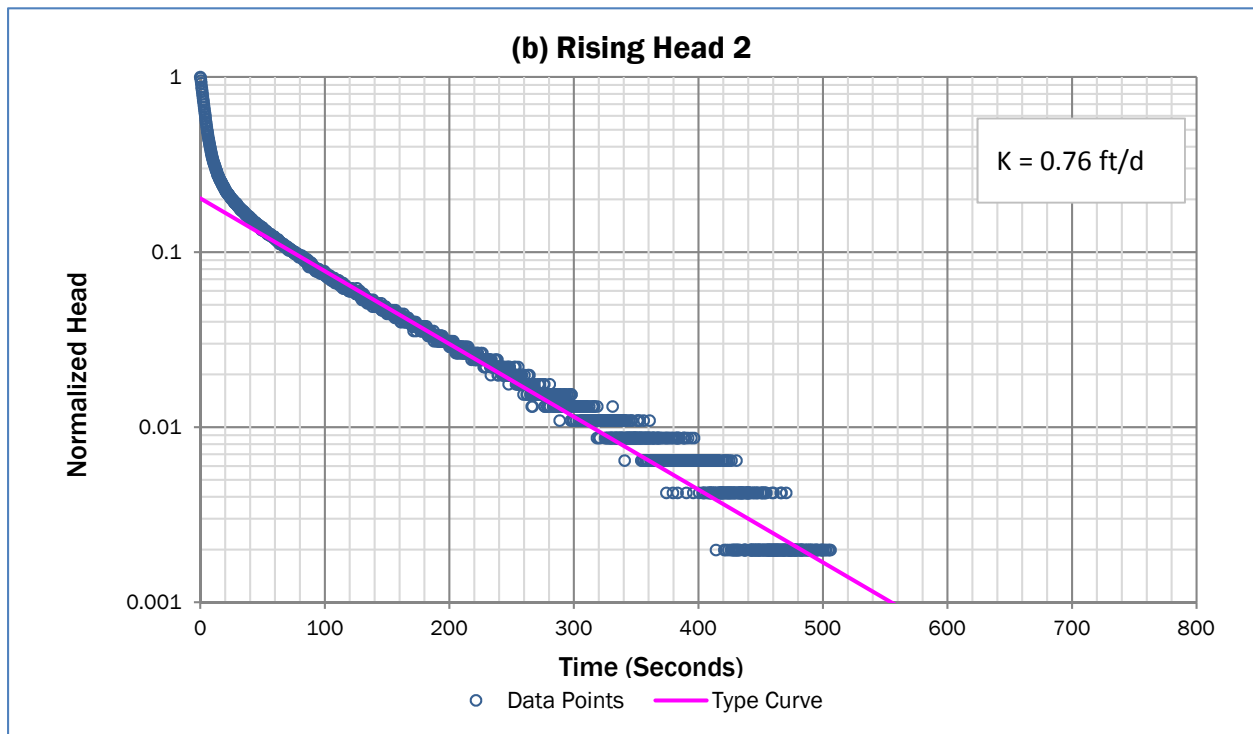
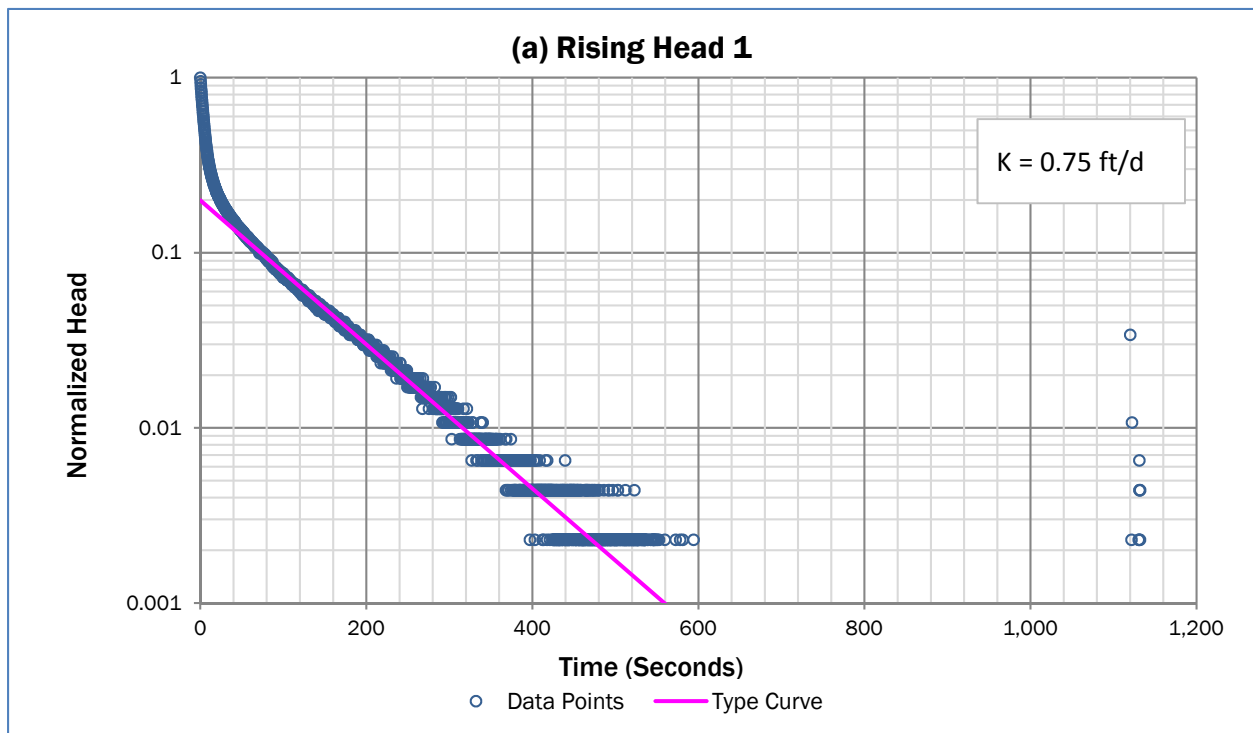
1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
 2. Well is screened across the water table.
 3. Aquifer is assumed to be unconfined.
 4. Saturated thickness is assumed to be 7.6 feet.
 5. Well is screened from 3.7 to 15.7 feet below ground surface.
 6. Static water level was 6.86 feet below ground surface.
 7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
- Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study and Slug Testing/Slug Tests/MW-3_BouwerRice1976.xls

Aquifer Slug Test at MW-3

Quiet Cove Property
Anacortes, Washington



Figure 25



Notes:

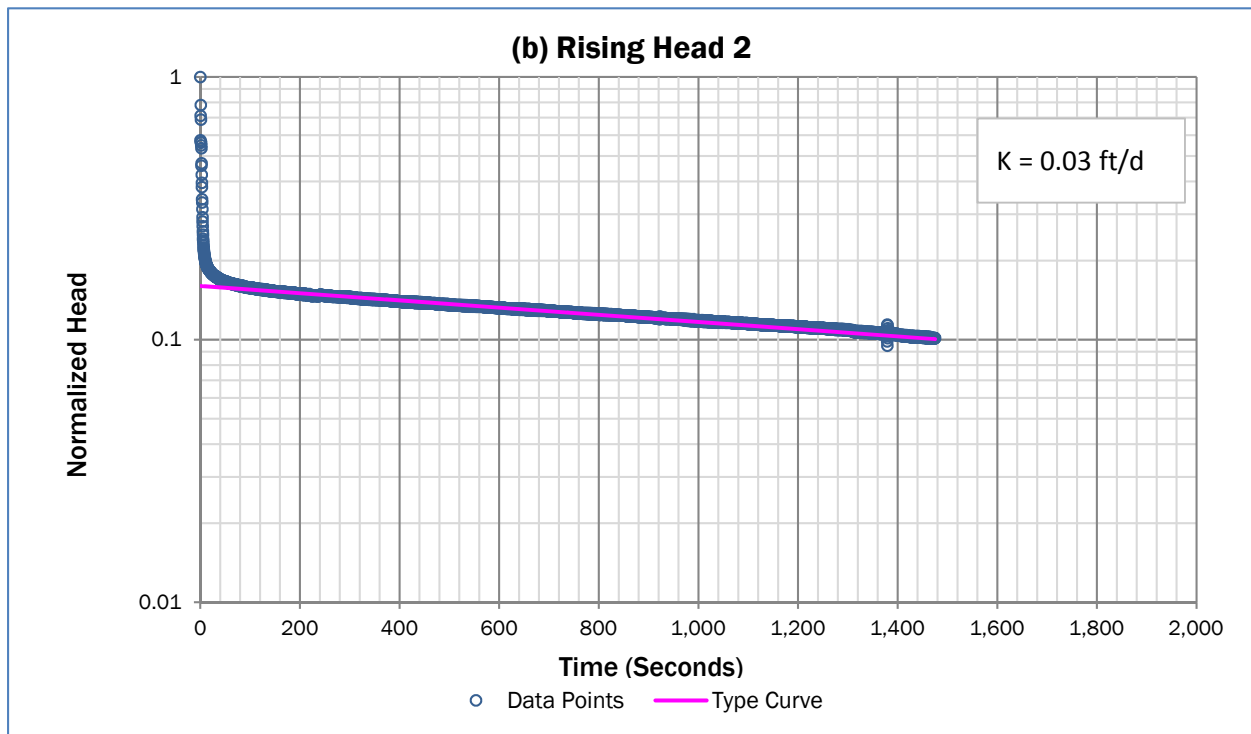
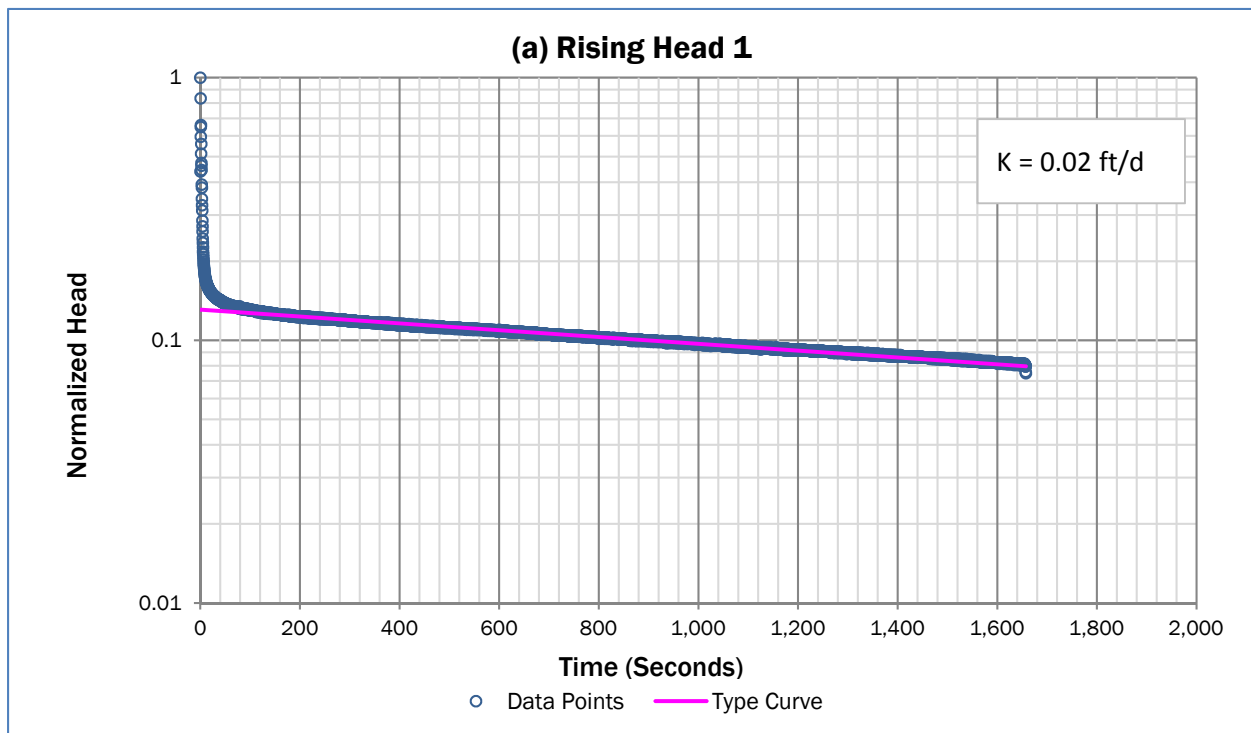
1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
 2. Well is screened across the water table.
 3. Aquifer is assumed to be unconfined.
 4. Saturated thickness is assumed to be 9.2 feet.
 5. Well is screened from 3.7 to 14.7 feet below ground surface.
 6. Static water level was 6.3 feet below ground surface.
 7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
- Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study and Slug Testing/Slug Tests/MW-4_BouwerRice1976.xls

Aquifer Slug Test at MW-4

Quiet Cove Property
Anacortes, Washington



Figure 26



Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 9.07 feet.
5. Well is screened from 5 to 15 feet below ground surface.
6. Static water level was 6.43 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

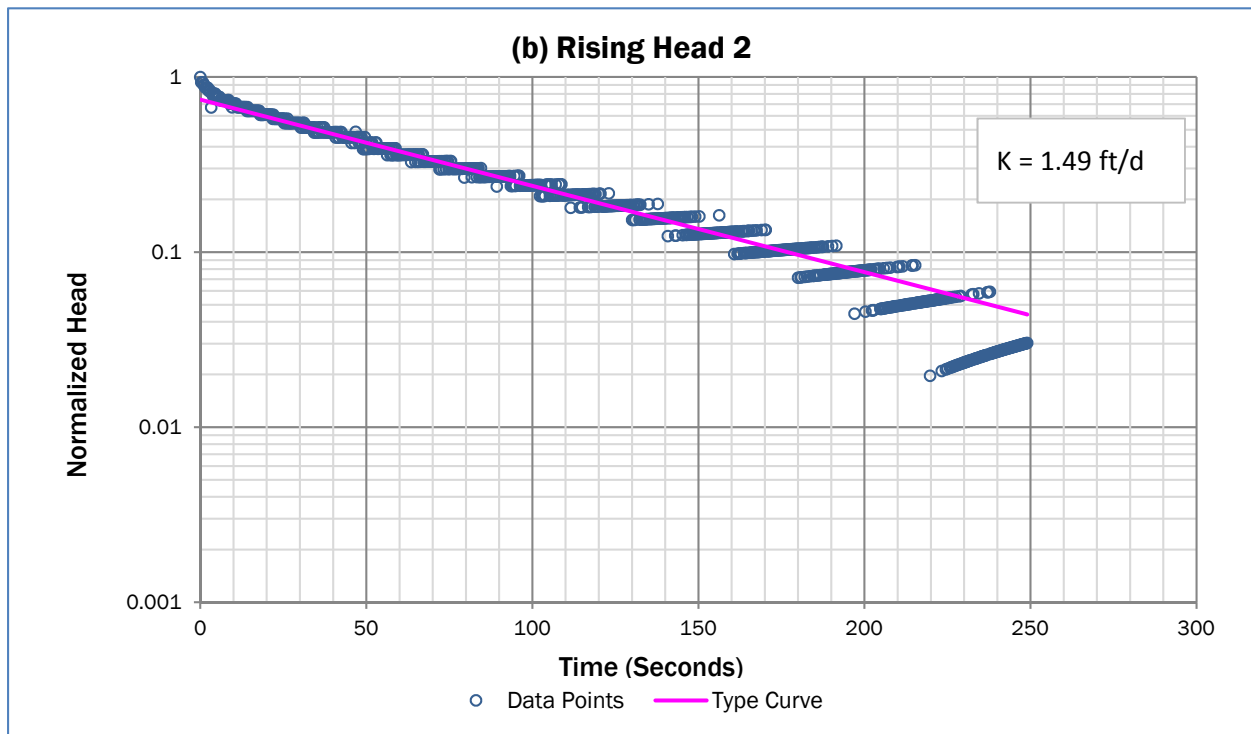
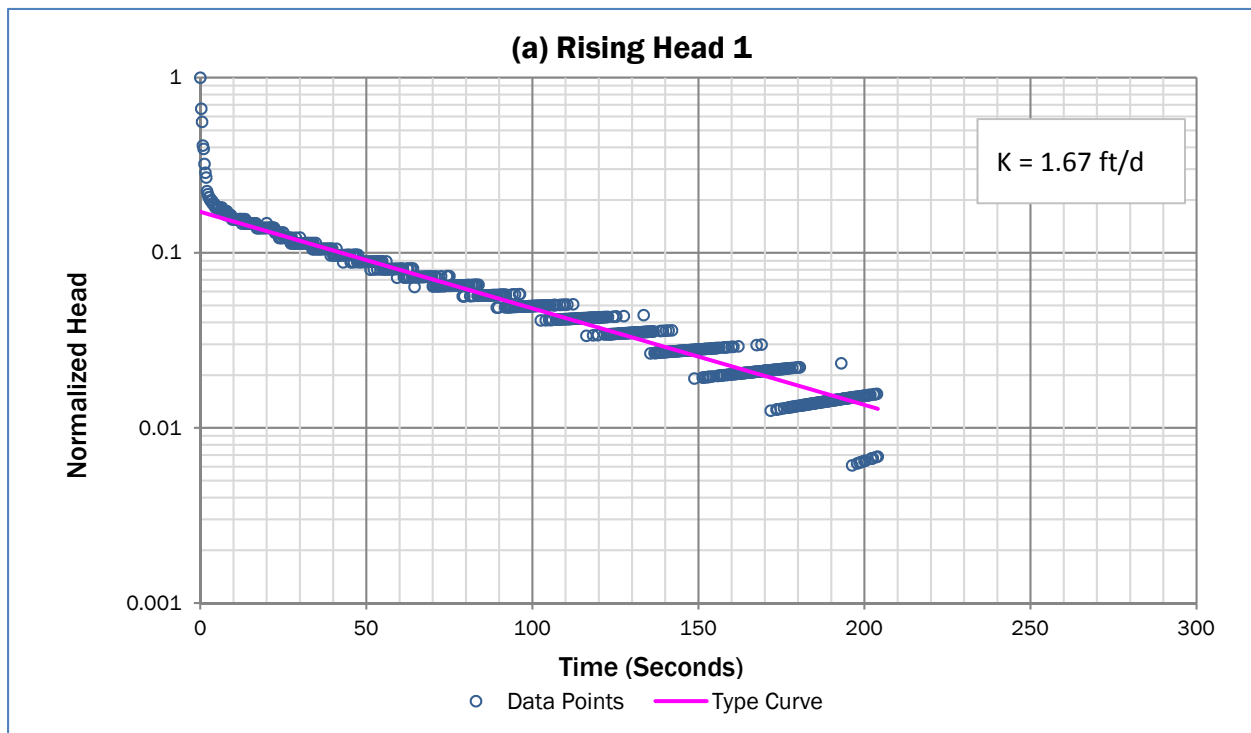
Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study and Slug Testing/Slug Tests/MW-6_BouwerRice1976.xls

Aquifer Slug Test at MW-6

Quiet Cove Property
Anacortes, Washington



Figure 27



Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 8.11 feet.
5. Well is screened from 5 to 10 feet below ground surface.
6. Static water level was 7.39 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

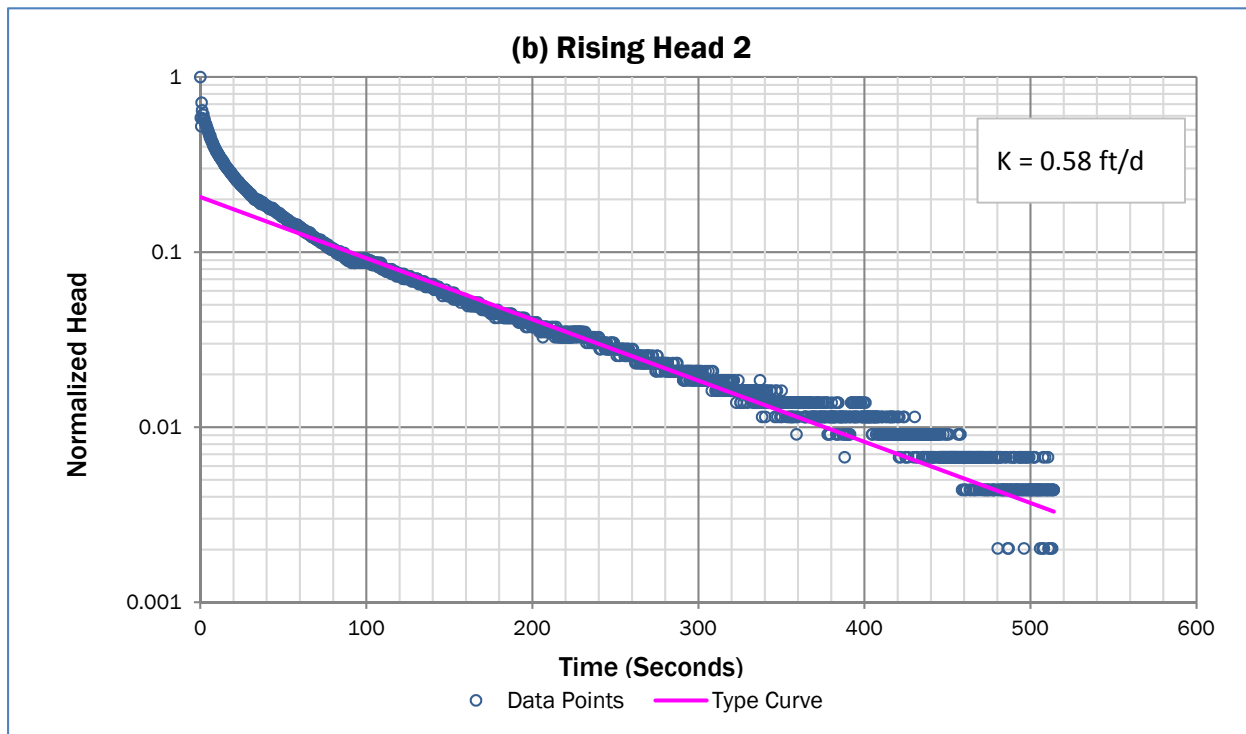
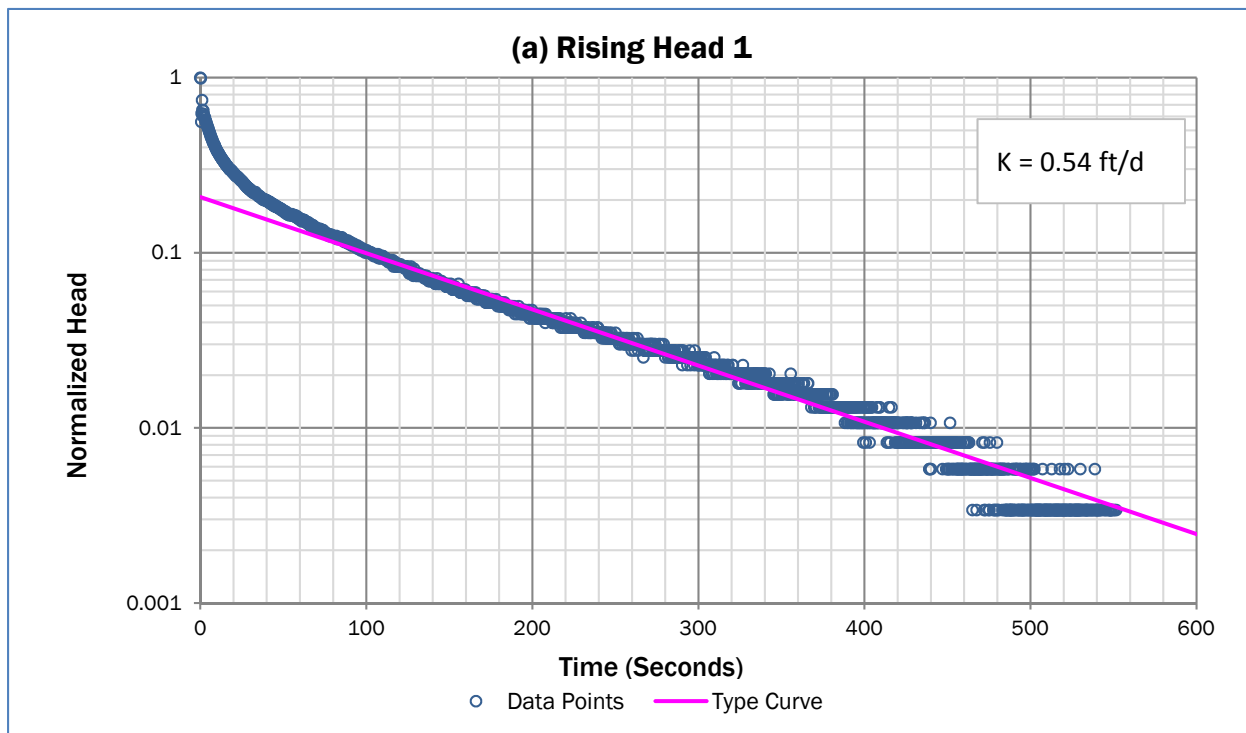
Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study and Slug Testing/Slug Tests/MW-7_BouwerRice1976.xls

Aquifer Slug Test at MW-7

Quiet Cove Property
Anacortes, Washington



Figure 28



Notes:

1. Water level response was measured with an unvented 0-30psi INW PT2X pressure transducer recording 8 times per second.
2. Well is screened across the water table.
3. Aquifer is assumed to be unconfined.
4. Saturated thickness is assumed to be 10.45 feet.
5. Well is screened from 5 to 15 feet below ground surface.
6. Static water level was 5 feet below ground surface.
7. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: project.GeoEngineers.com/Technical Analysis/Tidal Study and Slug Testing/Slug Tests/MW-11_BouwerRice1976.xlsx

Aquifer Slug Test at MW-11

Quiet Cove Property
Anacortes, Washington



Figure 29

ATTACHMENT 5
Investigation Derived Waste Disposal Records

CAMI 3

460423

NON-HAZARDOUS WASTE MANIFEST		1. Generator ID Number WA2000000023	2. Page 1 of 2	3. Emergency Response Phone (800) 424-3310	4. Waste Tracking Number CAMI-2-03-182018
5. Generator's Name and Mailing Address PORT OF ANACORTES QUINCY COVE 202 O AVENUE ANACORTES WA 99221 Generator's Phone: (509) 881-1527					
6. Generator's Site Address (if different than mailing address)					
6. Transporter 1 Company Name CHEMICAL WASTE MANAGEMENT			U.S. EPA ID Number ORD089462353		
7. Transporter 2 Company Name UNION PACIFIC RAILROAD			U.S. EPA ID Number NEC001792310		
8. Designated Facility Name and Site Address CHEMICAL WASTE MANAGEMENT, INC 17829 CEDAR SPRINGS LANE ARLINGTON OR 97012-8709 Facility's Phone: (503) 454-2843			U.S. EPA ID Number ORD089462353		
GENERATOR	9. Waste Shipping Name and Description		10. Containers		11. Total Quantity
			No.	Type	12. Unit Vol./Vol.
	1. MATERIAL NOT REGULATED BY D.O.T. OR327858		6	DM	4800 P X004
	2. MATERIAL NOT REGULATED BY D.O.T. OR327858		4	DM	2400 P X004
	3.				
13. Special Handling Instructions and Additional Information 1. OR327858- SOIL 2. OR327858- WATER					
14. GENERATOR'S OFFICER'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.					
Generator's Officer's Printed/Typed Name BRAD TAYLOR			Signature 		Month Day Year 2 21 18
TRANSPORTER	15. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit: Date leaving U.S.				
	16. Transporter Acknowledgment of Receipt of Materials				
	Transporter 1 Printed/Typed Name: JEFF GORDON Signature: Month Day Year: 2 21 18				
Transporter 2 Printed/Typed Name: Antonio Hernandez Signature: Month Day Year: 2 26 18					
DESIGNATED FACILITY	17. Discrepancy				
	17a. Discrepancy Description Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection				
	17b. Alternate Facility (or Generator) Manifest Reference Number: U.S. EPA ID Number:				
	Facility's Phone:				
	17c. Signature of Alternate Facility (or Generator) Month Day Year				
17d. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in item 17a					
Printed/Typed Name: Pat Slider			Signature:		Month Day Year: 5 7 18

DATA

DESIGNATED FACILITY'S COPY

467460

CWM1

NON-HAZARDOUS WASTE MANIFEST		1. Generator ID Number N/A	2. Page 1 of 2	3. Emergency Response Phone (503) 221-4311	4. Waste Tracking Number PCA121718-CWM1
5. Generator's Name and Mailing Address PORT OF ANACORTES QUIET COVE: 202 O AVENUE ANACORTES, WA 98221 Generator's Phone: (360) 221-1307					
Generator's Site Address (if different than mailing address)					
6. Transporter 1 Company Name CHEMICAL WASTE MANAGEMENT, INC.				U.S. EPA ID Number ORD088452353	
7. Transporter 2 Company Name UPRR				U.S. EPA ID Number NE5001792910	
8. Designated Facility Name and Site Address CHEMICAL WASTE MANAGEMENT, INC. 17628 CEDAR SPRINGS LANE ARLINGTON OR 97812-9709				U.S. EPA ID Number ORD088452353	
Facility's Phone: (541) 454-2843					
9. Waste Shipping Name and Description		10. Containers		11. Total Quantity	12. Unit Wt./Vol
		No.	Type		
1. MATERIAL NOT REGULATED BY D.O.T OR337268		5	DM	2,500	P
2. MATERIAL NOT REGULATED BY D.O.T OR337263		4	DM	2,600	P
3.					
4.					
13. Special Handling Instructions and Additional Information 1. OR337268-STAB01-RI WATER 4-55g 1-15g 2. OR337263-LF01/STAB01-RI SOIL 3-55g 1-15g WMXU 970252					
14. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.					
Generator's/Officer's Printed/Typed Name EDWARD L. JAMES		Signature <i>Edward L. James</i>		Month Day Year 1 14 19	
15. International Shipments ☐ Import to U.S. ☐ Export from U.S.		Port of export: U.S. leaving U.S.:			
16. Transporter Acknowledgment of Receipt of Materials					
Transporter 1 Printed/Typed Name KEE LAVATTI		Signature <i>KEE LAVATTI</i>		Month Day Year 1 14 19	
Transporter 2 Printed/Typed Name James Ruppert		Signature <i>James Ruppert</i>		Month Day Year 1 16 19	
17. Discrepancy					
17a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection					
17b. Alternate Facility (or Generator) Manifest Reference Number: U.S. EPA ID Number:					
Facility's Phone:					
17c. Signature of Alternate Facility (or Generator) Month Day Year					
18. Designated Facility Owner or Operator. Certification of receipt of materials covered by the manifest except as noted in Item 17a Printed/Typed Name Dan Dwyer Signature <i>Dan Dwyer</i> Month Day Year 01 14 19					

Ques:

GENERATOR

ATTACHMENT 6
Laboratory Data Reports

Not included in this draft. Available upon request.

ATTACHMENT 7
Data Validation Reports

Data Validation Report

Plaza 600 Building, 600 Stewart Street, Suite 1700, Seattle, WA 98101, Telephone: 206.728.2674, Fax: 206.728.2732

www.geoengineers.com

Project: Port of Anacortes – Quiet Cove RIFS
Second groundwater monitoring event

GEI File No: 005147-024-05

Date: April 17, 2018

This report documents the results of a United States Environmental Protection Agency (USEPA)-defined Stage 2B data validation (USEPA Document 540-R-08-005; USEPA 2009) of analytical data from the analyses of groundwater samples collected as part of the Quiet Cove RIFS – second monitoring event, and the associated laboratory and field quality control (QC) samples. The samples were obtained from the Quiet Cove Site (Site) located at 3rd Street and O Avenue in Anacortes, Washington.

OBJECTIVE AND QUALITY CONTROL ELEMENTS

GeoEngineers, Inc. (GeoEngineers) completed the data validation consistent with USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA 2008) and Inorganic Superfund Data Review (USEPA 2010; National Functional Guidelines) to determine if the laboratory analytical results meet the project objectives and are usable for their intended purpose. Data usability was assessed by determining if:

- The samples were analyzed using well-defined and acceptable methods that provide reporting limits below applicable regulatory criteria;
- The precision and accuracy of the data are well-defined and sufficient to provide defensible data; and
- The quality assurance/quality control (QA/QC) procedures utilized by the laboratory meet acceptable industry practices and standards.

In accordance with the RI/FS Work Plan (GeoEngineers, 2017), the data validation included review of the following QC elements:

- Data Package Completeness
- Chain-of-Custody Documentation
- Holding Times and Sample Preservation
- Surrogate Recoveries
- Method, Trip, and Rinsate Blanks
- Matrix Spikes/Matrix Spike Duplicates
- Laboratory Control Samples/Laboratory Control Sample Duplicates
- Laboratory and Field Duplicates

- Instrument Tuning
- Internal Standards
- Initial Calibrations (ICALs)
- Continuing Calibrations (CCALs)
- Miscellaneous

VALIDATED SAMPLE DELIVERY GROUPS

This data validation included review of the sample delivery groups (SDGs) listed below in Table 1.

TABLE 1: SUMMARY OF VALIDATED SAMPLE DELIVERY GROUPS

Laboratory Sample Delivery Group	Validated Samples
18C0320	MW-1_031918, MW-4_031918, MW-8_031918, MW-10_031918, and TRIPBLANK_031918
18C0338	MW-2_032018, DUP-1_032018, MW-3_032018, MW-5_032018, MW-6_032018, MW-7_032018, MW-11_032018, and TRIPBLANK_032018

CHEMICAL ANALYSIS PERFORMED

Analytical Resources, Inc. (ARI), located in Tukwila, Washington, performed laboratory analyses on the sediment and soil samples using one or more of the following methods:

- Gasoline-range Hydrocarbons (NWTPH-Gx) by Method NWTPH-Gx;
- Petroleum Hydrocarbons (NWTPH-Dx) by Method NWTPH-Dx;
- Volatile Organic Compounds (VOCs) by Method SW8260C;
- Polycyclic Aromatic Hydrocarbons (PAHs) by Method SW8270D-SIM;
- Total Metals by Methods EPA 6020/7470

DATA VALIDATION SUMMARY

The results for each of the QC elements are summarized below.

Data Package Completeness

ARI provided all required deliverables for the data validation according to the National Functional Guidelines. The laboratory followed adequate corrective action processes and all identified anomalies were discussed in the relevant laboratory case narrative.

Chain-of-Custody Documentation

Chain-of-custody (COC) forms were provided with the laboratory analytical reports. The COCs and sample container IDs were signed, initialed, accurate and complete when submitted to the lab, with the exceptions noted below:

COC and Sample Container Exceptions

- **SDG 18C0320:** The laboratory noted that 3 Trip Blank vials contained large air bubbles, which was taken into consideration during the validation process. Since the trip blank is only used as a test to ascertain whether there was a source of contamination during the transportation process, qualification was determined to be unnecessary in this case. No qualifiers were applied.
- **SDG 18C0338:** The laboratory noted that 3 Trip Blank vials contained large air bubbles, which was taken into consideration during the validation process. Since the trip blank is only used as a test to ascertain whether there was a source of contamination during the transportation process, qualification was determined to be unnecessary in this case. No qualifiers were applied. It was also noted that small bubbles were observed in at least one vial each for Samples MW-5_032018, MW-6_032018, and MW-11_032018. No qualification was required for this size of bubble in the vials.

Holding Times and Sample Preservation

The sample holding time is defined as the time that elapses between sample collection and sample analysis. Maximum holding time criteria exist for each analysis to help ensure that the analyte concentrations found at the time of analysis reflect the concentration present at the time of sample collection. Established holding times were met for all analyses, with the exceptions noted below. The sample coolers arrived at the laboratory within the appropriate temperatures of between 2° and 6° Celsius, with the exceptions noted below.

Cooler Temperature Exceptions

- **SDG 18C0320:** One sample cooler temperature was recorded at the laboratory as 1.6° Celsius. It was determined through professional judgment that these temperatures should not affect the sample analytical results; no action was taken other than to note in this report.

Surrogate Recoveries

A surrogate compound is a compound that is chemically similar to the organic analytes of interest, but unlikely to be found in any environmental sample. Surrogates are used for organic analyses and are added to all samples, standards, and blanks to serve as an accuracy and specificity check of each analysis. The surrogates are added to the samples at a known concentration and percent recoveries (%R) are calculated following analysis. All surrogate recoveries for field samples were within the laboratory control limits, with the following exceptions:

Volatile Organic Compound (VOC) Surrogate Exceptions

- **SDG 18C0320 and 18C0338:** The %R values for 1,2-dichloroethane-d4 were greater than the control limits in Samples MW-4_031918, MW-6_032018, and MW-10_031918. No qualifiers were required as the laboratory used a total of 4 surrogates for each sample. In both cases, there were at least 3 of the 4 surrogates were within the control limits provided by the laboratory. No qualifiers were required.

Method Blanks

Method blanks are analyzed to ensure that laboratory procedures and reagents do not introduce measurable concentrations of the analytes of interest. A method blank was analyzed with each batch of samples, at a frequency of 1 per 20 samples. For all sample batches, method blanks were analyzed at the required frequency. None of the analytes of interest were detected in the method blanks.

Trip Blanks

Trip blanks are analyzed to assess whether field sampling or sample transport processes may have introduced measurable concentrations of volatile analytes of interest into project samples. The following SDGs contained trip blanks that were packed into the sample coolers and transported with the field samples:

- **SDG 18C0320:** A Trip Blank was sampled on 3/19/18 and analyzed for Gasoline Range Hydrocarbons and Volatile contaminants. There were no positive results greater than the reporting limits in this Trip Blank. No qualifiers were applied to any field samples.
- **SDG 18C0338:** A Trip Blank was sampled on 3/20/18 and analyzed for Gasoline Range Hydrocarbons and Volatile contaminants. There were no positive results greater than the reporting limits in this Trip Blank. No qualifiers were applied to any field samples.

Matrix Spikes/Matrix Spike Duplicates

Since the actual analyte concentration in an environmental sample is not known, the accuracy of a particular analysis is usually inferred by performing a matrix spike (MS) analysis on one sample from the associated batch, known as the parent sample. One aliquot of the sample is analyzed in the normal manner and then a second aliquot of the sample is spiked with a known amount of analyte concentration and analyzed. From these analyses, a %R is calculated. Matrix spike duplicate (MSD) analyses are generally performed for organic analyses as a precision check and analyzed in the same sequence as a matrix spike. Using the results from the MS and MSD, the relative percent difference (RPD) is calculated. The %R control limits for MS and MSD analyses are specified in the laboratory documents, as are the RPD control limits for MS/MSD sample sets.

One MS/MSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for all analyses and the %R and RPD values were within the proper control limits, with the exceptions noted below.

Volatile Organic Compound (VOC) MS/MSD Exceptions

- **SDG 18C0338:** The laboratory performed a matrix spike on Sample MW-6-032018. The %Rs for m,p-xylene and 1,2-dibromomethane were greater than the control limits in either the MS or the MSD. However, in both cases, the corresponding MS/MSD %R values were within their respective control limits. No qualification was required.

Laboratory Control Samples/Laboratory Control Sample Duplicates

A laboratory control sample (LCS) is a blank sample that is spiked with a known amount of analyte and then analyzed. An LCS is similar to an MS, but without the possibility of matrix interference. Given that matrix interference is not an issue, control limits for accuracy and precision in the LCS and its duplicate (LCSD) are usually more rigorous than for MS/MSD analyses. Additionally, data qualification based on LCS/LCSD analyses would apply to each sample in the associated batch, instead of just the parent

sample. The %R control limits for LCS and LCSD analyses are specified in the laboratory documents, as are the RPD control limits for LCS/LCSD sample sets.

One LCS/LCSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for each analysis and the %R and RPD values were within the proper control limits.

Laboratory Duplicates

Internal laboratory duplicate analyses are performed to monitor the precision of the analyses. Two separate aliquots of a sample are analyzed as distinct samples in the laboratory and the RPD between the two results is calculated. Duplicate analyses should be performed once per analytical batch. If one or more of the samples used has a concentration less than five times the reporting limit for that sample, the absolute difference is used instead of the RPD. The RPD control limits are specified in the laboratory documents. Laboratory duplicates were analyzed at the proper frequency and the specified acceptance criteria were met.

Field Duplicates

Field duplicates are similar to laboratory duplicates in that they are used to assess precision. Two samples (parent and duplicate) are created in the field by subsampling the homogenized sample and submitting them to the lab as separate samples. Duplicate samples were collected and analyzed for the same parameters as the associated parent samples. Precision is determined by calculating the RPD between each pair of samples. If one or more of the sample analytes has a concentration less than five times the reporting limit for that sample, then the absolute difference is used instead of the RPD. The RPD control limit for soil samples is 50 percent.

SDG 18C0338: One field duplicate sample pair, MW-2-032018 and DUP-1-032018, was submitted with this SDG. The precision criteria for were met for all target analytes.

Instrument Tuning

Instrument tuning for analyses by gas chromatography/mass spectrometry (GC/MS) are completed to ensure that mass resolution, identification, and sensitivity of the analyses are acceptable. Instrument tuning should be performed at the beginning of each 12-hour period during which samples or standards are analyzed. The frequency and specified acceptance criteria were met for each applicable analysis.

Internal Standards (Low Resolution Mass Spectrometry)

Like the surrogate, an internal standard is a compound that is chemically similar to the analytes of interest, but unlikely to be found in any environmental sample. Internal standards are used only for the mass spectrometry instrumentation and are usually added to the sample aliquot after extraction has taken place. The internal standard should be analyzed at the beginning of a 12-hour sample run and the control limits for internal standard recoveries are 50 percent to 200 percent of the calibration standard. All internal standard recoveries were within the control limits.

Initial Calibrations (ICALs)

The initial calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent relative standard deviation (%RSD) and relative

response factors (RRF) values were within the control limits stated in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 2008).

Continuing Calibrations (CCALs)

The continuing calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent difference (%D) and relative response factors (RRF) values were within the control limits in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 2008).

Overall Assessment

As was determined by this data validation, the laboratory followed the specified analytical methods. Accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD, and MS/MSD %R values, with the exceptions noted above. Precision was acceptable, as demonstrated by the LCS/LCSD, MS/MSD, and laboratory/field duplicate RPD values, with the exceptions noted above.

No data points were qualified for any reason.

All data are acceptable for the intended use.

REFERENCES

GeoEngineers, 2017. FINAL Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan); Quiet Cove Property; Anacortes, WA; Ecology Agreed Order No. DE 11346. GEI No. 5147-024-03, dated January 25, 2017.

U.S. Environmental Protection Agency (USEPA). "Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use," EPA-540-R-08-005. January 2009.

U.S. Environmental Protection Agency (USEPA). "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review," EPA-540-R-08-01. June 2008.

U.S. Environmental Protection Agency (USEPA). "Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review," EPA-540-R-10-011. January 2010

Data Validation Report

Plaza 600 Building, 600 Stewart Street, Suite 1700, Seattle, WA 98101, Telephone: 206.728.2674, Fax: 206.728.2732

www.geoengineers.com

Project: Port of Anacortes – Quiet Cove RIFS
September 2017 Upland Sampling Event

GEI File No: 005147-024-05

Date: February 13, 2018

This report documents the results of a United States Environmental Protection Agency (USEPA)-defined Stage 2B data validation (USEPA Document 540-R-08-005; USEPA 2009) of analytical data from the analyses of groundwater samples collected as part of the October/November 2017 Quiet Cove RIFS sampling event, and the associated laboratory and field quality control (QC) samples. The samples were obtained from the Quiet Cove Site (Site) located at 3rd Street and O Avenue in Anacortes, Washington.

OBJECTIVE AND QUALITY CONTROL ELEMENTS

GeoEngineers, Inc. (GeoEngineers) completed the data validation consistent with USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA 2008) and Inorganic Superfund Data Review (USEPA 2010; National Functional Guidelines) to determine if the laboratory analytical results meet the project objectives and are usable for their intended purpose. Data usability was assessed by determining if:

- The samples were analyzed using well-defined and acceptable methods that provide reporting limits below applicable regulatory criteria;
- The precision and accuracy of the data are well-defined and sufficient to provide defensible data; and
- The quality assurance/quality control (QA/QC) procedures utilized by the laboratory meet acceptable industry practices and standards.

In accordance with the RI/FS Work Plan (GeoEngineers, 2017), the data validation included review of the following QC elements:

- Data Package Completeness
- Chain-of-Custody Documentation
- Holding Times and Sample Preservation
- Surrogate Recoveries
- Method, Trip, and Rinsate Blanks
- Matrix Spikes/Matrix Spike Duplicates
- Laboratory Control Samples/Laboratory Control Sample Duplicates
- Laboratory and Field Duplicates

- Instrument Tuning
- Internal Standards
- Initial Calibrations (ICALs)
- Continuing Calibrations (CCALs)
- Miscellaneous

VALIDATED SAMPLE DELIVERY GROUPS

This data validation included review of the sample delivery groups (SDGs) listed below in Table 1.

TABLE 1: SUMMARY OF VALIDATED SAMPLE DELIVERY GROUPS

Laboratory Sample Delivery Group	Validated Samples
17J0350	MW-3_101817, MW-4_101817, MW-5_101817, MW-6_101817, and MW-7_101817
17K0171	MW-1-110917, DUP-1-110917, MW-2-110917, MW-8-110917, MW-10-110917, MW-11-110917, and TRIP_BLANKS

CHEMICAL ANALYSIS PERFORMED

Analytical Resources, Inc. (ARI), located in Tukwila, Washington, performed laboratory analyses on the sediment and soil samples using one or more of the following methods:

- Gasoline-range Hydrocarbons (NWTPH-Gx) by Method NWTPH-Gx;
- Petroleum Hydrocarbons (NWTPH-Dx) by Method NWTPH-Dx;
- Volatile Organic Compounds (VOCs) by Method SW8260C;
- Polycyclic Aromatic Hydrocarbons (PAHs) by Method SW8270D-SIM;
- Total Metals by Methods EPA 6020/7470

DATA VALIDATION SUMMARY

The results for each of the QC elements are summarized below.

Data Package Completeness

ARI provided all required deliverables for the data validation according to the National Functional Guidelines. The laboratory followed adequate corrective action processes and all identified anomalies were discussed in the relevant laboratory case narrative.

Chain-of-Custody Documentation

Chain-of-custody (COC) forms were provided with the laboratory analytical reports. The COCs and sample container IDs were signed, initialed, accurate and complete when submitted to the lab, with the exceptions noted below:

COC and Sample Container Exceptions

- **SDG 17J0350:** The 'Relinquished by:' date of 10-19-2017 was corrected by the laboratory as 10-20-2017. The laboratory noted that 4 bottles were missing labels, and that the 'No. Containers' column was incorrect for MW-4_101817 and MW-7_101817. The quantity of these sample containers were switched, MW-4_101817 should be '13' samples, and MW-7_101817 should be '26' samples.

Holding Times and Sample Preservation

The sample holding time is defined as the time that elapses between sample collection and sample analysis. Maximum holding time criteria exist for each analysis to help ensure that the analyte concentrations found at the time of analysis reflect the concentration present at the time of sample collection. Established holding times were met for all analyses, with the exceptions noted below. The sample coolers arrived at the laboratory within the appropriate temperatures of between 2° and 6° Celsius, with the exceptions noted below.

Cooler Temperature Exceptions

- **SDG 17J0350:** One sample cooler temperature was recorded at the laboratory above 6 ° Celsius. It was determined through professional judgment that these temperatures should not affect the sample analytical results; no action was taken other than to note in this report.
- **SDG 17K0171:** Two sample cooler temperatures were recorded at the laboratory as 0.3° Celsius and 1.9° Celsius. It was determined through professional judgment that since the samples were not frozen, this temperature should not affect the sample analytical results.

Surrogate Recoveries

A surrogate compound is a compound that is chemically similar to the organic analytes of interest, but unlikely to be found in any environmental sample. Surrogates are used for organic analyses and are added to all samples, standards, and blanks to serve as an accuracy and specificity check of each analysis. The surrogates are added to the samples at a known concentration and percent recoveries (%R) are calculated following analysis. All surrogate recoveries for field samples were within the laboratory control limits.

Method Blanks

Method blanks are analyzed to ensure that laboratory procedures and reagents do not introduce measurable concentrations of the analytes of interest. A method blank was analyzed with each batch of samples, at a frequency of 1 per 20 samples. For all sample batches, method blanks were analyzed at the required frequency. None of the analytes of interest were detected in the method blanks, with the exceptions noted below.

Volatile Organic Compound (VOC) Method Blank Exceptions

- **SDG 17K0171:** There were positive results for m,p-xylene and n-hexane detected above the method detection limit, but below the reporting limit in the groundwater method blank prepared on 11/16/17. The positive results for these compounds were qualified (U) as not-detected only in Sample DUP-1-110917, as this was the only associated sample that reported detections for these analytes below the reporting limits.

There were positive results for m,p-xylene, o-xylene, and n-hexane detected above the method detection limit, but below the reporting limits in the groundwater method blank prepared on

11/15/17. The positive results for these compounds were qualified (U) as not-detected only in Sample TRIP_BLANKS, as this was the only associated sample that reported detections for these analytes below the reporting limits.

Total Metals Method Blank Exceptions

- **SDG 17J0350:** There was a positive result for arsenic detected above the method detection limit, but below the reporting limit in the method blank digested on 10/26/2017. The associated field samples all reported positive results greater than the reporting limits; therefore, no qualifiers were required.

Trip Blanks

Trip blanks are analyzed to assess whether field sampling or sample transport processes may have introduced measurable concentrations of volatile analytes of interest into project samples. The following SDGs contained trip blanks that were packed into the sample coolers and transported with the field samples:

- **SDG 17K0171:** Trip Blank sampled on 11/9/17. There were no positive results greater than the reporting limits in this Trip Blank. No qualifiers were applied to any field samples.

Matrix Spikes/Matrix Spike Duplicates

Since the actual analyte concentration in an environmental sample is not known, the accuracy of a particular analysis is usually inferred by performing a matrix spike (MS) analysis on one sample from the associated batch, known as the parent sample. One aliquot of the sample is analyzed in the normal manner and then a second aliquot of the sample is spiked with a known amount of analyte concentration and analyzed. From these analyses, a %R is calculated. Matrix spike duplicate (MSD) analyses are generally performed for organic analyses as a precision check and analyzed in the same sequence as a matrix spike. Using the results from the MS and MSD, the relative percent difference (RPD) is calculated. The %R control limits for MS and MSD analyses are specified in the laboratory documents, as are the RPD control limits for MS/MSD sample sets.

One MS/MSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for all analyses and the %R and RPD values were within the proper control limits, with the exceptions noted below.

Total Metal MS/MSD Exceptions

- **SDG 17K0171:** The laboratory performed a matrix spike on Sample MW-8-110917. The %R for Total silver was less than the control limits in the MS. The positive results for this silver were qualified as estimated (J) in all samples in this SDG.

Laboratory Control Samples/Laboratory Control Sample Duplicates

A laboratory control sample (LCS) is a blank sample that is spiked with a known amount of analyte and then analyzed. An LCS is similar to an MS, but without the possibility of matrix interference. Given that matrix interference is not an issue, control limits for accuracy and precision in the LCS and its duplicate (LCSD) are usually more rigorous than for MS/MSD analyses. Additionally, data qualification based on LCS/LCSD analyses would apply to each sample in the associated batch, instead of just the parent sample. The %R control limits for LCS and LCSD analyses are specified in the laboratory documents, as are the RPD control limits for LCS/LCSD sample sets.

One LCS/LCSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for each analysis and the %R and RPD values were within the proper control limits.

Laboratory Duplicates

Internal laboratory duplicate analyses are performed to monitor the precision of the analyses. Two separate aliquots of a sample are analyzed as distinct samples in the laboratory and the RPD between the two results is calculated. Duplicate analyses should be performed once per analytical batch. If one or more of the samples used has a concentration less than five times the reporting limit for that sample, the absolute difference is used instead of the RPD. The RPD control limits are specified in the laboratory documents. Laboratory duplicates were analyzed at the proper frequency and the specified acceptance criteria were met, with the following exceptions:

SDG 17J0350: (Total Metals) A laboratory duplicate analysis was performed on Sample MW-7_101817. The RPD values for arsenic were greater than the control limits. The positive results for this target analyte was qualified as estimated (J) in all samples in this SDG.

Field Duplicates

Field duplicates are similar to laboratory duplicates in that they are used to assess precision. Two samples (parent and duplicate) are created in the field by subsampling the homogenized sample and submitting them to the lab as separate samples. Duplicate samples were collected and analyzed for the same parameters as the associated parent samples. Precision is determined by calculating the RPD between each pair of samples. If one or more of the sample analytes has a concentration less than five times the reporting limit for that sample, then the absolute difference is used instead of the RPD. The RPD control limit for soil samples is 50 percent.

SDG 17K0171: One field duplicate sample pair, MW-1-110917 and DUP-1_110917, was submitted with this SDG. The precision criteria for Total arsenic, Total copper, Total zinc, Total chromium, Total lead, Diesel-range organic and Motor oil were not met for this sample pair. the positive results for these analytes were qualified as estimated (J) in both samples.

Instrument Tuning

Instrument tuning for analyses by gas chromatography/mass spectrometry (GC/MS) are completed to ensure that mass resolution, identification, and sensitivity of the analyses are acceptable. Instrument tuning should be performed at the beginning of each 12-hour period during which samples or standards are analyzed. The frequency and specified acceptance criteria were met for each applicable analysis.

Internal Standards (Low Resolution Mass Spectrometry)

Like the surrogate, an internal standard is a compound that is chemically similar to the analytes of interest, but unlikely to be found in any environmental sample. Internal standards are used only for the mass spectrometry instrumentation and are usually added to the sample aliquot after extraction has taken place. The internal standard should be analyzed at the beginning of a 12-hour sample run and the control limits for internal standard recoveries are 50 percent to 200 percent of the calibration standard. All internal standard recoveries were within the control limits, with the following exceptions:

SDG 17J0350: (PAHs) The internal standard %R for d10-phenanthrene was less than the control limits in Sample MW-4_101817. The sample was re-extracted and diluted at a factor of 3, and both results were

reported. Only the re-extracted results were used for this project, the positive results and reporting limits in the initial analysis were labeled as Do-Not-Report (DNR).

Initial Calibrations (ICALs)

The initial calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent relative standard deviation (%RSD) and relative response factors (RRF) values were within the control limits stated in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 2008).

Continuing Calibrations (CCALs)

The continuing calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent difference (%D) and relative response factors (RRF) values were within the control limits in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 2008).

Miscellaneous

SDG 17J0350: (PAHs) The laboratory reported two sets of results for Sample MW-4-101817. The second analysis was diluted at a factor of 3 for all analytes. For this reason, the results all the PAH analytes were labeled as Do-Not-Report (DNR) in the first analysis in order to avoid redundant analyte reporting.

SDG 17K0171: (NWTPH-Dx) The laboratory reported two sets of results for Sample MW-11-110917 because Diesel-range organics exceeded the calibration range of the instrument in the first analysis. The second analysis was diluted at a factor of 10 for all analytes. For this reason, the result of Diesel-range organics was labeled as Do-Not-Report (DNR) in the first analysis and the result of Motor Oil-range organics was labeled as Do-Not-Report (DNR) in the second analysis in order to avoid redundant analyte reporting.

Overall Assessment

As was determined by this data validation, the laboratory followed the specified analytical methods. Accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD, and MS/MSD %R values. Precision was acceptable, as demonstrated by the LCS/LCSD, MS/MSD, and laboratory/field duplicate RPD values, with the exceptions noted above.

Data were qualified as not detected because of method blank contamination. Data were also qualified as estimated because of matrix spikes %R outliers, laboratory duplicate precision outliers, and field duplicate precision outliers.

Data were labeled as Not Reportable in order to avoid redundant analytes per sample.

All data are acceptable for the intended use, with the following qualifications listed below in Table 2.

TABLE 2: SUMMARY OF QUALIFIED SAMPLES

Sample ID	Analyte	Qualifier	Reason
DUP-1-110917	Xylene, m-,p-	U	Method Blank Contamination
DUP-1-110917	Xylene, o-	U	Method Blank Contamination
DUP-1-110917	n-Hexane	U	Method Blank Contamination
TRIP_BLANKS	Xylene, m-,p-	U	Method Blank Contamination
TRIP_BLANKS	n-Hexane	U	Method Blank Contamination
MW-1-110917	Diesel-range hydrocarbons	J	Field Duplicate Precision
MW-1-110917	Motor Oil	UJ	Field Duplicate Precision
DUP-1-110917	Diesel-range hydrocarbons	J	Field Duplicate Precision
DUP-1-110917	Motor Oil	J	Field Duplicate Precision

References

GeoEngineers, 2017. FINAL Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan); Quiet Cove Property; Anacortes, WA; Ecology Agreed Order No. DE 11346. GEI No. 5147-024-03, dated January 25, 2017.

U.S. Environmental Protection Agency (USEPA). "Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use," EPA-540-R-08-005. January 2009.

U.S. Environmental Protection Agency (USEPA). "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review," EPA-540-R-08-01. June 2008.

U.S. Environmental Protection Agency (USEPA). "Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review," EPA-540-R-10-011. January 2010.

Data Validation Report

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Project: Port of Anacortes – Quiet Cove RIFS
September 2017 Upland Sampling Event

GEI File No: 005147-024-05

Date: December 15, 2017

This report documents the results of a United States Environmental Protection Agency (USEPA)-defined Stage 2B data validation (USEPA Document 540-R-08-005; USEPA 2009) of analytical data from the analyses of soil and sediment samples collected as part of the September 2017 Quiet Cove RIFS sampling event, and the associated laboratory and field quality control (QC) samples. The samples were obtained from the Quiet Cove Site (Site) located at 3rd Street and O Avenue in Anacortes, Washington.

OBJECTIVE AND QUALITY CONTROL ELEMENTS

GeoEngineers, Inc. (GeoEngineers) completed the data validation consistent with USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA 2008) and Inorganic Superfund Data Review (USEPA 2010; National Functional Guidelines) to determine if the laboratory analytical results meet the project objectives and are usable for their intended purpose. Data usability was assessed by determining if:

- The samples were analyzed using well-defined and acceptable methods that provide reporting limits below applicable regulatory criteria;
- The precision and accuracy of the data are well-defined and sufficient to provide defensible data; and
- The quality assurance/quality control (QA/QC) procedures utilized by the laboratory meet acceptable industry practices and standards.

In accordance with the Ecology-approved Remedial Investigation (RI)/Feasibility Study (FS) Work Plan (GeoEngineers, 2017), the data validation included review of the following QC elements:

- Data Package Completeness
- Chain-of-Custody Documentation
- Holding Times and Sample Preservation
- Surrogate Recoveries
- Method, Trip, and Rinsate Blanks
- Matrix Spikes/Matrix Spike Duplicates
- Laboratory Control Samples/Laboratory Control Sample Duplicates
- Laboratory and Field Duplicates

- Instrument Tuning
- Internal Standards
- Initial Calibrations (ICALs)
- Continuing Calibrations (CCALs)
- Miscellaneous

VALIDATED SAMPLE DELIVERY GROUPS

This data validation included review of the sample delivery groups (SDGs) listed below in Table 1.

TABLE 1: SUMMARY OF VALIDATED SAMPLE DELIVERY GROUPS

Laboratory Sample Delivery Group	Validated Samples
17I0184 (Sediments)	GEI-SED1-1-3_091517, GEI-SED1-4-6_091517, and GEI-SED-COMP-1_091517
17I0121 (Soils)	GEI-31-3-5_091117, GEI-31-6-8_091117, GEI-31-13-15_091117, GEI-32-3-4.5_091117, GEI-32-7-9_091117, GEI-32-10-12_091117, and TRIP_BLANK_170911
17I0125 (Soils)	GEI-29-5-7_091217, GEI-29-10-12_091217, GEI-29-13-15_091217, GEI-30-2-4_091217, GEI-30-6-8_091217, GEI-30-9-11_091217, and TRIP_BLANK_170912
17I0146 (Soils)	GEI-41-5-7_091317, GEI-42-1-3_091317, GEI-42-6-8_091317, GEI-43-3-5_091317, GEI-43-5-7_091317, GEI-44-2-4_091317, GEI-44-7-9_091317, and GEI-44-10-12_091317
17I0185 (Soils)	GEI-39-1-3_091517, GEI-39-5-7_091517, GEI-39-8-10_091517, and TRIP_BLANK_170916
17I0266 (Soils)	GEI-38-2-4_091917, GEI-38-5-7_091917, GEI-DUP-2_091917, GEI-38-12-14, GEI-40-2-4_091917, GEI-40-5-7_091917, and GEI-40-12-14_091917

CHEMICAL ANALYSIS PERFORMED

Analytical Resources, Inc. (ARI), located in Tukwila, Washington, performed laboratory analyses on the sediment and soil samples using one or more of the following methods:

- Gasoline-range Hydrocarbons (NWTPH-Gx) by Method NWTPH-Gx;
- Petroleum Hydrocarbons (NWTPH-Dx) by Method NWTPH-Dx;
- Volatile Organic Compounds (VOCs) by Method SW8260C;
- Semi-volatile Organic Compounds (SVOCs) by Method SW8270D;
- Polycyclic Aromatic Hydrocarbons (PAHs) by Method SW8270D-SIM;
- Total Metals by Methods EPA6010A/7471B;
- Total Organic Carbon (TOC) by Method Plumb 1981 (Combustion IR)

- Ammonia by SM4500-NH3
- Sulfides by SM4500-S2 D-00

Materials Testing & Consulting (MT&C) headquartered in Burlington, Washington, performed laboratory analysis on the soil and sediment samples using the following method:

- Grain Size analysis by Puget Sound Estuary Protocols (PSEP)

DATA VALIDATION SUMMARY

The results for each of the QC elements are summarized below.

Data Package Completeness

ARI provided all required deliverables for the data validation according to the National Functional Guidelines. The laboratory followed adequate corrective action processes and all identified anomalies were discussed in the relevant laboratory case narrative.

Chain-of-Custody Documentation

Chain-of-custody (COC) forms were provided with the laboratory analytical reports. The COCs and sample container IDs were signed, accurate and complete when submitted to the lab, with the exceptions noted below:

Sample Container Exceptions

- **SDG 17I0121:** The laboratory noted that all of the sample containers for the cooler trip blank (sampled on 9/11/17) were received with air bubbles approximately >4 mm in diameter. There were no positive results for any target analytes in the trip blank, therefore all reporting limits were qualified as estimated (UJ) in Sample TRIP_BLANK_170911.
- **SDG 17I0125:** The laboratory noted that archived Sample GEI-29-7-9_091217 (on COC) was received with Sample ID GEI-12-7-9_091217 listed on the sample jar. Samples GEI-29-5-7_091217 and GEO-30-13-15_091217 were both received by the laboratory with incorrect dates on the sample containers.

There were also discrepancies between the amount of sample containers listed on the COC and amounts actually received:

GEI-39-13-15_091217 listed 8 containers on COC; received 10

Trip Blanks listed 0 containers on COC; received 4

- **SDG 17I0266:** The laboratory noted that one of two sample containers for Sample GEI-40-9-11_091917 was received broken. The soil contents of the jar were immediately transferred to a new jar and, collectively, the sample was archived at the laboratory. No other action was taken other than to note the discrepancy here.

Holding Times and Sample Preservation

The sample holding time is defined as the time that elapses between sample collection and sample analysis. Maximum holding time criteria exist for each analysis to help ensure that the analyte concentrations found at the time of analysis reflect the concentration present at the time of sample

collection. Established holding times were met for all analyses, with the exceptions noted below. The sample coolers arrived at the laboratory within the appropriate temperatures of between 2° and 6° Celsius, with the exceptions noted below.

Cooler Temperature Exceptions

- **SDG 17I0184:** One sample cooler temperature recorded at the laboratory was 0.5 ° Celsius. It was determined through professional judgment that since the samples were not frozen, this temperature should not affect the sample analytical results.
- **SDG 17I0125:** Two sample cooler temperatures were recorded at the laboratory above 6 ° Celsius. It was determined through professional judgment that these temperatures should not affect the sample analytical results; no action was taken other than to note in this report.
- **SDG 17I0185:** One sample cooler temperature recorded at the laboratory was 0.5 ° Celsius. It was determined through professional judgment that since the samples were not frozen, this temperature should not affect the sample analytical results.
- **SDG 17I0266:** Two sample cooler temperatures were recorded at the laboratory above 6 ° Celsius. It was determined through professional judgment that these temperatures should not affect the sample analytical results; no action was taken other than to note in this report.

Surrogate Recoveries

A surrogate compound is a compound that is chemically similar to the organic analytes of interest, but unlikely to be found in any environmental sample. Surrogates are used for organic analyses and are added to all samples, standards, and blanks to serve as an accuracy and specificity check of each analysis. The surrogates are added to the samples at a known concentration and percent recoveries (%R) are calculated following analysis. All surrogate recoveries for field samples were within the laboratory control limits, with the exceptions noted below.

Poly-Aromatic Hydrocarbons (PAH) Surrogate Exceptions

- **SDG 17I0266:** The %R values for surrogate dibenzo(a,h)anthracene-d14 were greater than the control limits in Samples GEI-40-2-4_091917 and GEI-40-5-7_091917; however, the samples were both spiked with two additional surrogates, all within the control limits. No action was required for these outliers.

Method Blanks

Method blanks are analyzed to ensure that laboratory procedures and reagents do not introduce measurable concentrations of the analytes of interest. A method blank was analyzed with each batch of samples, at a frequency of 1 per 20 samples. For all sample batches, method blanks were analyzed at the required frequency. None of the analytes of interest were detected in the method blanks, with the exceptions noted below.

Volatile Organic Compound (VOC) Method Blank Exceptions

- **SDG 17I0121 and 17I0125:** There were positive results for m,p-xylene and n-hexane detected above the method detection limit, but below the reporting limit in the soil method blank extracted on 9/15/17; and there were no positive results for either of these analytes in any of the associated samples; therefore, no qualifications were required.

Semi-Volatile Organic Compound (SVOC) Method Blank Exceptions

- **SDG 16G0026:** There was a positive result for diethyl phthalate detected above the method detection limit, but below the reporting limit in the method blank extracted on 7/25/2016. The positive result for diethyl phthalate was qualified as non-detected (U) in Sample EDP22_16-17.

Total Metals Method Blank Exceptions

- **SDG 17I0184:** There was a positive result for cadmium detected above the method detection limit, but below the reporting limit in the method blank digested on 9/20/2017. The associated field samples, GEI-SED-COMP-1_091517 and GEI-SED1-1-3_091517 also reported positive results at levels less than the reporting limits; therefore, these results were qualified as not-detected (U) in both samples.
- **SDG 17I0121 and 17I0125:** There were positive results for copper, chromium, lead, and zinc detected above the method detection limits, but below the reporting limits in the method blank digested on 9/15/2017. The associated field samples all reported positive results greater than the reporting limits; therefore, no qualifiers were required.
- **SDG 17I0146:** There was a positive result for copper detected above the method detection limit, but below the reporting limit in the method blank digested on 9/18/2017. The associated field samples all reported positive results greater than the reporting limits; therefore, no qualifiers were required.
- **SDG 17I0185:** There was a positive result for cadmium detected above the method detection limit, but below the reporting limit in the method blank digested on 9/20/2017. The associated field sample, GEI-39-8-10_091517 also reported a positive result at a level less than the reporting limit; therefore, this result was qualified as not-detected (U) in this sample.

There was a positive result for zinc detected above the method detection limit, but below the reporting limit in the method blank digested on 9/21/2017. The associated field samples all reported positive results greater than the reporting limits; therefore, no qualifiers were required.

Trip Blanks

Trip blanks are analyzed to assess whether field sampling or sample transport processes may have introduced measurable concentrations of volatile analytes of interest into project samples. The following SDGs contained trip blanks that were packed into the sample coolers and transported with the field samples:

- **SDG 17I0184:** Trip Blank sampled on 9/15/17.
- **SDG 17I0121:** Trip Blank sampled on 9/11/17.
- **SDG 17I0125:** Trip Blank sampled on 9/12/17.
- **SDG 17I0185:** Trip Blank sampled on 9/16/17.

None of the analytes of interest were detected in the trip blanks, with the following exceptions:

Matrix Spikes/Matrix Spike Duplicates

Since the actual analyte concentration in an environmental sample is not known, the accuracy of a particular analysis is usually inferred by performing a matrix spike (MS) analysis on one sample from the associated batch, known as the parent sample. One aliquot of the sample is analyzed in the normal manner and then a second aliquot of the sample is spiked with a known amount of analyte concentration

and analyzed. From these analyses, a %R is calculated. Matrix spike duplicate (MSD) analyses are generally performed for organic analyses as a precision check and analyzed in the same sequence as a matrix spike. Using the results from the MS and MSD, the relative percent difference (RPD) is calculated. The %R control limits for MS and MSD analyses are specified in the laboratory documents, as are the RPD control limits for MS/MSD sample sets.

One MS/MSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for all analyses and the %R and RPD values were within the proper control limits, with the exceptions noted below.

Volatile Organic Compound (VOC) MS/MSD Exceptions

- **SDG 17I0184:** The laboratory performed an MS/MSD on Sample GEI-SED1-4-6 091517. The %R values for 1,2-dibromoethane were less than the control limits in the MS and MSD samples. There was no positive result for this compound in the parent sample; therefore, the reporting limit for this compound was qualified as estimated (UJ) in the parent sample.
- **SDG 17I0266:** The laboratory performed an MS/MSD on Sample GEI-40-2-4_091917. The %R values for ethylbenzene and m,p-xylene were less than the control limits in the MS. However, the %R values for these analytes were acceptable in the corresponding MSD. No qualification was required for this outlier.

Semi-Volatile Organic Compound (SVOC) MS/MSD Exceptions

- **SDG 17I0184:** (SW8270 and SW8270-SIM analyses) The laboratory performed an MS/MSD on Sample GEI-SED1-4-6 091517. In both analyses, the %R values for 15 analytes were outside the control limits in the MS and/or MSD samples. Upon inspection it was noted that several of the native concentrations had concentrations that exceeded the calibration range of the instrument. No qualifications were required in either case.
- **SDG 17I0146:** (SW8270-SIM analyses) The laboratory performed an MS/MSD on Sample GEI-44-7-9_091317. The %R value for dibenz(a,h)anthracene was greater than the control limits in the MS. However, the %R values for these analytes were acceptable in the corresponding MSD. No qualification was required for this outlier.
- **SDG 17I0266:** (SW8270-SIM analyses) The laboratory performed an MS/MSD on Sample GEI-40-2-4_091917. The %R values for phenanthrene, fluoranthene, pyrene, and chrysene were greater than the control limits in the MS/MSD. The positive results for these compounds were qualified as estimated (J) in the parent sample.

Total Metal MS/MSD Exceptions

- **SDG 17I0184:** The laboratory performed a matrix spike on Sample GEI-SED1-4-6_091517. The %R for silver was less than the control limits in the MS digested on 9/21/2017. The positive results for this silver were qualified as estimated (J) in all samples in this SDG. The %R for copper was greater than the control limits in the same matrix spike. The positive results for copper were qualified as estimated (J) in all samples in this SDG.
- **SDG 17I0146:** The laboratory performed a matrix spike on Sample GEI-44-7-9_091317. The %R for chromium was greater than the control limits in the MS digested in this sample set. However, the %R values for chromium were acceptable in the corresponding MSD. No qualification was required for this outlier.

- **SDG 17I0266:** The laboratory performed a matrix spike on Sample GEI-40-2-4_091917. The %R values for chromium and copper were greater than the control limits in the MS/MSD digested in this sample set. The positive results for chromium and copper were qualified as estimated (J) in this SDG. The %R values for lead were also outside of the control limits in the MS/MSD digested in this sample set, however, the native sample concentration for lead was greater than 4 times the amount spiked into the sample. No action was required for this outlier.

Petroleum Hydrocarbon (NWTPH-Dx) MS/MSD Exceptions

- **SDG 17I0184:** The laboratory performed an MS/MSD on Sample GEI-SED1-4-6_091517. The %R for diesel-range hydrocarbons was less than the control limits in the MSD extracted on 9/20/2017; however, the native sample concentration for diesel-range hydrocarbons was greater than 4 times the amount spiked into the sample. No action was required for this outlier.

Laboratory Control Samples/Laboratory Control Sample Duplicates

A laboratory control sample (LCS) is a blank sample that is spiked with a known amount of analyte and then analyzed. An LCS is similar to an MS, but without the possibility of matrix interference. Given that matrix interference is not an issue, control limits for accuracy and precision in the LCS and its duplicate (LCSD) are usually more rigorous than for MS/MSD analyses. Additionally, data qualification based on LCS/LCSD analyses would apply to each sample in the associated batch, instead of just the parent sample. The %R control limits for LCS and LCSD analyses are specified in the laboratory documents, as are the RPD control limits for LCS/LCSD sample sets.

One LCS/LCSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for each analysis and the %R and RPD values were within the proper control limits, with the exceptions noted below.

PAHs (8270-SIM) LCS/LCSD Exceptions

SDG 17I0121, 17I0125, 17I0146: The %R for dibenz(a,h)anthracene was greater than the control limits in the LCS extracted on 9/21/2017 (#BFI0317). The positive results for dibenz(a,h)anthracene were qualified as estimated (J) in Samples GEI-29-5-7_091217, GEI-43-3-5_091317, and GEI-44-2-4_091317.

Laboratory Duplicates

Internal laboratory duplicate analyses are performed to monitor the precision of the analyses. Two separate aliquots of a sample are analyzed as distinct samples in the laboratory and the RPD between the two results is calculated. Duplicate analyses should be performed once per analytical batch. If one or more of the samples used has a concentration less than five times the reporting limit for that sample, the absolute difference is used instead of the RPD. The RPD control limits are specified in the laboratory documents. Laboratory duplicates were analyzed at the proper frequency and the specified acceptance criteria were met, with the following exceptions:

SDG 17I0184: (TOC) A laboratory duplicate analysis was performed on Sample GEI-SED1-4-6_091517. The RPD for TOC was greater than the control limit. The positive result for this target analyte was qualified as estimated (J) in all samples in this SDG.

(Total Metals) A laboratory duplicate analysis was performed on Sample GEI-SED1-4-6_091517. The RPD values for cadmium, copper, mercury, and lead were greater than the control limits. The positive results for these target analytes were qualified as estimated (J) in all samples in this SDG.

SDG 17I0266: (Total Metals) A laboratory duplicate analysis was performed on Sample GEI-40-2-4_091917. The RPD values for arsenic, chromium, copper, silver, and lead were greater than the control limits. The positive results for these target analytes were qualified as estimated (J) in all samples in this SDG.

Field Duplicates

Field duplicates are similar to laboratory duplicates in that they are used to assess precision. Two samples (parent and duplicate) are created in the field by subsampling the homogenized sample and submitting them to the lab as separate samples. Duplicate samples were collected and analyzed for the same parameters as the associated parent samples. Precision is determined by calculating the RPD between each pair of samples. If one or more of the sample analytes has a concentration less than five times the reporting limit for that sample, then the absolute difference is used instead of the RPD. The RPD control limit for soil samples is 50 percent.

SDG 17I0266: One field duplicate sample pair, GEI-38-5-7_091917 and GEI-DUP-2_091917, was submitted with this SDG. The precision criteria for chromium, lead, and zinc were not met for this sample pair. The positive results for these analytes were qualified as estimated (J) in both samples.

Instrument Tuning

Instrument tuning for analyses by gas chromatography/mass spectrometry (GC/MS) are completed to ensure that mass resolution, identification, and sensitivity of the analyses are acceptable. Instrument tuning should be performed at the beginning of each 12-hour period during which samples or standards are analyzed. The frequency and specified acceptance criteria were met for each applicable analysis.

Internal Standards (Low Resolution Mass Spectrometry)

Like the surrogate, an internal standard is a compound that is chemically similar to the analytes of interest, but unlikely to be found in any environmental sample. Internal standards are used only for the mass spectrometry instrumentation and are usually added to the sample aliquot after extraction has taken place. The internal standard should be analyzed at the beginning of a 12-hour sample run and the control limits for internal standard recoveries are 50 percent to 200 percent of the calibration standard.

Initial Calibrations (ICALs)

The initial calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent relative standard deviation (%RSD) and relative response factors (RRF) values were within the control limits stated in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 2008).

Continuing Calibrations (CCALs)

The continuing calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent difference (%D) and relative response factors (RRF) values were within the control limits in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 2008), with the following exceptions:

SDG 17I0184: (VOCs) The %D value for n-hexane was greater than the control limit in the continuing calibration verification (CCAL) performed on 9/19/2017. There were no positive results for this analyte in the associated batched field samples. No qualifiers were required.

(SVOCs) The %D values for butylbenzyl phthalate were lower than the control limit in the CCAL performed on 9/28/2017. The positive results and reporting limits for this compound were qualified as estimated (J/UJ) in all Samples in this SDG. The %D value for pentachlorophenol was greater than the control limit in this same CCAL. The positive result for pentachlorophenol was qualified as estimated (J) in Sample GEI-SED1-4-6_091517.

Also, the %D value for butylbenzyl phthalate and pentachlorophenol were outside of the control limits in the CCAL performed on 10/4/2017. No qualification was required because this calibration standard was only used for the diluted analytes in the sample.

(SVOC-PAHs) The %D values for hexachlorobenzene were lower than the control limit in the CCAL performed on 9/28/2017. There were no positive results for hexachlorobenzene in any of the associated samples. The reporting limits for hexachlorobenzene were qualified as estimated (UJ) in all Samples in this SDG.

SDG 17I0121, 17I0125, and 17I0146: (VOCs) The %D value for n-hexane was greater than the control limit in the continuing calibration verification (CCAL) performed Instrument NT5 (9/18/2017). There were no positive results for this analyte in the associated batched field samples. No qualifiers were required.

SDG 17I0185 and 17I0266: (VOCs) The %D value for n-hexane was greater than the control limit in the continuing calibration verification (CCAL) performed Instrument NT5 (9/19/2017). There were no positive results for this analyte in the associated batched field samples. No qualifiers were required.

Miscellaneous

SDG 17I0184: (SVOCs) The laboratory reported two sets of results for Sample GEI-SED1-4-6_091517 because phenanthrene, fluoranthene, and pyrene exceeded the calibration range of the instrument in the first analysis. The second analysis was diluted at a factor of 3 for all analytes. For this reason, the results of phenanthrene, fluoranthene, and pyrene were labeled as Do-Not-Report (DNR) in the first analysis and all other analytes were labeled as Do-Not-Report (DNR) in the second analysis in order to avoid redundant analyte reporting.

(PAH-SIMs) The laboratory reported two sets of results for Sample GEI-SED1-4-6_091517 because 10 analytes exceeded the calibration range of the instrument in the first analysis. The second analysis was diluted at a factor of 10 for all analytes. For this reason, the results of the undiluted analytes that exceeded calibration range were labeled as Do-Not-Report (DNR) in the first analysis and all other analytes were labeled as Do-Not-Report (DNR) in the second analysis in order to avoid redundant analyte reporting.

SDG 17I0125: (PAH-SIMs) The laboratory reported three sets of results for Sample GEI-30-6-8_091217 because 12 analytes exceeded the calibration range of the instrument in the first analysis. The second analysis was diluted at a factor of 5 for all analytes, and the third analysis was diluted at a factor of 20 for all analytes. For this reason, the results of the analytes that exceeded the calibration range were labeled as Do-Not-Report (DNR) in the first and second analyses and all other analytes were labeled as Do-Not-Report (DNR) in the third analysis in order to avoid redundant analyte reporting.

SDG 1710185: (PAH-SIMs) The laboratory reported two sets of results for Sample GEI-39-5-7_091517 because 5 analytes exceeded the calibration range of the instrument in the first analysis. The second analysis was diluted at a factor of 20 for all analytes, and the first analysis was diluted at a factor of 5 for all analytes. For this reason, the results of the analytes that exceeded the calibration range were labeled as Do-Not-Report (DNR) in the first analyses and all other analytes were labeled as Do-Not-Report (DNR) in the second analysis in order to avoid redundant analyte reporting.

Overall Assessment

As was determined by this data validation, the laboratory followed the specified analytical methods. Accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD, and MS/MSD %R values, with the exceptions noted above. Precision was acceptable, as demonstrated by the LCS/LCSD, MS/MSD, and laboratory/field duplicate RPD values, with the exceptions noted above.

Data were qualified as not detected because of method blank contamination. Data were also qualified as estimated because of headspace in the sample container, MS/MSD %R outliers, laboratory duplicate RPD outliers, and continuing calibration %D outliers.

Data were labeled as Not Reportable in order to avoid redundant analytes per sample.

All data are acceptable for the intended use, with the following qualifications listed below in Table 2.

TABLE 2: SUMMARY OF QUALIFIED SAMPLES

Sample ID	Analyte	Qualifier	Reason
GEI-SED1-1-3_091517	Lead	J	Laboratory Duplicate Precision
GEI-SED1-1-3_091517	Silver	J	Matrix Spike
GEI-SED1-1-3_091517	Cadmium	UJ	Method Blank, Laboratory Duplicate Precision
GEI-SED1-1-3_091517	Copper	J	Laboratory Duplicate Precision, Matrix Spike
GEI-SED1-1-3_091517	Mercury	J	Laboratory Duplicate Precision
GEI-SED1-1-3_091517	Butyl benzyl Phthalate	J	Continuing Calibration
GEI-SED1-1-3_091517	Total Organic Carbon	J	Laboratory Duplicate Precision
GEI-SED1-4-6_091517	1,2-Dibromoethane	UJ	Matrix Spike
GEI-SED1-4-6_091517	Butyl benzyl Phthalate	UJ	Continuing Calibration
GEI-SED1-4-6_091517	Cadmium	J	Laboratory Duplicate Precision
GEI-SED1-4-6_091517	Copper	J	Matrix Spike, Laboratory Duplicate Precision
GEI-SED1-4-6_091517	Lead	J	Laboratory Duplicate Precision
GEI-SED1-4-6_091517	Mercury	J	Laboratory Duplicate Precision
GEI-SED1-4-6_091517	Pentachlorophenol	J	Continuing Calibration
GEI-SED1-4-6_091517	Silver	J	Matrix Spike
GEI-SED1-4-6_091517	Total Organic Carbon	J	Laboratory Duplicate Precision
GEI-SED-COMP-1_091517	Butyl benzyl Phthalate	UJ	Continuing Calibration
GEI-SED-COMP-1_091517	Cadmium	UJ	Method Blank, Laboratory Duplicate Precision
GEI-SED-COMP-1_091517	Copper	J	Matrix Spike, Laboratory Duplicate Precision
GEI-SED-COMP-1_091517	Lead	J	Laboratory Duplicate Precision
GEI-SED-COMP-1_091517	Mercury	UJ	Laboratory Duplicate Precision
GEI-SED-COMP-1_091517	Silver	J	Matrix Spike
GEI-SED-COMP-1_091517	Total Organic Carbon	J	Laboratory Duplicate Precision
TRIP_BLANK_170911	1,2-Dibromoethane	UJ	Sample Preservation
TRIP_BLANK_170911	1,2-Dichloroethane	UJ	Sample Preservation
TRIP_BLANK_170911	Ethylbenzene	UJ	Sample Preservation
TRIP_BLANK_170911	Toluene	UJ	Sample Preservation
TRIP_BLANK_170911	n-Hexane	UJ	Sample Preservation
TRIP_BLANK_170911	Benzene	UJ	Sample Preservation
TRIP_BLANK_170911	Methyl t-butyl ether	UJ	Sample Preservation

TRIP_BLANK_170911	Xylene, m-,p-	UJ	Sample Preservation
TRIP_BLANK_170911	Xylene, o-	UJ	Sample Preservation
GEI-29-5-7_091217	Dibenzo(a,h)anthracene	J	Laboratory Control Sample
GEI-43-3-5_091317	Dibenzo(a,h)anthracene	J	Laboratory Control Sample
GEI-44-2-4_091317	Dibenzo(a,h)anthracene	J	Laboratory Control Sample
GEI-40-2-4_091917	Phenanthrene	J	Matrix Spike
GEI-40-2-4_091917	Fluoranthene	J	Matrix Spike
GEI-40-2-4_091917	Chrysene	J	Matrix Spike
GEI-40-2-4_091917	Pyrene	J	Matrix Spike
GEI-39-8-10_091517	Cadmium	U	Method Blank
GEI-38-12-14	Arsenic	J	Laboratory Duplicate Precision
GEI-38-12-14	Chromium	J	Laboratory Duplicate Precision
GEI-38-12-14	Copper	J	Laboratory Duplicate Precision
GEI-38-12-14	Lead	J	Laboratory Duplicate Precision
GEI-38-12-14	Silver	J	Laboratory Duplicate Precision
GEI-38-2-4_091917	Arsenic	J	Laboratory Duplicate Precision
GEI-38-2-4_091917	Chromium	J	Laboratory Duplicate Precision
GEI-38-2-4_091917	Copper	J	Laboratory Duplicate Precision
GEI-38-2-4_091917	Lead	J	Laboratory Duplicate Precision
GEI-38-2-4_091917	Silver	J	Laboratory Duplicate Precision
GEI-38-5-7_091917	Arsenic	J	Laboratory Duplicate Precision
GEI-38-5-7_091917	Chromium	J	Laboratory Duplicate Precision, Field Duplicate
GEI-38-5-7_091917	Copper	J	Laboratory Duplicate Precision
GEI-38-5-7_091917	Lead	J	Laboratory Duplicate Precision, Field Duplicate
GEI-38-5-7_091917	Silver	J	Laboratory Duplicate Precision
GEI-38-5-7_091917	Zinc	J	Field Duplicate
GEI-40-12-14_091917	Arsenic	J	Laboratory Duplicate Precision
GEI-40-12-14_091917	Chromium	J	Laboratory Duplicate Precision
GEI-40-12-14_091917	Copper	J	Laboratory Duplicate Precision
GEI-40-12-14_091917	Lead	J	Laboratory Duplicate Precision
GEI-40-12-14_091917	Silver	J	Laboratory Duplicate Precision
GEI-40-2-4_091917	Arsenic	J	Laboratory Duplicate Precision

GEI-40-2-4_091917	Chromium	J	Laboratory Duplicate Precision, Matrix Spike
GEI-40-2-4_091917	Copper	J	Laboratory Duplicate Precision, Matrix Spike
GEI-40-2-4_091917	Lead	J	Laboratory Duplicate Precision
GEI-40-2-4_091917	Silver	J	Laboratory Duplicate Precision
GEI-40-5-7_091917	Arsenic	J	Laboratory Duplicate Precision
GEI-40-5-7_091917	Chromium	J	Laboratory Duplicate Precision
GEI-40-5-7_091917	Copper	J	Laboratory Duplicate Precision
GEI-40-5-7_091917	Lead	J	Laboratory Duplicate Precision
GEI-40-5-7_091917	Silver	J	Laboratory Duplicate Precision
GEI-DUP-2_091917	Arsenic	J	Laboratory Duplicate Precision
GEI-DUP-2_091917	Chromium	J	Laboratory Duplicate Precision, Field Duplicate
GEI-DUP-2_091917	Copper	J	Laboratory Duplicate Precision
GEI-DUP-2_091917	Lead	J	Laboratory Duplicate Precision, Field Duplicate
GEI-DUP-2_091917	Silver	J	Laboratory Duplicate Precision
GEI-DUP-2_091917	Zinc	J	Field Duplicate

REFERENCES

GeoEngineers, 2017. FINAL Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan); Quiet Cove Property; Anacortes, WA; Ecology Agreed Order No. DE 11346. GEI No. 5147-024-03, dated January 25, 2017.

U.S. Environmental Protection Agency (USEPA). "Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use," EPA-540-R-08-005. January 2009.

U.S. Environmental Protection Agency (USEPA). "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review," EPA-540-R-08-01. June 2008.

U.S. Environmental Protection Agency (USEPA). "Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review," EPA-540-R-10-011. January 2010.

Data Validation Report

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Project: Port of Anacortes – Quiet Cove RIFS
2018 Tier 2 Sediment Sampling Event

GEI File No: 005147-024-05

Date: August 21, 2018

This report documents the results of a United States Environmental Protection Agency (USEPA)-defined Stage 2B data validation (USEPA Document 540-R-08-005; USEPA 2009) of analytical data from the analyses of soil and sediment samples collected as part of the September 2017 Quiet Cove RIFS sampling event, and the associated laboratory and field quality control (QC) samples. The samples were obtained from the Quiet Cove Site (Site) located at 3rd Street and O Avenue in Anacortes, Washington.

OBJECTIVE AND QUALITY CONTROL ELEMENTS

GeoEngineers, Inc. (GeoEngineers) completed the data validation consistent with USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA 2008) and Inorganic Superfund Data Review (USEPA 2010; National Functional Guidelines) to determine if the laboratory analytical results meet the project objectives and are usable for their intended purpose. Data usability was assessed by determining if:

- The samples were analyzed using well-defined and acceptable methods that provide reporting limits below applicable regulatory criteria;
- The precision and accuracy of the data are well-defined and sufficient to provide defensible data; and
- The quality assurance/quality control (QA/QC) procedures utilized by the laboratory meet acceptable industry practices and standards.

In accordance with the Final Sampling and Analysis Plan; Quiet Cove Property (GeoEngineers 2017), the data validation included review of the following QC elements:

- Data Package Completeness
- Chain-of-Custody Documentation
- Holding Times and Sample Preservation
- Surrogate Recoveries
- Method, Trip, and Rinsate Blanks
- Matrix Spikes/Matrix Spike Duplicates
- Laboratory Control Samples/Laboratory Control Sample Duplicates
- Laboratory and Field Duplicates

- Instrument Tuning
- Internal Standards
- Initial Calibrations (ICALs)
- Continuing Calibrations (CCALs)
- Miscellaneous

VALIDATED SAMPLE DELIVERY GROUPS

This data validation included review of the sample delivery groups (SDGs) listed below in Table 1.

TABLE 1: SUMMARY OF VALIDATED SAMPLE DELIVERY GROUPS

Laboratory Sample Delivery Group	Validated Samples
18G0186	SED-5-0-0.5, SED-5-2-4, SED-6-0-0.5, SED-7-0-0.5, DUP-1-0-0.5, SED-8-0-0.5, SED-8-3.2-4.5, SED-9-0-0.5, and TRIPBLANK_07162018
18G0206	SED-6-1-3, SED-7-0-1, DUP-2-0-1, SED-9-1.7-2.3, SED-10-2-4, and TRIPBLANK_07172018
18G0215	SED-10-0-0.5 and TRIPBLANK_07182018

CHEMICAL ANALYSIS PERFORMED

Analytical Resources, Inc. (ARI), located in Tukwila, Washington, performed laboratory analyses on the sediment and soil samples using one or more of the following methods:

- Gasoline-range Hydrocarbons (NWTPH-Gx) by Method NWTPH-Gx;
- Diesel and Heavy Oil range Hydrocarbons (NWTPH-Dx) by Method NWTPH-Dx;
- Volatile Organic Compounds (VOCs) by Method SW8260C;
- Semi-volatile Organic Compounds (SVOCs) by Method SW8270D;
- Polycyclic Aromatic Hydrocarbons (PAHs) by Method SW8270D-SIM;
- Total Metals by Methods EPA6010A/7471B;
- Total Organic Carbon (TOC) by Method Plumb 1981 (Combustion IR)
- Ammonia by SM4500-NH3
- Sulfides by SM4500-S2-D00
- Total Volatile Solids by SM2540 G-97

Materials Testing & Consulting (MT&C) headquartered in Burlington, Washington, performed laboratory analysis on the soil and sediment samples using the following method:

- Grain Size analysis by Puget Sound Estuary Protocols (PSEP)

DATA VALIDATION SUMMARY

The results for each of the QC elements are summarized below.

Data Package Completeness

ARI provided all required deliverables for the data validation according to the National Functional Guidelines. The laboratory followed adequate corrective action processes and all identified anomalies were discussed in the relevant laboratory case narrative.

Chain-of-Custody Documentation

Chain-of-custody (COC) forms were provided with the laboratory analytical reports. The COCs and sample container IDs were signed, accurate and complete when submitted to the lab, with the exceptions noted below:

Sample Container Exceptions

- **SDG 18G0186:** The laboratory noted that the cooler trip blank (sampled on 7/16/18) was not listed on the COC. Also, the preservative, zinc acetate, was not included on the sample containers for the Sulfide analysis. No action was taken for these oversights, other than to note them in this document.
- **SDG 18G0206:** The laboratory noted that archived Sample SED-10-4-5.7 (on COC) was received with Sample ID SED-10-4-5.6 listed on the sample jars.

There were also discrepancies between the amount of sample containers listed on the COC and amounts actually received:

SED-7-0-1 listed 13 containers on COC; received 12

DUP-2-0-1 listed 11 containers on COC; received 12

- **SDG 18G0215:** The laboratory noted that the cooler trip blank (sampled on 7/18/18) was not listed on the COC. Also, the project name was not included on the COC. No action was taken for these oversights, other than to note them in this document.

Holding Times and Sample Preservation

The sample holding time is defined as the time that elapses between sample collection and sample analysis. Maximum holding time criteria exist for each analysis to help ensure that the analyte concentrations found at the time of analysis reflect the concentration present at the time of sample collection. Established holding times were met for all analyses, with the exceptions noted below. The sample coolers arrived at the laboratory within the appropriate temperatures of between 2° and 6° Celsius, with the exception of cases where coolers were received at temperatures slightly below 2°. It was determined through professional judgment that since the samples were not frozen, these lower temperatures would not affect the analytical results.

Surrogate Recoveries

A surrogate compound is a compound that is chemically similar to the organic analytes of interest, but unlikely to be found in any environmental sample. Surrogates are used for organic analyses and are added to all samples, standards, and blanks to serve as an accuracy and specificity check of each analysis. The surrogates are added to the samples at a known concentration and percent recoveries (%R)

are calculated following analysis. All surrogate recoveries for field samples were within the laboratory control limits, with the exceptions noted below.

Semi-Volatile Organic Compounds (SVOC) Surrogate Exceptions

- **SDG 18G0215:** The %R for surrogate 2,4,6-tribromophenol was less than the control limits in Sample SED-10-0-0.5; however, the sample was spiked with three additional acidic surrogates, all within the control limits. No action was required for this outlier.

Method Blanks

Method blanks are analyzed to ensure that laboratory procedures and reagents do not introduce measurable concentrations of the analytes of interest. A method blank was analyzed with each batch of samples, at a frequency of 1 per 20 samples. For all sample batches, method blanks were analyzed at the required frequency. None of the analytes of interest were detected in the method blanks, with the exceptions noted below.

Metals Method Blank Exceptions

- **SDG 18G0186, 18G0206, 18G0215:** There were positive results for chromium and lead detected above the method detection limit, but below the reporting limit in the soil method blank digested on 7/27/18; and there were no results less than the reporting limits for either of these metals in any of the associated samples; therefore, no qualifications were required.

Trip Blanks

Trip blanks are analyzed to assess whether field sampling or sample transport processes may have introduced measurable concentrations of volatile analytes of interest into project samples. The following SDGs contained trip blanks that were packed into the sample coolers and transported with the field samples:

- **SDG 18G0186:** Trip Blank sampled on 7/16/18.
- **SDG 18G0206:** Trip Blank sampled on 7/17/18.
- **SDG 18G0215:** Trip Blank sampled on 7/18/18.

None of the analytes of interest were detected in the trip blanks.

Matrix Spikes/Matrix Spike Duplicates

Since the actual analyte concentration in an environmental sample is not known, the accuracy of a particular analysis is usually inferred by performing a matrix spike (MS) analysis on one sample from the associated batch, known as the parent sample. One aliquot of the sample is analyzed in the normal manner and then a second aliquot of the sample is spiked with a known amount of analyte concentration and analyzed. From these analyses, a %R is calculated. Matrix spike duplicate (MSD) analyses are generally performed for organic analyses as a precision check and analyzed in the same sequence as a matrix spike. Using the results from the MS and MSD, the relative percent difference (RPD) is calculated. The %R control limits for MS and MSD analyses are specified in the laboratory documents, as are the RPD control limits for MS/MSD sample sets.

One MS/MSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for all analyses and the %R and RPD values were within the proper control limits, with the exceptions noted below.

Volatile Organic Compounds (VOC) MS/MSD Exceptions

- **SDG 18G0206:** The laboratory performed an MS/MSD on Sample SED-6-1-3. The %R values for ethylbenzene were less than the control limits in the MS/MSD. There was no positive result for this compound in the parent sample. The reporting limit for ethylbenzene was qualified as estimated (UJ) in Sample SED-6-1-3.

Semi-Volatile Organic Compounds (SVOC) MS/MSD Exceptions

- **SDG 18G0206:** (SW8270 and SW8270-SIM analyses) The laboratory performed an MS/MSD on Sample SED-6-1-3. In both analyses, the %R values for fluoranthene and pyrene were less than the control limits in the MS and/or MSD samples. The positive results for fluoranthene and pyrene were qualified as estimated (J) in Sample SED-6-1-3.

Also, the RPD values for 2,4-dimethylphenol and benzoic acid exceeded the control limits in this same sample set, demonstrating a lack of precision for these analytes. The positive results for 2,4-dimethylphenol and benzoic acid were qualified as estimated (J) in Sample SED-6-1-3.

The SIM analysis also performed an MS/MSD on Sample SED-6-1-3. The %R and RPD values for several analytes were outside of the control limits in this sample set. However, these samples were diluted, therefore no qualification was required.

Total Metal MS/MSD Exceptions

- **SDG 18G0206:** The laboratory performed a matrix spike on Sample SED-6-1-3. The %R for chromium was less than the control limits in the MS/MSD sample set. The positive results for chromium were qualified as estimated (J) in all samples in this SDG. Also, the %R for lead and copper were greater than the control limits in the MSD from this sample set. However, the %R value for lead was within the control limits in the corresponding MS, no qualifiers were required for this outlier.

The RPD value for arsenic was greater than the control limits in the same MS/MSD sample set. The positive results for arsenic were qualified as estimated (J) in all samples in this SDG.

Total Organic Carbon (TOC) Exceptions

- **SDG 18G0186:** The laboratory performed a MS on Sample SED-6-0-0.5. The %R values for TOC was less than the control limits in the MS. The positive result for TOC was qualified as estimated (J) in the parent sample.
- **SDG 18G0206:** The laboratory performed a MS on Sample SED-6-1-3. The %R values for TOC was greater than the control limits in the MS/MSD. The positive result for TOC was qualified as estimated (J) in the parent sample.

Laboratory Control Samples/Laboratory Control Sample Duplicates

A laboratory control sample (LCS) is a blank sample that is spiked with a known amount of analyte and then analyzed. An LCS is similar to an MS, but without the possibility of matrix interference. Given that matrix interference is not an issue, control limits for accuracy and precision in the LCS and its duplicate (LCSD) are usually more rigorous than for MS/MSD analyses. Additionally, data qualification based on LCS/LCSD analyses would apply to each sample in the associated batch, instead of just the parent sample. The %R control limits for LCS and LCSD analyses are specified in the laboratory documents, as are the RPD control limits for LCS/LCSD sample sets.

One LCS/LCSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for each analysis and the %R and RPD values were within the proper control limits, with the exceptions noted below.

VOCs (8260) LCS/LCSD Exceptions

SDG 18G0215: The %R for methyl tert-butyl ether was less than the control limit in the LCSD extracted on 7/27/2018 (#BGG0688). However, as the %R value for this compound in the corresponding LCS was within the control limits, no action was taken.

Laboratory Duplicates

Internal laboratory duplicate analyses are performed to monitor the precision of the analyses. Two separate aliquots of a sample are analyzed as distinct samples in the laboratory and the RPD between the two results is calculated. Duplicate analyses should be performed once per analytical batch. If one or more of the samples used has a concentration less than five times the reporting limit for that sample, the absolute difference is used instead of the RPD. The RPD control limits are specified in the laboratory documents. Laboratory duplicates were analyzed at the proper frequency and the specified acceptance criteria were met, with the following exceptions:

SDG 18G0206: (Total Metals) A laboratory duplicate analysis was performed on Sample SED-6-1-3. The RPD values for arsenic, copper, and chromium was greater than the control limits. The positive results for chromium were qualified as estimated (J) in Samples SED-6-1-3, SED-7-0-1, DUP-2-0-1, SED-9-1.7-2.3, and SED-10-2-4.

Field Duplicates

Field duplicates are similar to laboratory duplicates in that they are used to assess precision. Two samples (parent and duplicate) are created in the field by subsampling the homogenized sample and submitting them to the lab as separate samples. Duplicate samples were collected and analyzed for the same parameters as the associated parent samples. Precision is determined by calculating the RPD between each pair of samples. If one or more of the sample analytes has a concentration less than five times the reporting limit for that sample, then the absolute difference is used instead of the RPD. The RPD control limit for soil/sediment samples is 50 percent, while the control limit for the absolute difference values is twice the reporting limit.

SDG 18G0186: One field duplicate sample pair, SED-7-0-0.5 and DUP-1-0-0.5, was submitted with this SDG. The precision criteria for Total Organic Carbon (TOC), Heavy Oil, copper, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzofluoranthenes (total), chrysene, diethyl phthalate, fluoranthene, phenanthrene, and pyrene were not met for this sample pair. The positive results for these analytes were qualified as estimated (J) in both samples.

SDG 18G0206: One field duplicate sample pair, SED-7-0-1 and DUP-2-0-1, was submitted with this SDG. The precision criteria for sulfide, copper, benzoic acid, phenanthrene, and pyrene were not met for this sample pair. The positive results for these analytes were qualified as estimated (J) in both samples.

Instrument Tuning

Instrument tuning for analyses by gas chromatography/mass spectrometry (GC/MS) are completed to ensure that mass resolution, identification, and sensitivity of the analyses are acceptable. Instrument

tuning should be performed at the beginning of each 12-hour period during which samples or standards are analyzed. The frequency and specified acceptance criteria were met for each applicable analysis.

Internal Standards (Low Resolution Mass Spectrometry)

Like the surrogate, an internal standard is a compound that is chemically similar to the analytes of interest, but unlikely to be found in any environmental sample. Internal standards are used only for the mass spectrometry instrumentation and are usually added to the sample aliquot after extraction has taken place. The internal standard should be analyzed at the beginning of a 12-hour sample run and the control limits for internal standard recoveries are 50 percent to 200 percent of the calibration standard. All internal standard recoveries were within the control limits.

Initial Calibrations (ICALs)

The initial calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent relative standard deviation (%RSD) and relative response factors (RRF) values were within the control limits stated in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 2008).

Continuing Calibrations (CCALs)

The continuing calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent difference (%D) and relative response factors (RRF) values were within the control limits in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 2008), with the following exceptions:

SDG 18G0186: (SVOC-PAHs) The %D value for benzoic acid was less than the control limit in the continuing calibration verifications (CCAL) performed on 7/21/2018 and 7/30/2018. The positive results and reporting limits for benzoic acid were qualified as estimated (J/UJ) in all samples in the SDG, with the exception of Sample TRIPBLANK_07162018.

SDG 18G0206: (SVOC-PAHs) The %D value for benzoic acid was less than the control limit in the continuing calibration verifications (CCAL) performed on 7/30/2018 and 8/1/2018. The positive results and reporting limits for benzoic acid were qualified as estimated (J/UJ) in all samples in the SDG, with the exception of Sample TRIPBLANK_07172018.

SDG 18G0215: (SVOC-PAHs) The %D value for benzoic acid was less than the control limit in the continuing calibration verification (CCAL) performed on 8/1/2018. The reporting limit for benzoic acid was qualified as estimated (UJ) in Sample SED-10-0-0.5.

Miscellaneous

SDG 18G0186: (PAH-SIMs) The laboratory reported two sets of results for Sample SED-9-0-0.5 because fluoranthene and pyrene exceeded the calibration range of the instrument in the first analysis. The second analysis was diluted at a factor of 3 for all analytes. For this reason, the results of the analytes that exceeded the calibration range were labeled as Do-Not-Report (DNR) in the first analyses and all other analytes were labeled as Do-Not-Report (DNR) in the third analysis in order to avoid redundant analyte reporting.

ALL SDGs: (SVOCs by 8270) Several compounds were reported with the 8270-Full List analysis that were also analyzed by the SIM method. In these cases, the SIM method was chosen for reporting purposes by GeoEngineers. The redundant compounds were labeled as Do-Not-Report (DNR) from the 8270-Full List analyses in order to avoid redundant analyte reporting.

Overall Assessment

As was determined by this data validation, the laboratory followed the specified analytical methods. Accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD, and MS/MSD %R values, with the exceptions noted above. Precision was acceptable, as demonstrated by the LCS/LCSD, MS/MSD, and laboratory/field duplicate RPD values, with the exceptions noted above.

Data were qualified because of MS/MSD %R outliers, laboratory and field duplicate precision outliers, and continuing calibration %D outliers.

Data were labeled as Not Reportable in order to avoid redundant analytes per sample.

All data are acceptable for the intended use, with the following qualifications listed below in Table 2.

TABLE 2: SUMMARY OF QUALIFIED SAMPLES

Sample ID	Analyte	Qualifier	Reason
SED-7-0-0.5	Heavy Oil	J	Field Duplicate Precision
DUP-1-0-0.5	Heavy Oil	J	Field Duplicate Precision
SED-6-1-3	Ethylbenzene	UJ	Matrix Spike (MS & MSD) Recoveries
SED-6-1-3	2,4-Dimethylphenol	UJ	Precision (MS/MSD)
SED-6-1-3	Pyrene	J	Matrix Spike (MS & MSD) Recoveries
SED-6-1-3	Fluoranthene	J	Matrix Spike (MS & MSD) Recoveries
SED-6-1-3	Benzoic Acid	UJ	Precision (MS/MSD)
SED-7-0-0.5	Anthracene	J	Field Duplicate Precision
SED-7-0-0.5	Pyrene	J	Field Duplicate Precision
SED-7-0-0.5	Benzo(g,h,i)perylene	J	Field Duplicate Precision
SED-7-0-0.5	Fluoranthene	J	Field Duplicate Precision
SED-7-0-0.5	Chrysene	J	Field Duplicate Precision
SED-7-0-0.5	Benzo(a)pyrene	J	Field Duplicate Precision
SED-7-0-0.5	Benzo(a)anthracene	J	Field Duplicate Precision
SED-7-0-0.5	Phenanthrene	J	Field Duplicate Precision
SED-7-0-0.5	Benzofluoranthenes (Total)	J	Field Duplicate Precision
SED-7-0-0.5	Diethyl Phthalate	J	Field Duplicate Precision
DUP-1-0-0.5	Anthracene	J	Field Duplicate Precision
DUP-1-0-0.5	Pyrene	J	Field Duplicate Precision
DUP-1-0-0.5	Benzo(g,h,i)perylene	J	Field Duplicate Precision
DUP-1-0-0.5	Fluoranthene	J	Field Duplicate Precision
DUP-1-0-0.5	Chrysene	J	Field Duplicate Precision
DUP-1-0-0.5	Benzo(a)pyrene	J	Field Duplicate Precision
DUP-1-0-0.5	Benzo(a)anthracene	J	Field Duplicate Precision
DUP-1-0-0.5	Phenanthrene	J	Field Duplicate Precision
DUP-1-0-0.5	Benzofluoranthenes (Total)	J	Field Duplicate Precision
DUP-1-0-0.5	Diethyl Phthalate	J	Field Duplicate Precision
SED-5-0-0.5	Benzoic Acid	UJ	Calibration (continuing)
SED-5-2-4	Benzoic Acid	UJ	Calibration (continuing)
SED-6-0-0.5	Benzoic Acid	UJ	Calibration (continuing)

SED-6-1-3	Benzoic Acid	UJ	Calibration (continuing)
SED-7-0-0.5	Benzoic Acid	UJ	Calibration (continuing)
SED-7-0-1	Benzoic Acid	UJ	Calibration (continuing)
SED-8-0-0.5	Benzoic Acid	UJ	Calibration (continuing)
SED-8-3.2-4.5	Benzoic Acid	UJ	Calibration (continuing)
SED-9-0-0.5	Benzoic Acid	UJ	Calibration (continuing)
SED-9-1.7-2.3	Benzoic Acid	UJ	Calibration (continuing)
SED-10-0-0.5	Benzoic Acid	UJ	Calibration (continuing)
SED-10-2-4	Benzoic Acid	UJ	Calibration (continuing)
DUP-1-0-0.5	Benzoic Acid	UJ	Calibration (continuing)
DUP-2-0-1	Benzoic Acid	UJ	Calibration (continuing)
SED-7-0-1	Benzoic Acid	J	Field Duplicate Precision
SED-7-0-1	Phenanthrene	J	Field Duplicate Precision
SED-7-0-1	Pyrene	J	Field Duplicate Precision
DUP-2-0-1	Benzoic Acid	UJ	Field Duplicate Precision
DUP-2-0-1	Phenanthrene	J	Field Duplicate Precision
DUP-2-0-1	Pyrene	J	Field Duplicate Precision
DUP-1-0-0.5	Copper	J	Field Duplicate Precision
DUP-2-0-1	Arsenic	J	Lab Precision
DUP-2-0-1	Chromium	J	Lab precision, MS/MSD accuracy
DUP-2-0-1	Copper	J	Lab Precision, Field Duplicate
SED-10-2-4	Arsenic	J	Lab Precision
SED-10-2-4	Chromium	J	Lab precision, MS/MSD accuracy
SED-10-2-4	Copper	J	Lab Precision
SED-6-1-3	Arsenic	J	Lab Precision
SED-6-1-3	Chromium	J	Lab precision, MS/MSD accuracy
SED-6-1-3	Copper	J	Lab Precision
SED-7-0-0.5	Copper	J	Field Duplicate
SED-7-0-1	Arsenic	J	Lab Precision
SED-7-0-1	Chromium	J	Lab precision, MS/MSD accuracy
SED-7-0-1	Copper	J	Lab Precision, Field Duplicate
SED-9-1.7-2.3	Arsenic	J	Lab Precision

SED-9-1.7-2.3	Chromium	J	Lab precision, MS/MSD accuracy
SED-9-1.7-2.3	Copper	J	Lab Precision
SED-7-0-1	Sulfide	J	Field Duplicate
DUP-2-0-1	Sulfide	J	Field Duplicate

References

GeoEngineers, 2017. FINAL Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan); Quiet Cove Property; Anacortes, WA; Ecology Agreed Order No. DE 11346. GEI No. 5147-024-03, dated January 25, 2017.

U.S. Environmental Protection Agency (USEPA). "Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use," EPA-540-R-08-005. January 2009.

U.S. Environmental Protection Agency (USEPA). "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review," EPA-540-R-08-01. June 2008.

U.S. Environmental Protection Agency (USEPA). "Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review," EPA-540-R-10-011. January 2010.

Data Validation Report

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Project: Port of Anacortes – Quiet Cove Property, Supplemental Data Collection
October 2018 Groundwater Samples

GEI File No: 05147-024-06

Date: November 29, 2018

This report documents the results of a United States Environmental Protection Agency (USEPA)-defined Stage 2B data validation (USEPA Document 540-R-08-005; USEPA, 2009) of analytical data from the analyses of groundwater samples collected as part of the October 2018 sampling event, and the associated laboratory and field quality control (QC) samples. The samples were obtained from the Quiet Cove Property (Site) located at 3rd Street and O Avenue in Anacortes, Washington.

OBJECTIVE AND QUALITY CONTROL ELEMENTS

GeoEngineers, Inc. (GeoEngineers) completed the data validation consistent with the USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review (USEPA, 2017a) and Inorganic Superfund Methods Data Review (USEPA, 2017b) (National Functional Guidelines) to determine if the laboratory analytical results meet the project objectives and are usable for their intended purpose. Data usability was assessed by determining if:

- The samples were analyzed using well-defined and acceptable methods that provide reporting limits below applicable regulatory criteria;
- The precision and accuracy of the data are well-defined and sufficient to provide defensible data; and
- The quality assurance/quality control (QA/QC) procedures utilized by the laboratory meet acceptable industry practices and standards.

In accordance with the Final Remedial Investigation/Feasibility Study Work Plan, Quiet Cove Property (GeoEngineers, 2017a), the Final Sampling and Analysis Plan, Quiet Cove Property (GeoEngineers, 2017b), and the Work Plan Addendum for Supplemental Upland Area Soil and Groundwater Investigation at the Quiet Cove Site (GeoEngineers, 2018), the data validation included review of the following QC elements:

- Data Package Completeness
- Chain-of-Custody Documentation
- Holding Times and Sample Preservation
- Surrogate Recoveries
- Method and Trip Blanks
- Matrix Spikes/Matrix Spike Duplicates

- Laboratory Control Samples/Laboratory Control Sample Duplicates
- Field Duplicates
- Instrument Tuning
- Internal Standards
- Initial Calibrations (ICALs)
- Continuing Calibrations (CCALs)
- Reporting Limits
- Miscellaneous

VALIDATED SAMPLE DELIVERY GROUPS

This data validation included review of the sample delivery groups (SDGs) listed below in Table 1.

TABLE 1: SUMMARY OF VALIDATED SAMPLE DELIVERY GROUPS

Laboratory Sample Delivery Group	Validated Samples
18J0501	MW-4_102918, MW-6_102918, MW-8_102918, MW-10_102918
18J0516	MW-3_103018, MW-7_103018, MW-12_103018, DUP-1_103018,
18J0533	MW-1_103118, MW-2_103118, MW-5_103118, MW-11_103118, TB_103118

CHEMICAL ANALYSIS PERFORMED

Analytical Resources, Inc. (ARI), located in Tukwila, Washington, performed laboratory analyses on the groundwater samples using one or more of the following methods:

- Gasoline-range Hydrocarbons (NWTPH-Gx) by Method NWTPH-Gx;
- Petroleum Hydrocarbons (NWTPH-Dx) by Method NWTPH-Dx (with separate Silica Gel analysis);
- BTEX Compounds by Method SW8260C
- Nitrate and Sulfate by Method EPA 300.0
- Manganese by Method EPA6020
- Ferrous Iron by Standard Method SM3500FeB
- Methane by Method RSK-175
- Alkalinity as CaCO₃ by Standard Method SM2320B

DATA VALIDATION SUMMARY

The results for each of the QC elements are summarized below.

Data Package Completeness

ARI provided all required deliverables for the data validation according to the National Functional Guidelines. The laboratory followed adequate corrective action processes and all identified anomalies were discussed in the relevant laboratory case narrative.

Chain-of-Custody Documentation

Chain-of-custody (COC) forms were provided with the laboratory analytical reports. The COCs and sample container IDs were signed, accurate and complete when submitted to the lab, with the exception noted below:

SDG 18J0501: The laboratory noted that no trip blank was received by the laboratory; even though there was a sample with an ID of TB-102918 listed on the COC.

Also, several sample VOA vials were received with small bubble in the bottle. It was determined that the sample analyses were not affected by these bubbles as the laboratory had other viable sample containers.

SDG 18J0533: Several sample VOA vials were received with small bubble in the bottle. It was determined that the sample analyses were not affected by these bubbles as the laboratory had other containers to take samples from.

Holding Times and Sample Preservation

The sample holding time is defined as the time that elapses between sample collection and sample analysis. Maximum holding time criteria exist for each analysis to help ensure that the analyte concentrations found at the time of analysis reflect the concentration present at the time of sample collection. The sample coolers arrived at the laboratory within the appropriate temperatures of between 2° and 6° Celsius, with minor exceptions where the samples were taken directly to the laboratory with 24 hours. Established holding times were met for all analyses, with the exceptions below:

SDG 18J0501: (VOCs) The ferrous iron holding time of 24 hours was exceeded for Sample MW-4_102918 by one hour. The positive result for ferrous iron was qualified as estimated (J) in this sample.

SDG 18J0516: (VOCs) The ferrous iron holding time of 24 hours was exceeded for Sample MW-3_103018, MW-12_103018, and DUP-1_103018 by one to two hours. The positive result for ferrous iron were qualified as estimated (J) in these samples.

Surrogate Recoveries

A surrogate compound is a compound that is chemically similar to the organic analytes of interest, but unlikely to be found in any environmental sample. Surrogates are used for organic analyses and are added to all samples, standards, and blanks to serve as an accuracy and specificity check of each analysis. The surrogates are added to the samples at a known concentration and percent recoveries (%R) are calculated following analysis. All surrogate recoveries for field samples were within the laboratory control limits.

Method Blanks

Method blanks are analyzed to ensure that laboratory procedures and reagents do not introduce measurable concentrations of the analytes of interest. A method blank was analyzed with each batch of samples, at a frequency of 1 per 20 samples. For all sample batches, method blanks were analyzed at the required frequency. None of the analytes of interest were detected in the method blanks, with the exceptions noted below:

Metals (Manganese) Method Blank Exceptions

- **SDG 18J0501:** There was a positive result for manganese detected above the method detection limit, but below the reporting limit in the method blank digested on 11/1/2018. The associated field samples reported positive results at concentrations greater than 5X the concentration in the method blank for these analytes; therefore, no qualifications were required.
- **SDGs 18J0516 and 18J0533:** There was a positive result for manganese detected above the method detection limit, but below the reporting limit in the method blank digested on 11/2/2018. The associated field samples reported positive results at concentrations greater than 5X the concentration in the method blank for these analytes; therefore, no qualifications were required.

Trip Blanks

Trip blanks are analyzed to assess whether field sampling or sample transport processes may have introduced measurable concentrations of volatile analytes of interest into project samples. The following SDGs contained trip blanks that were packed into the sample coolers and transported with the field samples:

- **SDG 18J0533:** Trip Blank sampled on 10/31/2018.

None of the analytes of interest were detected in the trip blanks.

Matrix Spikes/Matrix Spike Duplicates

Since the actual analyte concentration in an environmental sample is not known, the accuracy of a particular analysis is usually inferred by performing a matrix spike (MS) analysis on one sample from the associated batch, known as the parent sample. One aliquot of the sample is analyzed in the normal manner and then a second aliquot of the sample is spiked with a known amount of analyte concentration and analyzed. From these analyses, a %R is calculated. Matrix spike duplicate (MSD) analyses are generally performed for organic analyses as a precision check and analyzed in the same sequence as a matrix spike. Using the results from the MS and MSD, the relative percent difference (RPD) is calculated. The %R control limits for MS and MSD analyses are specified in the laboratory documents, as are the RPD control limits for MS/MSD sample sets.

One MS/MSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for all analyses and the %R and RPD values were within the proper control limits, with the exception noted below.

BTEX Compound MS/MSD Exceptions

- **SDG 18J0533:** The laboratory performed an MS/MSD on Sample MW-11_103118. The %R for benzene was less than the control limit in the MS extracted on 11/1/2018; however, the %R for

this target analyte was within the control limits in the corresponding MSD. No qualification was required for this outlier.

Methane MS/MSD Exceptions

- **SDG 18J0516:** The laboratory performed an MS/MSD on Sample MW-3_103018. The %R values for methane were greater than the control limits in the MS/MSD analyzed on 11/1/2018; however, the native sample concentration was greater than 4 times the amount spiked into the sample. No qualification was required for this outlier.

Laboratory Control Samples/Laboratory Control Sample Duplicates

A laboratory control sample (LCS) is a blank sample that is spiked with a known amount of analyte and then analyzed. An LCS is similar to an MS, but without the possibility of matrix interference. Given that matrix interference is not an issue, control limits for accuracy and precision in the LCS and its duplicate (LCSD) are usually more rigorous than for MS/MSD analyses. Additionally, data qualification based on LCS/LCSD analyses would apply to each sample in the associated batch, instead of just the parent sample. The %R control limits for LCS and LCSD analyses are specified in the laboratory documents, as are the RPD control limits for LCS/LCSD sample sets.

One LCS/LCSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for each analysis and the %R and RPD values were within the proper control limits.

Field Duplicates

Field duplicates are similar to laboratory duplicates in that they are used to assess precision. Two samples (parent and duplicate) are created in the field by subsampling the homogenized sample and submitting them to the lab as separate samples. Duplicate samples were collected and analyzed for the same parameters as the associated parent samples. Precision is determined by calculating the RPD between each pair of samples. If one or more of the sample analytes has a concentration less than five times the reporting limit for that sample, then the absolute difference is used instead of the RPD. The RPD control limit for soil samples is 50 percent.

SDG 18J0516: One field duplicate sample pair, MW-12_103018 and DUP-1_103018, were submitted with this SDG. The precision criteria for all target analytes were met in these sample pairs, no precision qualifiers were required.

Instrument Tuning

Instrument tuning for analyses by gas chromatography/mass spectrometry (GC/MS) are completed to ensure that mass resolution, identification, and sensitivity of the analyses are acceptable. Instrument tuning should be performed at the beginning of each 12-hour period during which samples or standards are analyzed. The frequency and specified acceptance criteria were met for each applicable analysis.

Internal Standards (Low Resolution Mass Spectrometry)

Like the surrogate, an internal standard is a compound that is chemically similar to the analytes of interest, but unlikely to be found in any environmental sample. Internal standards are used only for the mass spectrometry instrumentation and are usually added to the sample aliquot after extraction has taken place. The internal standard should be analyzed at the beginning of a 12-hour sample run and the

control limits for internal standard recoveries are 50 percent to 200 percent of the calibration standard. All internal standard recoveries were within the control limits.

Initial Calibrations (ICALs)

The initial calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent relative standard deviation (%RSD) and relative response factors (RRF) values were within the control limits stated in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA, 2017a).

Continuing Calibrations (CCALs)

The continuing calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent difference (%D) and relative response factors (RRF) values were within the control limits in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA, 2017a).

Reporting Limits

The contract required quantitation limits (CRQL) were met by the laboratory for the target analytes throughout this sampling event, with some exceptions where the CRQL was elevated due to required sample dilution.

Miscellaneous

Petroleum Hydrocarbons (NWTPH-Dx)

- **SDG 18J0533:** The laboratory reported two sets of results for Sample MW-11_103118 (non silica-gel cleaned), an initial and a dilution (2X), because the result for diesel-range hydrocarbons exceeded the linear calibration range in the initial sample. The initial reported result for diesel-range hydrocarbons and the dilution reported result for lube oil-range hydrocarbons were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

Overall Assessment

As was determined by this data validation, the laboratory followed the specified analytical methods. Accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD, and MS/MSD %R values, with the exceptions noted above. Precision was acceptable, as demonstrated by the LCS/LCSD, MS/MSD, and field duplicate RPD values.

Data were qualified as estimated because holding time outliers.

Data were labeled as Not Reportable in order to avoid redundant analytes per sample.

The data are acceptable for the intended use, with the following qualifications listed below in Table 2.

TABLE 2: SUMMARY OF QUALIFIED SAMPLES

Sample ID	Analyte	Qualifier	Reason
MW-4_102918	Ferrous iron	J	Holding time outlier

MW-3_103018	Ferrous iron	J	Holding time outlier
MW-12_103018	Ferrous iron	J	Holding time outlier
DUP-1_103018	Ferrous iron	J	Holding time outlier
MW-11_103018	Diesel-range hydrocarbons	DNR	Initial analysis
MW-11_103018	Lube oil-range hydrocarbons	DNR	2X dilution

References

U.S. Environmental Protection Agency (USEPA), 2009 “Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use,” EPA-540-R-08-005. January 2009.

U.S. Environmental Protection Agency (USEPA), 2017a. “Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review,” EPA-540-R-2017-002. January 2017.

U.S. Environmental Protection Agency (USEPA), 2017b. “Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Methods Data Review,” EPA-540-R-2017-001. January 2017.

GeoEngineers, 2017a. “Final Remedial Investigation/Feasibility Study Work Plan, Quiet Cove Property, Anacortes Washington, Ecology Agreed Order No. DE 11346,” Prepared for the Washington Department of Ecology on behalf of the Port of Anacortes. January 25, 2017.

GeoEngineers, 2017b. “Final Sampling and Analysis Plan, Quiet Cove Property, Anacortes Washington, Ecology Agreed Order No. DE 11346,” Prepared for the Washington Department of Ecology on behalf of the Port of Anacortes. January 25, 2017.

GeoEngineers, 2018. “Work Plan Addendum for Supplemental Upland Area Soil and Groundwater Investigation at the Quiet Cove Site, Anacortes, Washington,” Prepared for the Washington Department of Ecology on behalf of the Port of Anacortes. October 1, 2018.

Data Validation Report

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Project: Port of Anacortes – Quiet Cove Property, Supplemental Data Collection
October 2018 Soil Samples

GEI File No: 05147-024-06

Date: November 19, 2018

This report documents the results of a United States Environmental Protection Agency (USEPA)-defined Stage 2B data validation (USEPA Document 540-R-08-005; USEPA, 2009) of analytical data from the analyses of soil samples collected as part of the October 2018 sampling event, and the associated laboratory and field quality control (QC) samples. The samples were obtained from the Quiet Cove Property (Site) located at 3rd Street and O Avenue in Anacortes, Washington.

OBJECTIVE AND QUALITY CONTROL ELEMENTS

GeoEngineers, Inc. (GeoEngineers) completed the data validation consistent with the USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review (USEPA, 2017a) and Inorganic Superfund Methods Data Review (USEPA, 2017b) (National Functional Guidelines) to determine if the laboratory analytical results meet the project objectives and are usable for their intended purpose. Data usability was assessed by determining if:

- The samples were analyzed using well-defined and acceptable methods that provide reporting limits below applicable regulatory criteria;
- The precision and accuracy of the data are well-defined and sufficient to provide defensible data; and
- The quality assurance/quality control (QA/QC) procedures utilized by the laboratory meet acceptable industry practices and standards.

In accordance with the Final Remedial Investigation/Feasibility Study Work Plan, Quiet Cove Property (GeoEngineers, 2017a), the Final Sampling and Analysis Plan, Quiet Cove Property (GeoEngineers, 2017b), and the Work Plan Addendum for Supplemental Upland Area Soil and Groundwater Investigation at the Quiet Cove Site (GeoEngineers, 2018), the data validation included review of the following QC elements:

- Data Package Completeness
- Chain-of-Custody Documentation
- Holding Times and Sample Preservation
- Surrogate Recoveries
- Method and Trip Blanks
- Matrix Spikes/Matrix Spike Duplicates

- Laboratory Control Samples/Laboratory Control Sample Duplicates
- Field Duplicates
- Instrument Tuning
- Internal Standards
- Initial Calibrations (ICALs)
- Continuing Calibrations (CCALs)
- Reporting Limits
- Miscellaneous

VALIDATED SAMPLE DELIVERY GROUPS

This data validation included review of the sample delivery groups (SDGs) listed below in Table 1.

TABLE 1: SUMMARY OF VALIDATED SAMPLE DELIVERY GROUPS

Laboratory Sample Delivery Group	Validated Samples
18J0352	SD-1-2-4, SD-1-5-6.5, SD-1-10-12, SD-1-13-15, SD-1-17-19, SD-2-2-3, SD-2-6-8, SD-2-11-12, SD-2-14-15, SD-3-2.5-3.5, SD-3-7-8.5, SD-3-12-13, SD-7-1-2, SD-7-2-3.5, SD-7-9-10, SD-7-15-16.5, SD-7-18.5-20, SD-8-2-4, SD-8-6-8, SD-8-9-11, SD-8-13-15, TRIPBLANK_101718
18J0365	MW-12-3-4, MW-12-7.5-9.5, MW-12-11-12, MW-12-14-15, SD-4-2.5-3.5, SD-4-6.5-7.5, SD-4-12-13, SD-DUP-1, SD-5-0.5-2, SD-5-5-6, SD-5-9-10, SD-6-1-2, SD-6-4-5, SD-6-6-7, SD-DUP-2, SD-6-9-10, SD-9-2.5-4, SD-10-4-5, TRIPBLANK_101818

CHEMICAL ANALYSIS PERFORMED

Analytical Resources, Inc. (ARI), located in Tukwila, Washington, performed laboratory analyses on the soil samples using one or more of the following methods:

- Gasoline-range Hydrocarbons (NWTPH-Gx) by Method NWTPH-Gx;
- Petroleum Hydrocarbons (NWTPH-Dx) by Method NWTPH-Dx;
- Volatile Organic Compounds (VOCs) by Method SW8260C;
- Polycyclic Aromatic Hydrocarbons (PAHs) by Method SW8270D-SIM; and
- Total Metals by Methods EPA6020A/7471B

DATA VALIDATION SUMMARY

The results for each of the QC elements are summarized below.

Data Package Completeness

ARI provided all required deliverables for the data validation according to the National Functional Guidelines. The laboratory followed adequate corrective action processes and all identified anomalies were discussed in the relevant laboratory case narrative.

Chain-of-Custody Documentation

Chain-of-custody (COC) forms were provided with the laboratory analytical reports. The COCs and sample container IDs were signed, accurate and complete when submitted to the lab, with the exception noted below:

SDG 18J0352: The laboratory noted that for Sample SD-7-1-2 the COC listed eight sample containers; however, nine sample containers were received by the laboratory.

Holding Times and Sample Preservation

The sample holding time is defined as the time that elapses between sample collection and sample analysis. Maximum holding time criteria exist for each analysis to help ensure that the analyte concentrations found at the time of analysis reflect the concentration present at the time of sample collection. Established holding times were met for all analyses. The sample coolers arrived at the laboratory within the appropriate temperatures of between 2° and 6° Celsius.

SDG 18J0352: (VOCs) The laboratory noted that for Sample TRIPBLANK_101718 all sample vials submitted were received with bubbles. The reporting limits for the VOC target analytes were qualified as estimated (UJ) in this sample, due to possible loss of analyte concentration.

SDG 18J0365: (NWTPH-Gx and VOCs) The laboratory noted that for Sample TRIPBLANK_101818 all sample vials submitted were received with bubbles. The reporting limits for gasoline-range hydrocarbons and the VOC target analytes were qualified as estimated (UJ) in this sample, due to possible loss of analyte concentration.

Surrogate Recoveries

A surrogate compound is a compound that is chemically similar to the organic analytes of interest, but unlikely to be found in any environmental sample. Surrogates are used for organic analyses and are added to all samples, standards, and blanks to serve as an accuracy and specificity check of each analysis. The surrogates are added to the samples at a known concentration and percent recoveries (%R) are calculated following analysis. All surrogate recoveries for field samples were within the laboratory control limits, with the exceptions noted below.

Volatile Organic Compounds (VOCs) Surrogate Exceptions

- **SDG 18J0352:** The %R for surrogate 4-Bromofluorobenzene was greater than the control limits in Sample SD-1-5-6.5. The positive results for benzene, ethylbenzene, m,p-Xylene, and o-Xylene were qualified as estimated (J) in this sample. There were no positive results for toluene in this sample; therefore, no qualification was required.

The %R values for surrogates 4-Bromofluorobenzene and toluene-d8 were greater than the control limits in Sample SD-1-10-12. There were no positive results for the VOC target analytes in this sample; therefore, no qualifications were required.

The %R for surrogate 4-Bromofluorobenzene was greater than the control limits in Sample SD-2-6-8. The positive results for benzene, ethylbenzene, m,p-Xylene, o-Xylene, and toluene were qualified as estimated (J) in this sample.

The %R for surrogate 4-Bromofluorobenzene was greater than the control limits in Samples SD-3-7-8.5 and SD-3-12-13. The positive results for benzene, ethylbenzene, m,p-Xylene, and toluene were qualified as estimated (J) in these samples. There were no positive results for o-Xylene in these samples; therefore, no qualifications were required.

The %R for surrogate 4-Bromofluorobenzene was greater than the control limits in Samples SD-8-2-4 and SD-8-6-8. There were no positive results for the VOC target analytes in these samples; therefore, no qualifications were required.

- **SDG 18J0365:** The %R for surrogate 4-Bromofluorobenzene was greater than the control limits in Sample MW-12-7.5-9.5. There were no positive results for the VOC target analytes in this sample; therefore, no qualifications were required.

The %R for surrogate 4-Bromofluorobenzene was greater than the control limits in Sample SD-4-6.5-7.5. The positive results for ethylbenzene, m,p-Xylene, and toluene were qualified as estimated (J) in this sample. There were no positive results for benzene and o-Xylene in this sample; therefore, no qualifications were required.

The %R for surrogate 4-Bromofluorobenzene was greater than the control limits in Sample SD-10-4-5; however, the sample was spiked with two additional surrogates, each within their control limits. No action was required for this outlier.

The %R for surrogate 4-Bromofluorobenzene was less than the control limits in Sample SD-9-2.5-4; however, the sample was spiked with two additional surrogates, each within their control limits. No action was required for this outlier.

The %R for surrogate 4-Bromofluorobenzene was greater than the control limits in Sample MW-12-11-12. The positive results for benzene, m,p-Xylene, and toluene were qualified as estimated (J) in this sample. There were no positive results for ethylbenzene and o-Xylene in this sample; therefore, no qualifications were required.

Polycyclic Aromatic Hydrocarbons (PAHs) Surrogate Exceptions

- **SDG 18J0365:** The %R for surrogate 2-Methylnaphthalene-d10 was less than the control limits in Sample SD-10-4-5; however, the sample was spiked with two additional surrogates, each within their control limits. No action was required for this outlier.

Method Blanks

Method blanks are analyzed to ensure that laboratory procedures and reagents do not introduce measurable concentrations of the analytes of interest. A method blank was analyzed with each batch of samples, at a frequency of 1 per 20 samples. For all sample batches, method blanks were analyzed at the required frequency. None of the analytes of interest were detected in the method blanks, with the exceptions noted below.

Polycyclic Aromatic Hydrocarbons (PAHs) Method Blank Exceptions

- **SDG 18J0352:** There was a positive result for 1-Methylnaphthalene and 2-Methylnaphthalene detected above the method detection limit, but below the reporting limit in the method blank extracted on 10/22/2018. The associated field samples reported positive results at

concentrations greater than 5X the concentration in the method blank for these analytes; therefore, no qualifications were required.

- **SDG 18J0365:** There was a positive result for 2-Methylnaphthalene, anthracene, and pyrene detected above the method detection limit, but below the reporting limit in the method blank extracted on 10/23/2018. The positive result for 2-Methylnaphthalene was qualified as non-detected (U) in Sample MW-12-14-15. The remaining associated field samples reported positive results at concentrations greater than 5X the concentration in the method blank for these analytes; therefore, no qualifications were required.

Trip Blanks

Trip blanks are analyzed to assess whether field sampling or sample transport processes may have introduced measurable concentrations of volatile analytes of interest into project samples. The following SDGs contained trip blanks that were packed into the sample coolers and transported with the field samples:

- **SDG 18J0352:** Trip Blank sampled on 10/17/2018.
- **SDG 18J0365:** Trip Blank sampled on 10/18/2018.

None of the analytes of interest were detected in the trip blanks.

Matrix Spikes/Matrix Spike Duplicates

Since the actual analyte concentration in an environmental sample is not known, the accuracy of a particular analysis is usually inferred by performing a matrix spike (MS) analysis on one sample from the associated batch, known as the parent sample. One aliquot of the sample is analyzed in the normal manner and then a second aliquot of the sample is spiked with a known amount of analyte concentration and analyzed. From these analyses, a %R is calculated. Matrix spike duplicate (MSD) analyses are generally performed for organic analyses as a precision check and analyzed in the same sequence as a matrix spike. Using the results from the MS and MSD, the relative percent difference (RPD) is calculated. The %R control limits for MS and MSD analyses are specified in the laboratory documents, as are the RPD control limits for MS/MSD sample sets.

One MS/MSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for all analyses and the %R and RPD values were within the proper control limits, with the exception noted below.

Petroleum Hydrocarbons (NWTPH-Dx) MS/MSD Exceptions

- **SDG 18J0365:** The laboratory performed an MS/MSD on Sample SD-9-2.5-4. The %R for diesel-range hydrocarbons was less than the control limits in the MS extracted on 10/26/2018; however, the %R for this target analyte was within the control limits in the corresponding MSD. No qualification was required for this outlier.

Laboratory Control Samples/Laboratory Control Sample Duplicates

A laboratory control sample (LCS) is a blank sample that is spiked with a known amount of analyte and then analyzed. An LCS is similar to an MS, but without the possibility of matrix interference. Given that matrix interference is not an issue, control limits for accuracy and precision in the LCS and its duplicate (LCSD) are usually more rigorous than for MS/MSD analyses. Additionally, data qualification based on LCS/LCSD analyses would apply to each sample in the associated batch, instead of just the parent

sample. The %R control limits for LCS and LCSD analyses are specified in the laboratory documents, as are the RPD control limits for LCS/LCSD sample sets.

One LCS/LCSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for each analysis and the %R and RPD values were within the proper control limits, with the exceptions noted below.

Volatile Organic Compounds (VOCs) LCS/LCSD Exceptions

- **SDG 18J0352:** The %R for benzene was greater than the control limits in the LCS extracted on 10/24/2018 (#BGJ0813); however, the %R for this target analyte was within the control limits in the corresponding LCSD. No action was required for this outlier.

The %R for benzene was greater than the control limits in the LCS extracted on 10/24/2018 (#BGJ0814); however, the %R for this target analyte was within the control limits in the corresponding LCSD. No action was required for this outlier.

- **SDG 18J0365:** The %R for benzene was greater than the control limits in the LCS extracted on 10/24/2018 (#BGJ0813); however, the %R for this target analyte was within the control limits in the corresponding LCSD. No action was required for this outlier.

The %R for methyl tert-butyl ether was greater than the control limits in the LCSD extracted on 10/26/2018 (#BGJ0884); however, the %R for this target analyte was within the control limits in the corresponding LCS. No action was required for this outlier.

Polycyclic Aromatic Hydrocarbons (PAHs) LCS/LCSD Exceptions

- **SDG 18J0365:** The %R for 1-Methylnaphthalene was less than the control limits in the LCS extracted on 10/23/2018. The positive results for 1-Methylnaphthalene were qualified as estimated (J) in Samples MW-12-3-4, MW-12-7.5-9.5, MW-12-11-12, MW-12-14-15, SD-9-2.5-4, and SD-10-4-5.

Field Duplicates

Field duplicates are similar to laboratory duplicates in that they are used to assess precision. Two samples (parent and duplicate) are created in the field by subsampling the homogenized sample and submitting them to the lab as separate samples. Duplicate samples were collected and analyzed for the same parameters as the associated parent samples. Precision is determined by calculating the RPD between each pair of samples. If one or more of the sample analytes has a concentration less than five times the reporting limit for that sample, then the absolute difference is used instead of the RPD. The RPD control limit for soil samples is 50 percent.

SDG 18J0365: Two field duplicate sample pairs, SD-4-12-13/SD-DUP-1 and SD-6-6-7/DUP-2, were submitted with this SDG. The precision criteria for the target analytes were met in these sample pairs, with the exception of gasoline-range hydrocarbons in Samples SD-4-12-13 and SD-DUP-1. The positive result and reporting limit for this target analyte were qualified as estimated (J and UJ, respectively) in this sample pair.

Instrument Tuning

Instrument tuning for analyses by gas chromatography/mass spectrometry (GC/MS) are completed to ensure that mass resolution, identification, and sensitivity of the analyses are acceptable. Instrument

tuning should be performed at the beginning of each 12-hour period during which samples or standards are analyzed. The frequency and specified acceptance criteria were met for each applicable analysis.

Internal Standards (Low Resolution Mass Spectrometry)

Like the surrogate, an internal standard is a compound that is chemically similar to the analytes of interest, but unlikely to be found in any environmental sample. Internal standards are used only for the mass spectrometry instrumentation and are usually added to the sample aliquot after extraction has taken place. The internal standard should be analyzed at the beginning of a 12-hour sample run and the control limits for internal standard recoveries are 50 percent to 200 percent of the calibration standard. All internal standard recoveries were within the control limits, with the following exceptions:

Volatile Organic Compounds (VOCs) Internal Standards Exceptions

- **SDG 18J0352:** The internal standard recovery for d4-1,4-Dichlorobenzene was outside the control limits in Sample SD-2-6-8. The corresponding analytes for this internal standard were not reported target analytes for this sample; therefore, no qualification was required.
- **SDG 18J0365:** The internal standard recovery for d4-1,4-Dichlorobenzene was outside the control limits in Samples SD-9-2.5-4 and SD-10-4-5. The corresponding analytes for this internal standard were not reported target analytes for these samples; therefore, no qualifications were required.

Initial Calibrations (ICALs)

The initial calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent relative standard deviation (%RSD) and relative response factors (RRF) values were within the control limits stated in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA, 2017a).

Continuing Calibrations (CCALs)

The continuing calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. For inorganic analyses, the %R values were within the control limits of 90% and 110%. For organic analyses, the percent difference (%D) and relative response factors (RRF) values were within the control limits in the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA, 2017a), with the following exceptions:

Volatile Organic Compounds (VOCs) CCALs Exceptions

- **SDG 18J0352:** The %D value for benzene was greater than the control limit in the continuing calibration verification (CCAL) performed on 10/24/2018. The positive results for benzene were qualified as estimated (J) in Samples SD-1-2-4, SD-2-2-3, SD-2-11-12, SD-2-14-15, SD-3-2.5-3.5, SD-7-1-2, and SD-7-2-3.5. There were no positive results for this analyte in Samples SD-1-10-12, SD-1-17-19, SD-7-18.5-20, SD-8-2-4, SD-8-6-8, SD-8-9-11, and SD-8-13-15; therefore, no qualifications were required.
- **SDG 18J0365:** The %D value for benzene was greater than the control limit in the continuing calibration verification (CCAL) performed on 10/24/2018. The positive result for benzene was

qualified as estimated (J) in Sample SD-5-5-6. There were no positive results for this analyte in Samples SD-4-12-13, SD-DUP-1, and SD-5-9-10; therefore, no qualifications were required.

Reporting Limits

The contract required quantitation limits (CRQL) were met by the laboratory for the target analytes throughout this sampling event, with some exceptions where the CRQL was elevated due to required sample dilution.

Miscellaneous

Gasoline-range Hydrocarbons (NWTPH-Gx)

- **SDG 18J0352:** The laboratory reported two sets of results for Samples SD-1-5-6.5, SD-3-2.5-3.5, SD-3-7-8.5, SD-8-2-4, and SD-8-6-8, an initial and a dilution (500X, 1000X, or 2000X, depending on the sample), because the results for gasoline-range hydrocarbons exceeded the linear calibration range in the initial samples. The initial reported results for gasoline-range hydrocarbons were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.
- **SDG 18J0365:** The laboratory reported two sets of results for Sample MW-12-11-12, an initial and a dilution (500X), because the result for gasoline-range hydrocarbons exceeded the linear calibration range in the initial sample. The initial reported result for gasoline-range hydrocarbons was labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

Petroleum Hydrocarbons (NWTPH-Dx)

- **SDG 18J0352:** The laboratory reported two sets of results for Sample SD-3-12-13, an initial and a dilution (2X), because the result for diesel-range hydrocarbons exceeded the linear calibration range in the initial sample. The initial reported result for diesel-range hydrocarbons and the dilution reported result for lube oil-range hydrocarbons were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.
- **SDG 18J0365:** The laboratory reported two sets of results for Sample SD-10-4-5, an initial and a dilution (50X), because the result for diesel-range hydrocarbons exceeded the linear calibration range in the initial sample. The initial reported result for diesel-range hydrocarbons and the dilution reported result for lube oil-range hydrocarbons were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

Volatile Organic Compounds (VOCs)

- **SDG 18J0352:** The laboratory reported two sets of results for Sample SD-1-5-6.5 because the %R for surrogate 4-Bromofluorobenzene was greater than the control limits and the %D for benzene in the CCAL was outside the control limit in the first analysis. The sample was re-analyzed with similar %R for the surrogate; however, the %D for benzene was within the control limit in the CCAL in the second analysis. For this reason, the results from the first analyses were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

The laboratory reported two sets of results for Sample SD-2-6-8 because the %R values for surrogates 4-Bromofluorobenzene and toluene-d8 were greater than the control limits and the %D for benzene in the CCAL was outside the control limit in the first analysis. The sample was re-analyzed with %R for the surrogate toluene-d8 and the %D for benzene in the CCAL within the

control limits in the second analysis. For this reason, the results from the first analysis were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

The laboratory reported two sets of results for Samples SD-3-7-8.5 and SD-3-12-13 because the %R for surrogate 4-Bromofluorobenzene was greater than the control limits and the %D for benzene in the CCAL was outside the control limit in the first analysis. The samples were re-analyzed with similar %R for the surrogate; however, the %D for benzene was within the control limit in the CCAL in the second analysis. For this reason, the results from the first analyses were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

- **SDG 18J0365:** The laboratory reported two sets of results for Samples MW-12-7.5-9.5 and SD-4-6.5-7.5 because the %R for surrogate 4-Bromofluorobenzene was greater than the control limits in the first analysis. The samples were re-analyzed with similar %R for the surrogate in the second analysis. For this reason, the results from the second analyses were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

The laboratory reported two sets of results for Sample SD-9-2.5-4 because the %R for surrogate 4-Bromofluorobenzene was less than the control limits and the internal standards for 1,4-Dichlorobenzene-d4 and chlorobenzene-d5 were outside the control limits in the first analysis. The sample was re-analyzed with similar %R for the surrogate and the internal standard 1,4-Dichlorobenzene-d4; however, the %R for internal standard chlorobenzene-d5 was within the control limit in the second analysis. For this reason, the results from the first analyses were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

The laboratory reported two sets of results for Sample SD-10-4-5 because the results for m,p-Xylene and n-Hexane exceeded the linear calibration range and the %R values for surrogates 1,2-Dichloroethane-d4 and 4-Bromofluorobenzene were greater than the control limits in the first analysis. The sample was re-analyzed with m,p-Xylene and n-Hexane within the calibration range and the %R for surrogate 1,2-Dichloroethane-d4 was within the control limits. For this reason, the results from the first analysis were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

Polycyclic Aromatic Hydrocarbons (PAHs)

- **SDG 18J0352:** The laboratory reported two sets of results for Sample SD-7-1-2, an initial and a dilution (5X), because the results for five analytes exceeded the linear calibration range in the initial sample. The initial reported results for the five analytes that exceeded calibration range and the dilution report results for all other PAH target analytes were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

The laboratory reported two sets of results for Sample SD-7-2-3.5, an initial and a dilution (3X), because the result for 2-Methylnaphthalene exceeded the linear calibration range in the initial sample. The initial reported result for 2-Methylnaphthalene and the dilution reported results for all other PAH target analytes were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

- **SDG 18J0365:** The laboratory reported two sets of results for Sample MW-12-7.5-9.5, an initial and a dilution (10X), because the results for 1-Methylnaphthalene and 2-Methylnaphthalene exceeded the linear calibration range in the initial sample. The initial reported results for 1-Methylnaphthalene and 2-Methylnaphthalene and the dilution report results for all other PAH

target analytes were labeled as Do-Not-Report (DNR) in order to avoid redundant analyte reporting.

Overall Assessment

As was determined by this data validation, the laboratory followed the specified analytical methods. Accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD, and MS/MSD %R values, with the exceptions noted above. Precision was acceptable, as demonstrated by the LCS/LCSD, MS/MSD, and field duplicate RPD values, with the exceptions noted above.

Data were qualified as non-detected because of method blank contamination. Data were also qualified as estimated because of bubbles in the sample containers, surrogate and LCS %R outliers, field duplicate RPD outliers, and continuing calibration %D outliers.

Data were labeled as Not Reportable in order to avoid redundant analytes per sample.

The data are acceptable for the intended use, with the following qualifications listed below in Table 2.

TABLE 2: SUMMARY OF QUALIFIED SAMPLES

Sample ID	Analyte	Qualifier	Reason
SD-1-2-4	Benzene	J	CCAL %D
SD-1-5-6.5	Benzene	J	Surrogate Recovery
	Ethylbenzene	J	Surrogate Recovery
	m,p-Xylene	J	Surrogate Recovery
	o-Xylene	J	Surrogate Recovery
SD-2-2-3	Benzene	J	CCAL %D
SD-2-6-8	Benzene	J	Surrogate Recovery
	Ethylbenzene	J	Surrogate Recovery
	m,p-Xylene	J	Surrogate Recovery
	o-Xylene	J	Surrogate Recovery
	Toluene	J	Surrogate Recovery
SD-2-11-12	Benzene	J	CCAL %D
SD-2-14-15	Benzene	J	CCAL %D
SD-3-2.5-3.5	Benzene	J	CCAL %D
SD-3-7-8.5	Benzene	J	Surrogate Recovery
	Ethylbenzene	J	Surrogate Recovery
	m,p-Xylene	J	Surrogate Recovery
	Toluene	J	Surrogate Recovery
SD-3-12-13	Benzene	J	Surrogate Recovery
	Ethylbenzene	J	Surrogate Recovery
	m,p-Xylene	J	Surrogate Recovery
	Toluene	J	Surrogate Recovery
SD-4-6.5-7.5	Ethylbenzene	J	Surrogate Recovery
	m,p-Xylene	J	Surrogate Recovery
	Toluene	J	Surrogate Recovery
SD-4-12-13	Gasoline-range hydrocarbons	J	Field Duplicate RPD
SD-DUP-1	Gasoline-range hydrocarbons	UJ	Field Duplicate RPD
SD-5-5-6	Benzene	J	CCAL %D

SD-7-1-2	Benzene	J	CCAL %D
SD-7-2-3.5	Benzene	J	CCAL %D
SD-9-2.5-4	1-Methylnaphthalene	J	LCS Recovery
SD-10-4-5	1-Methylnaphthalene	J	LCS Recovery
MW-12-3-4	1-Methylnaphthalene	J	LCS Recovery
MW-12-7.5-9.5	1-Methylnaphthalene	J	LCS Recovery
MW-12-11-12	1-Methylnaphthalene	J	LCS Recovery
	Benzene	J	Surrogate Recovery
	m,p-Xylene	J	Surrogate Recovery
	Toluene	J	Surrogate Recovery
MW-12-14-15	1-Methylnaphthalene	J	LCS Recovery
	2-Methylnaphthalene	U	Method Blank Contamination
TRIPBLANK_101718	All VOC target analytes	UJ	Sample Preservation
TRIPBLANK_101818	Gasoline-range hydrocarbons	UJ	Sample Preservation
	All VOC target analytes	UJ	Sample Preservation

References

U.S. Environmental Protection Agency (USEPA), 2009 “Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use,” EPA-540-R-08-005. January 2009.

U.S. Environmental Protection Agency (USEPA), 2017a. “Contract Laboratory Program National Functional Guidelines for Organic Superfund Methods Data Review,” EPA-540-R-2017-002. January 2017.

U.S. Environmental Protection Agency (USEPA), 2017b. “Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Methods Data Review,” EPA-540-R-2017-001. January 2017.

GeoEngineers, 2017a. “Final Remedial Investigation/Feasibility Study Work Plan, Quiet Cove Property, Anacortes Washington, Ecology Agreed Order No. DE 11346,” Prepared for the Washington Department of Ecology on behalf of the Port of Anacortes. January 25, 2017.

GeoEngineers, 2017b. “Final Sampling and Analysis Plan, Quiet Cove Property, Anacortes Washington, Ecology Agreed Order No. DE 11346,” Prepared for the Washington Department of Ecology on behalf of the Port of Anacortes. January 25, 2017.

GeoEngineers, 2018. “Work Plan Addendum for Supplemental Upland Area Soil and Groundwater Investigation at the Quiet Cove Site, Anacortes, Washington,” Prepared for the Washington Department of Ecology on behalf of the Port of Anacortes. October 1, 2018.

ATTACHMENT 8
Supplemental Investigation Work Plan Addendum

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Date: October 1, 2018

File: 5147-024-06

Subject: Work Plan Addendum for Supplemental Upland Area Soil and Groundwater Investigation at the Quiet Cove Site, Anacortes, Washington

This memorandum provides an addendum to the Quiet Cove Remedial Investigation/Feasibility Study (RI/FS) Work Plan (GeoEngineers 2017a) and Sampling and Analysis Plan (SAP; GeoEngineers 2017b) for the Quiet Cove Site (Site). This Work Plan Addendum is being provided on behalf of the Port of Anacortes (Port) and describes supplemental soil and groundwater sample collection and chemical analysis activities that will be completed at the Site. This Work Plan addendum has been prepared to collect supplemental data utilizing procedures specified in the RI/FS Work Plan.

The supplemental sample collection and chemical analysis described in this Work Plan addendum is being performed to further characterize soil and groundwater conditions at the Site. To date, limited data have been collected from the interior area of the Site near the potential tank sources. The majority of the upland investigation has focused on defining the outer limits of contamination. Results of the RI field study completed to date indicate the presence of petroleum contamination, including free product, in the northern portion of the Quiet Cove property. Based on review of the existing data, supplemental data items have been identified that can better define the nature and extent of contamination, help identify appropriate remedial action levels and overall, inform the disproportionate cost analysis and remedial alternative selection for the Site.

The new data will supplement the existing soil and groundwater RI field study. The supplemental field investigation described in this Work Plan Addendum will provide data to help refine the selection of cleanup actions in the upland portion of the Site. The Port has coordinated with Washington State Department of Ecology (Ecology) for this work primarily through emails, phone calls and review of the existing data for the Site.

The supplemental data collection described in this Work Plan Addendum includes the collection of subsurface soil samples from eleven (11) new locations and up to three (3) quarterly groundwater monitoring events.

BACKGROUND

The Site is subject to formal cleanup under the regulatory authority of Ecology. The Site is generally located at 202 O Avenue in Anacortes, Washington. The Property consists of three parcels containing a total acreage of approximate 0.82 acres. The boundaries of the Site will be defined by the extent of contamination caused by the historical release of hazardous substances.

An initial RI field study of the upland area and the marine area was completed. As required by the Agreed Order a Data Report Technical Memorandum is being developed to document the findings of the RI field study. This document is in progress and will include the upland and marine area field study results.

Upland Area Remedial Investigation Field Study

The soil and groundwater portion of the RI field study was completed in accordance with the approved RI/FS Work Plan. Soil sampling was completed in September 2017. Additional monitoring wells were constructed and developed along with the soil sampling. Groundwater monitoring was completed during a dry season event in October/November 2017 and a wet season event in March 2018. The initial analytical results of the RI field study were submitted to Ecology via email on December 28, 2017. A hydrogeologic study was completed in October and November 2017 per the RI/FS Work Plan to evaluate tidal influence and determine the hydraulic conductivity and groundwater flow direction throughout the Site.

Marine Area Remedial Investigation Field Study

In September 2017 Tier 1 composite sediment samples were collected in the beach area of the Site in accordance with the RI/FS Work Plan. Analytical results of the upland soil samples adjacent to the beach and the composite sediment samples triggered the need to collect additional sediment data. The Tier 2 sediment sampling scope was determined through discussions with Ecology and field work was completed in July 2018. Results from this Tier 2 sediment sampling are forthcoming.

SUPPLEMENTAL SOIL SAMPLING AND ANALYSIS

Additional soil sampling and analysis is being proposed to further characterize contaminated soil in the upland area of the Site. The proposed sample locations are presented in Figure 1. The additional sampling and analysis activities include:

- A total of eleven (11) soil core sampling locations and collection of samples for analysis.
- Ten (10) core locations completed using direct-push drilling (DP) methods.
- One (1) core location completed using hollow-stem auger drilling methods.

The soil sample collection and analysis that will be completed as part of this Work Plan Addendum is summarized in the following sections.

Soil Sample Collection and Processing

Similar to the previous RI field study, DP borings for obtaining soil samples will be drilled using a truck-mounted direct-push drilling rig. It is anticipated that the DP borings at the Site will be advanced at least 3 feet into the native soil or to approximately 15 feet below ground surface (bgs), whichever occurs first. If evidence of petroleum contamination is observed, the boring will be advanced to at least 3 feet below the observed depth of contamination, or until refusal. DP borings will be completed by a licensed driller in the State of Washington. A representative from GeoEngineers' staff will be present to examine and classify the soils encountered and prepare a detailed boring log of each exploration. Continuous soil samples in 2-foot intervals will be obtained from the DP borings using a "macrocore" sampler or equivalent in direct pushes up to 5 feet in length. Push length may be reduced if recovery is poor. Soil from each sample interval will be visually classified, field screened and logged in the same manner in accordance with the RI/FS Work Plan.

Similar to the initial RI field study, hollow-stem auger (HSA) borings for obtaining soil samples will be drilled using a truck-mounted HSA drilling rig. It is anticipated that the HSA borings at the Site will be advanced at least 3 feet into the native soil or to approximately 15 feet bgs, whichever occurs first. Soil samples will be obtained

from the HSA borings on a 2.5-foot interval using a 2.5-inch-diameter split-barrel sampler or equivalent. The sampler will be advanced a maximum of 18 inches at each sample interval. The number of hammer blows to advance the sampler will be recorded on a boring log across 6-inch intervals.

Using the same approach as the initial RI field study, samples will be collected that are representative of contaminated or potentially contaminated materials and/or different material types. A minimum of three soil samples will be retained from each boring for laboratory analysis. Samples collected from the borings not submitted for chemical analysis will be archived for potential follow-up testing.

For each full-length core (SD-1 through SD-8 and MW-12) samples will be collected for analysis at up to four (4) separate intervals as summarized in Table 1. The samples intervals for collection and analysis include:

- Non-saturated fill material that overlays contaminated soils;
- Soil with the highest photoionization detector (PID) reading and/or evidence of petroleum contamination;
- Saturated fill material at the water table level; and
- Native material without evidence of petroleum contamination and at least 1 foot below the fill/native soil interface.

Based on previous studies at the Site it is possible that the interval with the highest PID reading may also be at the water level. In this case the interval below the water level would be collected and analyzed.

For the two (2) shallow cores (SD-9 and SD-10) the cores will be penetrated to approximately 4 feet bgs. One sample interval from 0 to 2 feet bgs will be collected for analysis at each location as detailed in Table 1.

Sample intervals will be individually homogenized and placed into the appropriate laboratory-supplied sample containers. Samples for volatile analysis (i.e., gasoline and/or volatile organic compounds [VOCs]) will be collected from the center of the sampling interval from undisturbed soil sample prior to homogenization using U.S. Environmental Protection Agency (EPA) Method 5035A sampling procedures consistent with Ecology guidance to reduce volatilization and biodegradation of the sample constituents. Immediately upon collection of the samples, the samples will be placed into a cooler with ice and logged on the chain-of-custody using quality assurance and control procedures in accordance with the RI/FS Work Plan.

Soil Sample Laboratory Analysis

Soil samples will be submitted to Analytical Resources Inc. (ARI) of Tukwila, Washington, for chemical analysis. Table 1 identifies the proposed sample locations, target sample horizons, laboratory analysis and rationale for the data that will be collected to further characterize the nature and extent of contamination of soil in the primary source area of the Site. Table 2 summarizes the analytical methods, sample size, containers, preservation and holding times for laboratory analysis. Sufficient material will be collected from each sample interval to perform each of the listed analysis in accordance with the RI/FS Work Plan and SAP. Selected soil samples as identified in Table 1 will be submitted for a combination of the following:

- Gasoline-range total petroleum hydrocarbons (TPH) by NWTPH-Gx;
- Heavy oil- and diesel-range TPH by NWTPH-Dx;
- BETX by EPA 8260;
- Ethylene dibromide (EDB), ethylene dichloride (EDC), methyl tert-butyl ether (MTBE) and n-Hexane by EPA 8260;

- Metals (arsenic, cadmium, chromium, lead and mercury) by EPA 6000/7000;
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs) by EPA 8270-SIM; and/or
- Naphthalenes by EPA 8270-SIM.

SUPPLEMENTAL GROUNDWATER MONITORING

Additional groundwater monitoring is being proposed to further characterize groundwater at the Site. The proposed sample locations are presented in Figure 1. The additional groundwater monitoring activities include:

- Construction and development of one (1) new permanent monitoring well for groundwater sampling and analysis.
- Installation of two (2) pre-pack monitoring wells using DP drilling methods for measurement of potential product in groundwater.
- Groundwater monitoring of ten (10) monitoring wells for up to three (3) rounds on a quarterly basis. Each quarter will include:
 - Water and product level measurements;
 - Sampling and analysis of a combination of VOCs and TPH in groundwater;
 - Comparison of TPH analyses with and without silica gel cleanup (first round only); and
 - Sampling and analysis of geochemistry parameters to evaluate potential for natural attenuation of contaminants in groundwater.

The groundwater monitoring activities that will be completed as part of this Work Plan Addendum are summarized in the following sections.

Monitoring Well Construction

A new monitoring well will be constructed following soil sampling and processing at MW-12 (see Figure 1). Monitoring well construction will follow the same procedures completed for the RI field study. Drilling and construction of the monitoring well will be conducted by a Washington State licensed driller in general accordance with the Minimum Standards for Construction and Maintenance of Wells (Washington Administrative Code [WAC] 173-160). It is anticipated that the monitoring wells will be completed at least 5 feet below the observed water level at the time of drilling. Installation of the monitoring wells will be observed by a GeoEngineers representative who will maintain a detailed log of the materials observed and depths of the wells. Monitoring well borings will be drilled using a truck mounted HSA drill rig or similar equipment. Soil cuttings from borings completed for the monitoring well installation will be placed in labeled and sealed 55-gallon drums. The drums will be stored temporarily at a secure location on Port property pending receipt of analytical results and off-site disposal at a permitted facility.

The monitoring well will be constructed of 2-inch-diameter, flush-threaded, Schedule 40 polyvinyl chloride (PVC) casing with machine-slotted PVC screen (0.010-inch). The top of the well screens will be located approximately 5 feet above the observed groundwater level, or within 3 feet of the ground surface, whichever is deeper. The well screen intervals may be modified based on field screening results or variations in soil type. Screened intervals of approximately 10 feet (ft) length are anticipated.

Following placement of the well screen and casing in the borehole, a filter pack will be installed around the well screen. The filter pack will extend from the bottom of the well to approximately 2 feet above the top of the well screen. It is anticipated that filter pack material will consist of commercially prepared 10-20 silica sand. However, an alternate sand size/gradation may be used to minimize the turbidity of water entering the wells depending on the materials observed at the time of drilling.

A bentonite annular seal at least 1-foot thick will be placed above the sand pack to a depth of about 1-foot bgs. Each well will be completed with a concrete surface seal, and either a flush-mount or above-ground steel or aluminum monument. The monument will be cemented in place from the surface to a depth of about 1-foot bgs.

Monitoring Well Development

Monitoring well development will follow the same procedures that were utilized in the initial RI field study. Each monitoring well will be developed to remove water introduced into the well during drilling (if any), stabilize the filter pack and formation materials surrounding the well screen, and restore the hydraulic connection between the well screen and the surrounding soil. The well screen interval will be gently surged with a decontaminated bailer or surge block and the well will be purged of water.

Development will continue until a minimum of five casing volumes of water have been removed and turbidity of the discharged water is relatively low. The goal of well development will be to reduce the turbidity content of the water to approximately 10 nephelometric turbidity unit (NTU) if practical. Up to 10 well volumes of water will be removed from the wells in an effort to attain the 10 NTU goal. The removal rate and volume of groundwater removed will be recorded during well development procedures. Water that is removed from the well during well development activities will be stored temporarily at a secure location on Port property in labeled 55-gallon drums, pending receipt of analytical results and off-site disposal at a permitted facility. Depths to water in the monitoring wells will be measured prior to development.

Temporary Pre-Pack Well Installation

Pre-pack wells have not been previously used at the Site. The following procedures will be utilized to complete these temporary groundwater monitoring points. At soil sample locations SD-2 and SD-8 (see Figure 1), temporary pre-pack well points will be installed in the borehole from the direct-push cores. These temporary wells will be installed by Washington State licensed driller. The pre-pack wells will not be developed and will only be used to measure water and product levels.

Survey

A licensed surveyor will be contracted to survey the new monitoring well and pre-pack well points. The surveyor will measure the elevation of the top of casing of these well points in the North American Vertical Datum of 1988 (NAVD 88). The top of casing will be surveyed on the north rim of the casing. Existing monitoring wells at the Site were surveyed during previous investigations.

Water and Product Level Measurements

Water and product level measurements will be completed using the procedures established in the initial RI field study. Prior to each groundwater sampling event, a groundwater level “snapshot” will be performed by measuring water and product levels in all wells within an approximate one-hour duration. Water and product levels will be measured using an electronic oil-water interface probe and will be recorded to the nearest 0.01 foot. The measurement point will be the north rim of the top of the well casing. Well casing and ground surface elevations will be referenced from temporary or permanent benchmarks.

Groundwater Sample Collection and Processing

Groundwater samples will be collected using the same procedures as were utilized for the initial RI field study. Groundwater samples will be collected from existing and new Site monitoring wells for chemical analysis of hazardous substances as identified in Table 3.

Sampling of monitoring wells located adjacent to the shoreline (i.e., tidally influenced wells) will be performed within 1 hour before and 3 hours after the day-time low tide to the extent practicable. Wells nearest the shoreline will be sampled first. Groundwater samples will be obtained by field personnel using low-flow/low-turbidity sampling techniques (EPA 2010) to minimize the suspension of sediment in the samples. The wells will be purged and groundwater samples will be obtained from the wells using a peristaltic or submersible pump and disposable polyethylene tubing. Groundwater will be purged from the wells at a rate not to exceed 0.5 liter per minute. A Horiba U-50 (or similar) water quality measuring system with a flow-through cell will be used to monitor the following water quality parameters during purging:

- Electrical conductivity;
- Dissolved oxygen;
- pH;
- Salinity;
- Turbidity;
- Total dissolved solids;
- Oxidation-reduction potential; and
- Temperature.

Samples will be collected from the wells after these parameters vary by less than 10 percent on three consecutive measurements or after five well volumes have been removed, whichever occurs first. The field measurements will be documented on the field log.

Groundwater samples will be collected in laboratory-supplied containers, placed into a cooler with ice and logged on the chain-of-custody using quality control and assurance procedures in accordance with the RI/FS Work Plan SAP. Attempts will be made to fill containers for gasoline-range TPH, VOCs and dissolved methane analyses ("VOA" vials) with no head space remaining. The goal will be "no head space." Note that the presence of several very small air bubbles (less than several millimeters in diameter) are occasionally unavoidable.

Groundwater Sample Laboratory Analysis

Groundwater samples will be submitted to ARI of Tukwila, Washington, for chemical analysis. Table 3 identifies the monitoring well locations and laboratory analysis that will be performed to further characterize the nature and extent of contamination of soil in the primary source area of the Site. The purpose of analyzing geochemical parameters is to provide data on the groundwater conditions that will inform evaluation of cleanup alternatives at the Site. Additional groundwater data for petroleum compounds will inform the extent of residual contamination in groundwater.

Table 4 summarizes the analytical methods, sample size, containers, preservation and holding times for laboratory analysis. Sufficient water will be collected from each well to perform each of the listed analysis in accordance with the RI/FS Work Plan and SAP. Groundwater samples as identified in Table 3 will be submitted for a combination of the following:

- Gasoline-range TPH by NWTPH-Gx;
- Heavy oil- and diesel-range TPH by NWTPH-Dx (no silica gel cleanup);
- Duplicate heavy oil- and diesel-range TPH by NWTPH-Dx with silica gel cleanup procedures;
- BETX by EPA 8260;
- Total alkalinity by SM 2420 B-97;
- Ferrous iron by SM 3500-Fe B-97;
- Nitrate and sulfate by EPA 300.0;
- Dissolved manganese by EPA 6020A; and
- Dissolved methane by EPA RSK-175.

DATA QUALITY OBJECTIVES

The specific data quality objectives (DQOs) for soil and groundwater sampling and analysis are detailed in the Ecology-approved RI/FS Work Plan. An EPA-defined Stage 2B validation will be performed on organic and inorganic analytical data in general accordance with EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (EPA 2004) and EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (EPA 2008). Data packages will be checked for completeness immediately upon receipt from the laboratory to ensure that data and quality assurance/quality control (QA/QC) information requested are present. At a minimum, the following items will be reviewed to verify the data as applicable:

- Data Package Completeness,
- Chain-of-Custody Documentation
- Holding Times and Sample Preservation
- Surrogate Recoveries
- Method Blanks
- Matrix Spikes/Matrix Spike Duplicates
- Laboratory Control Samples/Laboratory Control Sample Duplicates
- Laboratory and Field Duplicates
- Initial Calibrations (ICALs)
- Continuing Calibrations (CCALs)
- Internal Standards
- Instrument Tunes
- Reporting Limits

REPORTING

Upon completion, supplemental data collection activities and laboratory results will be transmitted to Ecology. Depending on timing and Ecology's preference this supplemental data will be included in the Data Report Technical Memorandum or provided as a separate memorandum. Chemical analytical data for soil and groundwater samples will be submitted to Ecology in electronic format in accordance with Ecology's Environmental Information Management (EIM) Policy 840 following review and validation.

SCHEDULE

This supplemental sampling and analysis will be performed following Ecology approval of this Work Plan Addendum. The additional soil and groundwater sampling and analysis will be completed as soon as possible upon Ecology approval of the Work Plan Addendum to evaluate the possibility of an upland area interim cleanup action. Field sampling would occur in September 2018 pending Ecology approval and driller availability. Analytical results would be expected about a month later in October 2018.

REFERENCES

- U.S. Environmental Protection Agency (EPA), "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review," EPA 540-R-04-004, Office of Emergency and Remedial Response, US Environmental Protection Agency, Washington, DC, dated October 2004.
- U.S. Environmental Protection Agency (EPA), 2008, "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, EPA-540-R-08-01," Office of Emergency and Remedial Response, US Environmental Protection Agency, Washington, DC, dated June 2008.
- U.S. Environmental Protection Agency (EPA), "Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells," EQASOP-GW-001, US Environmental Protection Agency, Washington, DC, dated January 2010.
- GeoEngineers 2017a. Final Remedial Investigation/Feasibility Study Work Plan, Quiet Cove Property, Anacortes Washington, Ecology Agreed Order No. DE 11346. Prepared for the Washington Department of Ecology on behalf of the Port of Anacortes. January 25, 2017.
- GeoEngineers 2017b. Final Sampling and Analysis Plan, Quiet Cove Property, Anacortes Washington, Ecology Agreed Order No. DE 11346. Prepared for the Washington Department of Ecology on behalf of the Port of Anacortes. January 25, 2017.

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Attachments:

- Table 1. Soil Sampling and Analysis Plan Addendum
- Table 2. Soil Test Methods, Sample Size, Containers, Preservation and Holding Times
- Table 3. Groundwater Sampling Analysis Plan Addendum
- Table 4. Groundwater Test Methods, Sample Size, Containers, Preservation and Holding Times
- Figure 1. Proposed Supplemental Data Collection Locations

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Table 1
Soil Sampling and Analysis Plan Addendum
 Quiet Cove Property
 Anacortes, Washington

Sample Location ¹	Target Sample Interval ^{2,3} (feet bgs)	Total Petroleum Hydrocarbons (TPH)		Volatile Organic Compounds (VOCs)		Metals	Polycyclic Aromatic Hydrocarbons (PAHs)		Purpose of Supplemental Data Collection Sampling Locations
		Gasoline-Range (NWTPH-Gx)	Diesel- and Heavy Oil-Range (NWTPH-Dx)	BETX (EPA 8260)	EDB, EDC, MTBE and n-Hexane (EPA 8260)	MTCA Metals ⁴ (EPA 6000/7000)	Carcinogenic PAHs (EPA 8270-SIM)	Naphthalenes (EPA 8270-SIM)	
Direct-Push (DP) Sample Location									
SD-1	0-2	S	S	S					Collect chemical analytical data for petroleum-related contaminants in the area of highest concentrations to confirm field evidence from the Integrated Planning Grant (IPG) and provide more certainty on the extent of soil contamination.
	2-4								
	4-6	X	X	X					
	6-8	W	W	W					
	8-10								
	10-12	N	N	N					
SD-2	12-14								Collect chemical analytical data for petroleum-related contaminants in the area of highest concentrations to confirm field evidence from the IPG and provide more certainty on the extent of soil contamination.
	0-2	S	S	S					
	2-4								
	4-6	X	X	X					
	6-8	W	W	W					
	8-10								
SD-3	10-12	N	N	N					Collect chemical analytical data for petroleum-related contaminants in the area of highest concentrations to confirm field evidence from the IPG and provide more certainty on the extent of soil contamination.
	12-14								
	0-2	S	S	S					
	2-4								
	4-6	X	X	X					
	6-8	W	W	W					
SD-4	8-10								Collect chemical analytical data for petroleum-related contaminants in the area of highest concentrations to confirm field evidence from the IPG and provide more certainty on the extent of soil contamination.
	10-12	N	N	N					
	12-14								
	0-2	S	S	S					
	2-4								
	4-6	X	X	X					
SD-5	6-8	W	W	W					Collect chemical analytical data for petroleum-related contaminants in the area of highest concentrations to confirm field evidence from the IPG and provide more certainty on the extent of soil contamination.
	8-10								
	10-12	N	N	N					
	12-14								
	0-2	S	S	S					
	2-4								
SD-6	4-6	X	X	X					Collect chemical analytical data for petroleum-related contaminants in the area of highest concentrations to confirm field evidence from the IPG and provide more certainty on the extent of soil contamination. This location is meant to provide confirmation of the extent of soil contamination to the east.
	6-8	W	W	W					
	8-10								
	10-12	N	N	N					
	12-14								
	0-2	S	S	S					
SD-7	2-4								Collect chemical analytical data for petroleum-related contaminants in the area of highest concentrations to confirm field evidence from the IPG and provide more certainty on the extent of soil contamination. Also analyzing PAHs due to existing data indicating PAH contamination in this area of the Site.
	4-6	X	X	X			S	S	
	6-8	W	W	W			X	X	
	8-10						W	W	
	10-12	N	N	N			N	N	
	12-14								
SD-8	0-2	S	S	S					Collect chemical analytical data for petroleum-related contaminants in the area of highest concentrations to confirm field evidence from the IPG and provide more certainty on the extent of soil contamination.
	2-4								
	4-6	X	X	X					
	6-8	W	W	W					
	8-10								
	10-12	N	N	N					
SD-9	12-14								Collect and analyze for characterization of soil overlying contaminated soil.
	0-2	S	S	S	S	S	S	S	
SD-10	2-4								Collect and analyze for characterization of soil overlying contaminated soil.
	0-2	S	S	S	S	S	S	S	
Hollow-Stem Auger Sample Location									
MW-12	0-2	S	S	S			S	S	Collect chemical analytical data for petroleum-related contaminants in the area of highest concentrations to confirm field evidence from the IPG and provide more certainty on the extent of soil contamination. Monitoring well installed to determine if free product exists in groundwater.
	2-4								
	4-6	X	X	X			X	X	
	6-8	W	W	W			W	W	
	8-10								
	10-12	N	N	N			N	N	
	12-14								
	0-2								

Notes:

¹ The approximate sample locations are shown on Figure 1.

² Sample intervals may be adjusted based on observed field conditions to collect samples representative of the fill and native soil horizon, and interface between the saturated and vadose zone. Samples will be collected for analysis based on (1) shallow soil approximately 0-2 feet; (2) highest PID reading; (3) interval at the interface of the saturated and vadose zone and; (4) deepest sample in the boring (native material). If the highest PID reading and water table sample interval overlap, only 3 samples will be collected for analysis. The sample intervals for analysis are anticipated in the table. The exploration will be advanced to at least three feet into native soil or to approximately 14 feet below ground surface (bgs), whichever occurs first. If field screening evidence of contamination is observed, the exploration will be advanced to at least three feet below the observed depth of contamination, or until refusal.

Sample for analysis (approximate in table)

S = Shallow Sample

X = Highest PID Reading Sample

W = Water Table Sample

N = Selected sample for initial chemical analysis .

³ Field screening will be completed for each 2-foot interval throughout the boring in accordance with the approved RI/FS Work Plan.

⁴ MTCA metals include arsenic, cadmium, chromium (total), lead and mercury.

Sample for analysis (approximate interval location in table)

S = Shallow Sample

X = Highest PID Reading Sample

W = Water Table Sample

N = Selected sample for initial chemical analysis .

bgs = below ground surface

BETX = Benzene, Ethylbenzene, Toluene and Xylenes

EDB = 1,2-Dichloroethane

EDC = 1,2-Dichloroethane

EPA = Environmental Protection Agency

MTBE = Methyl t-Butyl Ether

MTCA = Model Toxics Control Act

Table 2
Soil Sample Test Methods, Sample Size, Containers, Preservation and Holding Times
 Quiet Cove Property
 Anacortes, Washington

Laboratory Analysis	Analytical Method	Minimum Sample Size	Sample Container	Sample Preservation	Holding Time ¹
Metals (As, Cd, Cr, Pb and Hg)	EPA 6010/6020/ 7470/7471	100 g	4-oz glass WM with Teflon-lined lid	Cool ≤6° C	180 days/28 days for Mercury
Gasoline-Range Hydrocarbons	NWTPH-Gx	5 g	Two 40mL glass vial (VOA)	Cool ≤6° C	14 days to extraction/analysis
Diesel- and Oil-Range Hydrocarbons	NWTPH-Dx	100 g	8-oz amber glass WM with Teflon-lined lid	Cool ≤6° C	14 days to extraction/analysis
VOCs (Including Volatile Petroleum Compounds)	EPA 8260	5 g	Three 40mL glass vial (VOA)	Cool ≤6° C Two VOAs - Sodium Bisulfate One VOA - Methanol	14 days to extraction/analysis
SVOCs (Including PAHs)	EPA 8270/SIM	100 g	8-oz amber glass WM with Teflon-lined lid	Cool ≤6° C	14 days to extraction, 40 days from extraction to analysis

Notes:

¹ Holding times are based on elapsed time from date of collection.

NWTPH = Northwest total petroleum hydrocarbons

Dx = diesel-range extended

EPA = Environmental Protection Agency

SIM = selected ion mode

g = gram

Gx = gasoline-range extended

mL = milliliter

oz. = ounce

SVOC = semi-volatile organic compound

VOC = volatile organic compound

WM = wide mouth

Table 3
Groundwater Sampling and Analysis Plan Addendum
 Quiet Cove Property
 Anacortes, Washington

Sample Location ¹	Petroleum Hydrocarbons (TPH)			Volatile Organic Compounds (VOCs)	Geochemical Parameters					
	Gasoline-Range (NWTPH-Gx)	Diesel- and Heavy Oil-Range (NWTPH-Dx) - with silica gel cleanup	Diesel- and Heavy Oil-Range (NWTPH-Dx) - no silica gel cleanup	BETX ² (EPA 8260)	Total Alkalinity (SM 2420 B-97)	Ferrous Iron (SM3500-Fe B-97)	Nitrate (EPA 300.0)	Sulfate (EPA 300.0)	Dissolved Manganese (EPA 6020A)	Dissolved Methane (EPA RSK-175)
Existing Monitoring Well										
MW-1		X	X		X	X	X	X	X	X
MW-2		X	X		X	X	X	X	X	X
MW-3		X	X		X	X	X	X	X	X
MW-4		X	X		X	X	X	X	X	X
MW-5		X	X		X	X	X	X	X	X
MW-6		X	X		X	X	X	X	X	X
MW-7		X	X		X	X	X	X	X	X
MW-8	X	X	X	X	X	X	X	X	X	X
MW-10		X	X		X	X	X	X	X	X
MW-11	X	X	X	X	X	X	X	X	X	X
New Monitoring Well										
MW-12		X	X		X	X	X	X	X	X

Notes:

¹The approximate sample locations are shown on Figure 1.

²BETX = Benzene, ethylbenzene, toluene, xylene

Table 3 provides the chemical analysis for one groundwater sampling event. Up to three (3) quarterly events are planned for the supplemental data collection effort.

X = Selected sample for chemical analysis.

Table 4
Groundwater Sample Test Methods, Sample Size, Containers, Preservation and Holding Times
 Quiet Cove Property
 Anacortes, Washington

Laboratory Analysis	Analytical Method	Minimum Sample Size	Sample Container	Sample Preservation	Holding Time ¹
Diesel- and Oil-Range Hydrocarbons	NWTPH-Dx	500 mL	Two 500 mL amber glass with Teflon-lined lid	Cool ≤6 C	14 days to extraction
Diesel- and Oil-Range Hydrocarbons	NWTPH-Dx with silica gel cleanup				40 days from extraction to analysis
Total Alkalinity	SM 2420 B-97	500 mL	Two 500 mL amber glass with Teflon-lined lid	Cool ≤6 C	14 days to extraction
Ferrous Iron	SM 3500-Fe B-97				40 days from extraction to analysis
Sulfate/Nitrate	EPA 300.0	250 mL	One 500 mL HDPE no headspace	Cool ≤6 °C No Headspace	14 days to analysis
Dissolved Manganese	EPA 6020A				
Dissolved Methane	EPA RSK-175	250 mL	One 250mL amber glass with Teflon-lined lid, HCl preserved	Cool ≤6 °C	24 hours to analysis

Notes:

¹Holding times are based on elapsed time from date of collection.

NWTPH = Northwest total petroleum hydrocarbons

Dx = diesel-range extended

EPA = Environmental Protection Agency

EPH = extractable petroleum hydrocarbons

Gx = gasoline-range extended

HCl = hydrochloric acid

HDPE = high density polyethylene

HNO₃ = nitric acid

L = liter

mL = milliliter

PCBs = polychlorinated biphenyls

SIM = selected ion mode

SVOC = semi-volatile organic compound

VOC = volatile organic compound

VPH = volatile petroleum hydrocarbons

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Base survey by Sound Development Group on 10-11-2017

Projection: NAD83 WA State Planes, N Zone, US Foot

Legend

Site Boundary

Supplemental Data Sample Locations

- SD-1 Proposed Supplemental Data Soil Boring Location
- SD-2 Proposed Supplemental Data Soil Boring Location and Temporary Well Screen
- SD-9 Proposed Supplemental Data Shallow Soil Boring Location
- MW-12 Proposed Supplemental Data Monitoring Well

Previous Sample Locations

- GEI-31 RI Soil Boring Location, 2017
- SED-1A Tier 1 Sediment Sample, September 2017
- GEI-1 Integrated Planning Grant Soil Boring Location, 2014
- MW-10 Monitoring Well

Composite Sediment Sample Grab Area (SED-1)

Contour (Feet, NAVD 88)

Soil Sample Result

Exceedance of Preliminary Screening Level for:

- | | |
|-------------------------------|-------------------------------|
| Gasoline-Range TPH | Gas+Heavy-Oil TPH |
| Diesel-Range TPH | Diesel+Heavy Oil TPH |
| Heavy-Oil-Range TPH | No Exceedance for TPH |
| Gas, Diesel and Heavy-Oil TPH | Sample Not Analyzed, Archived |
| Gas+Diesel TPH | |

Soil Site Stratigraphy

F_s Surface Fill WT Water Table
N Native

Sediment Sample Results

- SED-1 Sample Interval Depth (bml)
- | | |
|-------------------------------------|-----------------------------------|
| 0-10 cm | SED-1 Sample Interval Depth (bml) |
| 1-3 ft | |
| 4-6 ft | |
| 8-9 ft | |
| No Exceedance | |
| Human Health Exceedance | |
| Benthic and Human Health Exceedance | |
| Sample Not Analyzed, Archived | |

Supplemental Data Collection Sample Locations

Quiet Cove Property
Anacortes, Washington



Figure 1

APPENDIX D

Draft SEPA Checklist



STATE ENVIRONMENTAL POLICY ACT (SEPA) CHECKLIST

A. BACKGROUND

1. Name of proposed project, if applicable:

Quiet Cove Interim Cleanup Action

2. Name of applicant:

Port of Anacortes

3. Address and phone number of applicant and contact person:

Applicant:
Sarah Tchang
Environmental Specialist
Port of Anacortes
100 Commercial Ave
Anacortes, WA 98221
360.299.1827
sarah.tchang@portofanacortes.com

Authorized Agent:
John Herzog
Senior Principal Geologist
GeoEngineers, Inc.
2101 4th Avenue #950
Seattle, WA 98121
206.239.3252
jherzog@geoengineers.com

4. Date checklist prepared:

July 9, 2019

5. Agency requesting checklist:

Port of Anacortes

6. Proposed timing or schedule (including phasing, if applicable):

Implementation of the cleanup action (construction of the project) is currently anticipated to begin in third and fourth quarter of 2020. Construction will not begin until required permits and approvals are obtained.



7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

No. Currently the Port does not have specific development plans for the Site. The Port will pursue options for potential further development of the Site following the cleanup action.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

- GeoEngineers, 2014. Focused Environmental Site Investigation Data Report, Quiet Cove Property, Anacortes, Washington, GEI No. 5147-024-01, dated October 20, 2014.
- GeoEngineers, 2017. FINAL Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan); Quiet Cove Property; Anacortes, WA; Ecology Agreed Order No. DE 11346. GEI No. 5147-024-03, dated January 25, 2017.
- GeoEngineers, 2018. Work Plan Addendum for Supplemental Upland Area Soil and Groundwater Investigation at the Quiet Cove Site, Anacortes, Washington (Work Plan Addendum). GEI No. 5147-024-06, dated October 1, 2018.
- GeoEngineers, Inc. 2019. Draft Interim Action Work Plan; Quiet Cove Site; Anacortes, Washington; Ecology Agreed Order No. DE 11346. Prepared for Washington State Department of Ecology on Behalf of Port of Anacortes, dated July 9, 2019.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

None are known.

10. List any government approvals or permits that will be needed for your proposal, if known.

The proposed cleanup action will be conducted as an interim remedial action under the existing Agreed Order (No. DE 11346) or as an Agreed Order Amendment with the Washington Department of Ecology (Ecology) within the authority of the state Model Toxics Control Act (MTCA). The proposed action is exempt from the procedural requirements of state and local permits that would otherwise be required, per RCW 70.105D.090. However, the proposed action is required to demonstrate substantive compliance with appropriate state and local permits. These may include: City of Anacortes building, right-of-way and construction permits, including grading and drainage approvals.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The Port of Anacortes (Port) proposes to implement cleanup of approximately 0.75 acres in the upland property on the Quiet Cove Cleanup Site. The cleanup is in the vicinity of a historical Standard Oil bulk fueling facility generally located southwest of the corner of O Avenue and 2nd Street and south of Curtis Wharf. Elevated levels of petroleum hydrocarbons, benzene, metals and carcinogenic polycyclic aromatic hydrocarbons (cPAHs) have been identified in soils on the site and are the result of historic uses of the property.



The site is currently paved with two existing buildings. The Port leases the property to multiple tenants for commercial use.

The site has been investigated under an Agreed Order with Ecology. The Port, in cooperation with Ecology has prepared an Interim Action Work Plan. Cleanup of the site is expected to last for approximately eight weeks, and after the project is complete, the site will be returned to the existing use as a short-term parking area. The project elements include:

- Abatement and demolition of two existing buildings on the site including decommissioning of utilities that currently service the buildings.
- Demolition of concrete surface on the northern area of the site to access contaminated soil.
- Excavation of approximately 1,500 to 3,000 cubic yards (CY) of overburden from the site. Segregate, stockpile and characterize the overburden material for potential reuse as backfill or transport material off site for disposal at an appropriate facility.
- Excavation and removal of approximately 8,500 CY of contaminated soil and transport excavated material off site for disposal at a permitted facility.
- Placement of oxygen-releasing material during backfilling activities to reduce residual contamination. Performance monitoring of groundwater will be completed to evaluate effectiveness of the cleanup.
- Backfilling and compaction of overburden and/or clean imported fill and crushed rock surfacing.
- Restoration of sidewalk, curb, parking strip, plantings within adjacent properties and City right-of-way that are disturbed during construction activities.
- Monitor wells on a quarterly basis for four consecutive quarters to evaluate the interim action effectiveness. Additional groundwater sampling may be necessary if initial monitoring indicates the potential for contaminant transfer to groundwater.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

The proposed project site is located between 2nd and 3rd Street with O Avenue to the east, Anacortes, Skagit County, Washington and is comprised of 4 parcels P55354, P55355, P55358 and P55359 (refer to Exhibit A for a project site plan).

Section 13, Township 35N, Range 01E

Legal Descriptions:

- P55354 – LOTS 1 TO 6, BLOCK 66, ANACORTES, RECORDED IN VOLUME 2 OF PLATS, PAGE 4, RECORDS OF SKAGIT COUNTY, WASHINGTON. TOGETHER WITH N1/2 VAC ALLEY ADJ ORD#1760
- P55355 – ANACORTES LTS 7 TO 10 BLK 66 TGW VAC R/R



- P55358 – LOTS 16 TO 18, BLOCK 66, ANACORTES, RECORDED IN VOLUME 2 OF PLATS, PAGE 4, RECORDS OF SKAGIT COUNTY, WASHINGTON. TOGETHER WITH S1/2 VAC ALLEY ORD#1760
- P55359 – LOTS 19 AND 20, BLOCK 66, ANACORTES, RECORDED IN VOLUME 2 OF PLATS, PAGE 4, RECORDS OF SKAGIT COUNTY, WASHINGTON. TOGETHER WITH S1/2 VAC ALLEY ADJ ORD#1760

B. ENVIRONMENTAL ELEMENTS

1. Earth

- a. **General description of the site (circle one):** Flat, rolling, hilly, steep slopes, mountainous, other

The site is located in an industrial waterfront setting, along Guemes Channel adjacent to the shoreline.

- b. **What is the steepest slope on the site (approximate percent slope)?**

The existing topography of the site is flat (<1%), but the adjacent O Avenue slopes to the north towards Guemes Channel. The beach area is sloped toward the Guemes Channel however, it is not part of the proposed interim action.

- c. **What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.**

Environmental Reports were conducted by GeoEngineers, Inc. for this cleanup project as required for the Ecology Agreed Order. Boring logs showed that the soils encountered at the site consist of relatively shallow fill overlying glaciomarine drift soils. Some of the soil borings encountered layers of organic soils within the fill. The fill observed in the explorations ranged from fine to coarse sand with gravel to organic silt. Fill soils on the northern portion of the Site were generally thicker [4 to 6 feet below ground surface (BGS)] compared to the southern portion of the site (2 to 6 feet BGS).

Native soils were encountered below the fill which is interpreted to be glaciomarine drift based on deeper explorations in the area. The glaciomarine drift more typically consists of varying amounts of silt, sand, and gravel.

- d. **Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.**

No. There are no visual surface indications or history of unstable soils in the immediate vicinity.

Portions of the general project area are identified as geologically hazardous on the City of Anacortes' Natural Resource and Critical Areas maps. This designation is due to historic filling in the area, which means the site could be susceptible to liquefaction or subsidence during a major seismic event.



e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.

Approximately 8,500 CY of contaminated soil will be excavated and hauled off site. Approximately 1,500 to 3,000 CY of overburden will be stockpiled onsite and reused as backfill, as appropriate. Up to approximately 11,500 CY of clean soil will be used on site as backfill material. Backfilling of excavated areas will be performed to restore existing grades. Grading of the disturbed upland areas of the site will occur after cleanup activities are complete. Crushed rock surfacing will be placed to maintain grading until the site is further developed in the future.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Erosion is not expected due to the limited area and scope of excavation activities and the flat topography of the site. The site is currently not vegetated. Potential erosion will be minimized through implementation of Best Management Practices (BMPs) and any additional erosion control measures required by regulatory agencies.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

The proposed activities will take place within the current developed area as the site is currently covered with concrete and asphalt surfaces. Areas that are excavated will be backfilled with compacted gravel resulting in a net increase of pervious surface at the site. After backfilling, the site will be restored with compacted gravel until future development planning is initiated.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Contractors will be required to implement Best Management Practices (BMPs) for erosion control during active construction and excavation consistent with Ecology's Stormwater Management Manual for Western Washington. During site preparation and construction, exposed soils will be kept to a minimum and management measures will be implemented to minimize and control sediment and erosion. BMPs such as construction fencing, silt fence, covered stockpiles, prevention of soils from entering storm drains, stabilized construction entrance, straw wattles, interceptor swales, check dams and/or triangular silt dikes will be implemented as applicable to contain sediment and prevent discharge off site. The design documents will provide erosion and sediment control requirements that the contractor will follow during construction.

2. Air

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.

It is anticipated that during construction, there will be dust and emissions from internal combustion engines associated with construction vehicles and other construction equipment. These short-term air emissions are expected to be limited to diesel and gasoline engine emissions from trucks and other heavy equipment being used for excavation, backfilling, and grading. These emissions will be temporary in duration and not expected to differ from similar



activities within other areas of the industrial waterfront. No adverse long-term impacts are anticipated. Off-site air quality impacts from construction activities are not anticipated. In addition, the project once complete will not generate air emissions.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

Offsite emission or odor sources have not been identified. Anacortes, or any part of Skagit County, is not designated as an air quality nonattainment area by the US Environmental Protection Agency (EPA).

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

Construction activities will utilize the proper precautions to minimize dust emissions. Potential minimization actions include, the use of water, reducing vehicle speeds, vehicle cleaning prior to exiting the site to prevent track-out of mud or dirt onto paved public roadways, and sweeping/vacuuming. Visual monitoring will be conducted during construction activities to confirm that dust emission prevention measures are effective.

3. Water

a. Surface:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

The Guemes Channel is located adjacent to the project area to the west.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

The proposed work includes excavation activities approximately 50 feet or more from the ordinary high water mark (OHWM) for Guemes Channel. See Exhibit B for the approximate area for excavation of contaminated soil. The interim cleanup action will be outside the OHWM and does not address sediment media at the site.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

No fill or dredge material will be placed in or removed from surface water or wetlands as part of the project.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.



The project does not include surface water withdrawals or diversions.

- 5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.**

No.

- 6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.**

No. Construction could increase the risk of erosion and construction debris entering surface waters. However, during construction, contractors will be required to adhere to federal, state, and local requirements and permit conditions.

b. Ground Water:

- 1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.**

Groundwater conditions at the site suggest that soil excavations extending below approximately 4 to 6 feet below ground surface will encounter groundwater. Removal of groundwater that fills in the excavation may be required to facilitate excavation and reduce the water content of excavated soils. If necessary, water collected during dewatering activities may be stored in tanks prior to disposal in the sanitary sewer. If excavation water is discharged to the sanitary sewer, water will be treated to comply with sanitary sewer discharge standards.

- 2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals...; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.**

This project does not include discharge of waste materials into the ground.

c. Water runoff (including stormwater):

- 1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.**

The source of runoff at the site is stormwater. Best Management Practices (BMPs) will be implemented throughout construction activities to manage runoff water. Following the interim cleanup action, the excavation area at the site will have an impermeable surface comprised of crushed gravel, and stormwater will infiltrate into the clean backfill material. In areas of the site outside the excavation area where impermeable surfaces exist, stormwater collection will be through existing catch basins and piping on and/or adjacent to the site, with eventual discharge via existing stormwater outfalls to Guemes Channel.

- 2) Could waste materials enter ground or surface waters? If so, generally describe.**



There is a small potential that waste materials could enter ground or surface waters due to an accidental spill during construction. Construction BMPs are proposed to avoid construction-related spills and discharges, and the contractor will abide by a Spill Prevention, Control, and Countermeasure (SPCC) Plan.

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

To minimize impacts to surface waters, staging and stockpiling work will be outside of the shoreline jurisdiction. Care will be taken to prevent any petroleum products, chemicals, or other toxic materials from entering the water. Contractors will be required to have a SPCC Plan and will have spill kits, absorbent pads and other appropriate materials necessary to contain and clean up an accidental spill at the site. BMPs will be implemented consistent with federal, state, and local requirements.

4. Plants

a. Check or circle types of vegetation found on the site:

- ☐ deciduous tree: alder, maple, aspen, other
- ☒ evergreen tree: shore pine
- ☒ Shrubs: scotch broom, Himalayan blackberry
- ☒ grass – various, adjacent to the N Avenue beach area
- ☐ pasture
- ☐ crop or grain
- ☐ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
- ☐ water plants: water lily, eelgrass, milfoil, other:
- ☐ other types of vegetation:

b. What kind and amount of vegetation will be removed or altered?

There is no significant vegetation on the site. An existing strip of street landscaping (grass) adjacent to the site along O Avenue (approximately 750 square feet) is expected to be removed during construction. There is a possibility that some vegetation west of the site adjacent to the N Avenue Park may be removed or altered. Any vegetation that is altered, damaged or removed to facilitate construction will be replaced/restored following completion of this interim cleanup action.

c. List threatened or endangered species known to be on or near the site.

No known threatened or endangered plant species are on or near the project site.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

These measures are not proposed.

e. List all noxious weeds and invasive species known to be on or near the site.



Noxious weeds have not been identified within the immediate project site, although invasive Himalayan blackberry (*Rubus armeniacus*) has been observed adjacent and west of the project site near the beach area.

5. Animals

- a. **List any birds and other animals which have been observed on or near the site or are known to be on or near the site:**

Several bald eagle nesting territories occur in the vicinity, primarily to the west of the project site near Fidalgo Bay, West Guemes Channel and Guemes Island. Several osprey nesting territories also occur in the Anacortes area, but these are located inland. Numerous waterfowl and shorebirds also use the area, primarily in the winter and during migration. No habitat has been observed on the site where construction is proposed.

- b. **List any threatened or endangered species known to be on or near the site.**

Federally listed or threatened species that may occur in the adjacent Guemes Channel area include the Puget Sound Chinook salmon, Puget Sound Steelhead, Coastal-Puget Sound Bull Trout, rockfish (bocaccio, canary, and yelloweye) and Southern Resident Killer Whale. The interim action addresses upland soil and therefore these listed or threatened marine species are not present at the site.

- c. **Is the site part of a migration route? If so, explain.**

The Puget Sound area is part of the Pacific flyway. Birds that inhabit the area vary seasonally due to migration. Fidalgo Bay, west of the project area, also provides over-wintering areas for migratory waterfowl.

- d. **Proposed measures to preserve or enhance wildlife, if any:**

No wildlife habitat will be disturbed as part of this project. There are no proposed measures to preserve or enhance wildlife as part of this project.

6. Energy and natural resources

- a. **What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.**

Both electrical and fossil fuel sources will be required to operate construction equipment at the site.

- b. **Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.**

The project will not affect potential use of solar energy on adjacent properties.

- c. **What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:**



None are proposed.

7. Environmental health

- a. **Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.**

Potential discharges to stormwater and surface waters during the cleanup include accidental spills or leakage of petroleum products from construction equipment used during the project. The likelihood of a spill is low. In the event of a potential spill the effects would be minimized and mitigated through implementation of an on-site SPCC plan and response strategy that has been prepared by the construction Contractor. These spill response materials will be available for use during site construction. The contractor will be required to prepare a health and safety plan for work in areas where it is expected that contaminated soils may be encountered. Nuisance petroleum odor may occur in the immediate vicinity of the excavation, but the Site is exposed to wind.

- 1) **Describe any known or possible contamination at the site from present or past uses.**

Historical use of the site has resulted in contaminated soil and groundwater at the site. Based on environmental investigations completed, elevated concentrations of petroleum hydrocarbons, volatile organic compounds, polycyclic aromatic hydrocarbons and metals in soil at the site exceed concentrations protective of human health and the environment. Additionally, groundwater is contaminated throughout the site.

- 2) **Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.**

No known hazardous chemicals/conditions that might affect project development and design exist. As noted above residual contaminated soils and groundwater are found at the Site but are below concentrations that are considered hazardous material.

- 3) **Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.**

Potential discharges during construction include accidental spills or leakage of petroleum products from construction equipment used during the project. Potential discharges after the project is complete could include accidental spills of fuels from Port and tenant activities. De minimus quantities of chemicals may be stored onsite for equipment maintenance needs during construction. However, the Port's strict enforcement of BMPs and policies and procedures that focus on preventing pollution from work and tenant activities minimizes these types of risks.



4) Describe special emergency services that might be required.

No special emergency service requirements are anticipated.

5) Proposed measures to reduce or control environmental health hazards, if any:

Implementation of a contractor SPCC plan and BMPs will minimize risks of accidental spills during construction. The contractor(s) will be required to prepare and implement a health and safety plan for work associated with site cleanup. Within contaminated areas, workers will be required to have current HAZMAT handling training and equipment.

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

Existing noise from the surrounding area will not affect the project.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

Construction noise associated with a variety of construction equipment will occur. This could include truck engines, back-up alarms, generators and other small engines, excavators, backhoes, and other heavy equipment.

The majority of site activities and associated noise will generally occur during daylight hours. It is expected that any noise generated by project development will be non-disruptive and within the range of normal activities

3) Proposed measures to reduce or control noise impacts, if any:

Construction would occur during normal working hours (Monday through Friday, 7 AM to 10 PM). The project will comply with environmental noise standards set by the State of Washington, WAC 173-60, which establishes limits on the level and duration of noise crossing property boundaries. Temporary construction noise is exempt from state noise limits during daytime hours, per WAC 173-60-050(3)(a). Construction activities will be carried out in a manner consistent with the City Municipal Code and State environmental noise standards.

8. Land and shoreline use

a. What is the current use of the site and adjacent properties?

The site is currently used for office space, equipment storage and light manufacturing for marine fishing and boating industries. Adjacent property use includes a marine terminal at Curtis Wharf (north), a bulk petroleum facility at the Reisner property (southwest) and public recreation at the N Avenue Beach (west).



b. Has the site been used for agriculture? If so, describe.

No, the site has never been used for working farmlands or working forest lands.

c. Describe any structures on the site.

There are two permanent structures on the Site. The buildings are currently used as a mix of office space, light manufacturing and equipment storage.

d. Will any structures be demolished? If so, what?

Yes. The two aforementioned existing buildings at the Site will be demolished and removed prior to the cleanup actions.

e. What is the current zoning classification of the site?

City of Anacortes Zoning map classifies the area as "Light Manufacturing."

f. What is the current comprehensive plan designation of the site?

The City of Anacortes 2012 Comprehensive Plan designates the site as "Light Manufacturing."

g. If applicable, what is the current shoreline master program designation of the site?

The current shoreline master program (2010) designates the site as "Urban Marine."

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

No.

i. Approximately how many people would reside or work in the completed project?

Not applicable.

j. Approximately how many people would the completed project displace?

Not applicable.

k. Proposed measures to avoid or reduce displacement impacts, if any:

Not applicable.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

The proposed cleanup action is consistent with the goals of the City of Anacortes Comprehensive Plan and would not interfere with existing or future uses in the area.



9. Housing

- a. **Approximately how many units would be provided, if any? Indicate whether high, middle, or low income housing.**

The project does not include provision of housing units.

- b. **Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low income housing.**

The project does not eliminate any existing housing units.

- c. **Proposed measures to reduce or control housing impacts, if any:**

Not applicable.

10. Aesthetics

- a. **What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?**

No structures are proposed.

- b. **What views in the immediate vicinity would be altered or obstructed?**

Views in the immediate vicinity will not be altered or obstructed by the completed project.

- c. **Proposed measures to reduce or control aesthetic impacts, if any:**

None are proposed.

11. Light and glare

- a. **What type of light or glare will the proposal produce? What time of day would it mainly occur?**

No lighting is proposed.

- b. **Could light or glare from the finished project be a safety hazard or interfere with views?**

No.

- c. **What existing off-site sources of light or glare may affect your proposal?**

None.

- d. **Proposed measures to reduce or control light and glare impacts, if any:**

None are proposed.



12. Recreation

- a. **What designated and informal recreational opportunities are in the immediate vicinity?**

The project is adjacent to the 2nd Street Beach that provides informal public access to the beach west of the Site from 2nd Street to Curtis Wharf.

- b. **Would the proposed project displace any existing recreational uses? If so, describe.**

There is-are no long-term changes to the recreational access to the 2nd Street Beach existing use. During construction there may be temporary pedestrian detours to avoid construction traffic including truck trailers.

- c. **Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:**

None are proposed.

13. Historic and cultural preservation

- a. **Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.**

A cultural resources assessment was completed for the site and did not identify any known historic places or objects located on or next to the site.

- b. **Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.**

Based on more than 45 subsurface environmental soil boring explorations at and adjacent to the site, there is no evidence of archeological deposits. No specific landmarks or evidence of historic, archeological, scientific, or cultural significance are known within the areas affected by the proposal.

Although the site has been subject to development and filling, it is possible that the project area could contain prehistoric archeological deposits beneath the areas of historic fill such as materials associated with occupation, shellfish gathering, fishing and other activities. In the unlikely event of an inadvertent discovery of archeologic deposits, work will be immediately halted, and the Port will work with Washington State Department of Archaeology and Historic Preservation (DAHP) and local Tribes until appropriate consultation and/or investigation have been carried out.

- c. **Proposed measures to reduce or control impacts, if any:**

In the event cultural or archeological resources are encountered, work in the immediate area will be stopped and the area protected until such time an assessment can be made on the significance of the discovery, followed with the development of a plan for disposition



of the discovery, and then lastly implementation of the plan. Washington State Historic Preservation Office will also be consulted.

14. Transportation

- a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.**

The site is located at the intersection of O Avenue and 2nd Street, northwest of downtown Anacortes. Southeast of the project site on the east side of downtown Anacortes is Q Avenue, which serves as a north-south truck route to State Route (SR) 20 through the main commercial area of town.

- b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?**

The site is not directly served by public transit with the nearest station 0.3 miles away at 6th Street at City Hall which is served by Route 409 and 410. Route 409 runs west to the Guemes Ferry and then south to the Island Hospital and John Storvik Park near 32nd Street before running north through downtown Anacortes. Route 410 makes a loop through Anacortes and provides service between the Anacortes Ferry Terminal and the March's Point Park & Ride lot.

- c. How many parking spaces would the completed project have? How many would the project eliminate?**

The existing parking uses will be temporarily displaced during the cleanup action. There are no proposed long-term changes to existing parking, and no parking spaces will be eliminated.

- d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).**

No new roads will be required. Existing sidewalks, curbs and/or roads that are damaged due to construction activities will be restored following excavation and backfilling work.

- e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.**

The project is in the immediate vicinity of Port of Anacortes Curtis Wharf terminal and the southern shoreline area of Guemes Channel. Curtis Wharf is used for commercial activities. Construction work will be completed to minimize disturbance of existing operations at Curtis Wharf.

- f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.**

Excavated materials and clean backfill will be transported to and from the site in dump trucks. It is expected that there will be approximately 10 to 12 truck trips per day during the active period of excavation/backfill. Construction workers may also travel to and from the site, and this may generate an estimated 6 to 10 vehicle trips per day to the site vicinity.



g. Proposed measures to reduce or control transportation impacts, if any:

Measures to reduce or control transportation impacts are not proposed. The truck and vehicle traffic are within the existing capacity of adjacent roadways and is not expected to have any impact on existing levels of service.

15. Public services

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.

The project will not increase demand for public services.

b. Proposed measures to reduce or control direct impacts on public services, if any.

Not applicable.

16. Utilities

a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

Electrical, gas, and water utilities may be encountered during excavation. Remediation and construction activities will be coordinated with the appropriate utility providers.

Utilities and providers at the site are as follows:

Electricity	Puget Sound Energy
Natural gas	Cascade Natural Gas
City of Anacortes	Water, Sewer, Refuse Service



C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: _____

Name of Signee: _____

Position and Agency/Organization: _____

Date Submitted: _____

APPENDIX E

Hazardous Building Material Survey



PACIFIC RIM ENVIRONMENTAL, INC.

Regulated Building Materials Survey

Port of Anacortes Quiet Cove Site

"O" Avenue & 2nd Street

Anacortes, WA



Prepared for:

GeoEngineers, Inc.

2101 4th Avenue Suite 950

Seattle, WA 98121

Prepared By:

Paul S. Hanway

Sr. Project Manager

Date Prepared: 04/24/2019

PacRim # 16596

Table of Contents

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Appendix A: Asbestos Inspection Summary

Appendix B: Bulk Sample Analysis Report

Appendix C: Sample Location Drawings

Appendix D: Lead-Based Paint (XRF) Data Sheets

Appendix E: XRF Performance Characteristic Sheet

Appendix F: Universal Waste Rule WAC 173-303-573

Appendix G: Less Than One Percent Asbestos Impact Guidelines

Appendix H: Inspector/Laboratory Certifications

Report Reviewed By: _____



Date Reviewed: _____

4/25/2019

Section 1.0 Scope of Work

Quite Cove | "O" Avenue & 2nd Street Anacortes, Washington

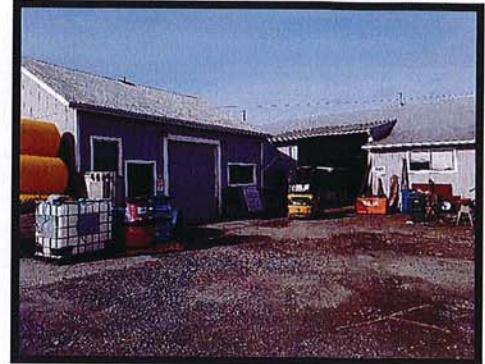
On April 15th, 2019, Matt DeDominces, an AHERA Accredited Building Inspector and DOC Lead Inspector for Pacific Rim Environmental, Inc. (PacRim), performed a regulated building material survey at the subject property for two structures "Quite Cove Site" located near "O" Avenue and 2nd Street in Anacortes, WA. The subject property work area is further described below.

Site: The subject structures are wooden framed buildings with metal sidings and office areas with warehouse / shop areas. Age of building construction is unknown.

- Building 1 – approximately 4,300 square feet of office and warehouse.
- Building 2 – approximately 1,650 square feet

Limitations: Due to occupied nature of the ongoing business some areas were not completely accessible and non-destructive methods were used.

Field inspection, data collection, and report generation were performed according to the following **Scope of Work**:



Asbestos-Containing Materials (ACM)

1. Bulk sampling and analysis of suspect asbestos-containing materials (ACM).
2. Analysis of suspect ACM by a NVLAP accredited laboratory.
3. Quantity estimates of ACM.
4. Written report including recommendations based on the technician's observations, abatement (removal) cost estimates, sample descriptions, and sample location.
5. Statement of Compliance with W.A.C. 296-62-07721 Sign-off form.

Lead-Based Paints (LBP)

6. Perform limited screening of suspect lead-based paints.
7. Written report including: Sample descriptions, conditions, locations, analytical results, and recommendations.

Universal Waste Inventory

8. Inspect and inventory lights and equipment to identify fixture and lamp type to determine presence of PCB and/or mercury.

DEFINITIONS

Surfacing: Materials; which are either spray-applied or troweled-on for acoustical, decorative or fireproofing purposes.

Thermal System Insulation (TSI): Insulating materials used to inhibit heat transfer or to prevent condensation on pipes, boilers, tanks, ducts and various other components.

Miscellaneous (Misc.): All other materials not included in the above categories such as floor tile, ceiling tile, roofing felt, cementitious materials, wallboard systems and products such as caulking, mastics and putties.

Homogeneous Material: For the purposes of this report; **Homogeneous Material** is defined as an area of surfacing material, thermal system insulation, or miscellaneous material that is uniform in color, texture and application. When materials are determined to be Homogeneous by the on-site AHERA Accredited Building Inspector; although laboratory results may vary, in accordance with AHERA regulations, if any of the samples in a Homogeneous Material Sample Set are found to contain asbestos, then all materials in the Sample Set must be considered to contain asbestos.

HM#: Homogeneous Material Number indicates which Homogeneous Material Sample Set that the collected sample belongs to.

Homogeneous Area: For the purposes of this report; **Homogeneous Area** is defined as a summary of all areas where a Homogeneous Material was identified within the Project Scope.

SURVEY FINDINGS SUMMARY:

The survey was intended to identify possible asbestos-containing materials (ACM) on the interior and exterior of the building. This inspection covered only those areas, which were exposed and/or physically accessible to the inspector. Materials uncovered during the course of demolition, renovation, or maintenance activities that are not identified in this inspection report must be presumed to contain asbestos until PLM analysis proves that this material is not asbestos-containing.

This survey is not intended for, nor should be used as a design specification. The Asbestos in Schools Hazard Amendment and Reauthorization Act (ASHARA), effective November 20, 1990, expanded accreditation requirements to apply to persons who work with asbestos in public and commercial buildings as well as schools. Specifically, ASHARA expanded the Toxic Substances Control Act (TSCA) Section 206 (a) (1) and (3) to require accreditation for any person who designs or conducts a response action with respect to friable ACM in a building. TSCA Section 207 provides for civil penalties of \$5,000 for each day of a violation for not employing accredited individuals to design and conduct response actions. Sampling of suspect asbestos-containing materials was conducted as prescribed in 40 CFR 763.86.

Suspect asbestos-containing materials were identified and classified as a surfacing material, thermal system insulation, or miscellaneous materials.

Bulk samples collected were submitted for sample analysis in accordance with method EPA-600/R-93/116: "Method for the Determination of Asbestos in Bulk Building Materials". Analyses were performed at Pacific Rim Environmental Inc.'s NVLAP Accredited Laboratory (Lab Code 101631-0). Materials are positive for asbestos if they are found to contain greater than one percent (1%) or 1% asbestos. Materials that are less than one percent (<1%) asbestos, although not considered positive for asbestos, when removed must follow applicable Washington State regulations. **See Appendix G for WA State Guidelines for Less than 1% Asbestos Material.**

A total of thirty (30) bulk samples were collected and submitted for PLM laboratory analysis. Five (05) of these samples were found to contain greater than 1% asbestos. Three (03) of these samples were found to contain less than 1% asbestos.

Section 2.0

Asbestos Survey Narrative - continued

Quite Cove | "O" Avenue & 2nd Street Anacortes, Washington

HOMOGENEOUS MATERIALS RESULTS SUMMARY

Materials identified as asbestos-containing materials (ACM) as defined by the EPA:

HM#	AHERA Category	Homogeneous Material Description	Homogeneous Area	Quantity (Approximate)	Sample #s	Asbestos Content
7	Misc.	Putty / caulk	Garage 1, at shed roof to corrugated wall penetration.	30 L.F.	7	Chrysotile 7-10%
16	Surfacing	Coatings silver on black.	Throughout Roof	7000 S.F.	19, 20	Layer 1 (silver coating): None Detected. Layer 2 (Black mastic): Chrysotile 3-15%
23	Misc.	Flooring sheet vinyl, 2 inseparable layers.	Office 2 storage Room floor.	160 S.F.	27	Layers 1-4: None Detected. Layer 5 (White backing): Chrysotile 35-40% Layer 6-7: None Detected.
25	Misc.	Roofing tar	At the North West corner of office 2, on cement slab.	16 S.F.	29	Chrysotile 1-3%

Materials determined to contain less than one percent (<1%) asbestos

HM#	AHERA Category	Homogeneous Material Description	Homogeneous Area	Quantity (Approximate)	Sample #s	Asbestos Content
2	Surfacing	Coatings On corrugated tin.	Garage 1, area 2, North wall.	350 S.F.	2	Tremolite <1%
10	Misc.	Window Putty (2'x2' Window)	Garage 2 west exterior.	8 Each	10	Tremolite <1%
17	Misc.	Window Putty (4'x5' window)	Office 2, to the right of front entry.	1 each	21	Layer 1 (Putty): Tremolite <1% Layer 2 (Substrate): None Detected.

Materials determined to be Non-Asbestos:

HM#	AHERA Category	Homogeneous Material Description	Homogeneous Area	Quantity (Approx.)	Sample #s	Asbestos Content
1	Misc.	Sheetrock (GWB)	Garage 1, area 1, east wall.	N/A	1	None Detected (Both Layers)
3	Surfacing	Coatings On corrugated tin roof.	Garage 1 roof.	N/A	3	None Detected.
4	Misc.	Flooring sheet vinyl	Garage 1, bathroom floor.	N/A	4	None Detected (Both Layers)
5	Misc.	Waterproofing felt	Garage 1, at shed roof.	N/A	5	None Detected.
6	Misc.	rolled roofing	Garage 1, at shed roof.	N/A	6	None Detected.
8	Misc.	rolled roofing	Garage 2 roof.	N/A	8	None Detected (Both Layers)
9	Misc.	Waterproofing felt	Garage 2 roof.	N/A	9	None Detected.
11	Misc.	Putty / caulk	Garage 2, at west exterior, at corrugated tin to fiberglass seam, of wall.	N/A	11	None Detected.
12	Surfacing	Texture on GWB	Garage 2, coat storage area, ceiling.	N/A	12, 13	None Detected (Both Layers)
13	Misc.	Gypsum Wall Board/Tape/Joint Compound	Garage 2, east wall.	N/A	14	None Detected (All Layers)
14	Surfacing	Texture on GWB	Office 1 ceiling.	N/A	15, 16, 17	None Detected (All Layers)
15	Misc.	Sheetrock (GWB)	Office 1, south wall.	N/A	18	None Detected.
18	Misc.	Carpet Mastic	Office 2 floor.	N/A	22	None Detected.
19	Misc.	Sheetrock (GWB)	Office 2, south wall.	N/A	23	None Detected.
20	Misc.	Ceiling tile, 31" by 16"	Office 2 ceiling.	N/A	24	None Detected.
21	Misc.	Ceiling tile 12" x 12"	Office 2 storage Room ceiling.	N/A	25	None Detected.
22	Misc.	Sheetrock (GWB)	Office 2 storage area East wall.	N/A	26	None Detected.
24	Misc.	Sheetrock (GWB)	Garage 1, bathroom, north wall.	N/A	28	None Detected.
26	Misc.	Vapor Barrier brown brittle.	Around the top of the outside of the ceiling of office 2.	N/A	30	None Detected.

If during the course of wall, ceiling or floor demolition, any miscellaneous materials that are not listed in this report are uncovered, sampling must be performed prior to disturbing these materials.

PacRim #16596

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Section 3.0 Statement of Compliance

Quite Cove | "O" Avenue & 2nd Street Anacortes, Washington

In accordance with W.A.C. 296-62-07721 and PSCAA Regulation III, Article 4, Pacific Rim Environmental, Inc. performed an asbestos survey of the subject structure located at "O" Avenue & 2nd Street in Anacortes, Washington. Should employees or contract personnel encounter any suspect asbestos-containing materials (ACM) it is their responsibility to:

1. Contact a representative of the owner.
2. Consult the inspection report to determine whether or not the suspect material contains asbestos.
3. If the suspect material does not appear in the inspection report, then that material was not sampled and must be presumed to contain asbestos until proven otherwise by sampling and PLM analysis.
4. Ensure that all employees and contractors are informed and advised of the location and type of materials that contain asbestos.

Limitations: Due to occupied nature of the ongoing business some areas were not completely accessible and non-destructive methods were used.

The following Asbestos-containing materials were identified in the survey area:

- **Putty / caulk**
- **Coatings silver on black.**
- **Backing under two layers of Flooring sheet vinyl**
- **Roofing tar**

The following less than 1% (<1%) asbestos-containing materials were identified at the subject property:

- **Coatings On corrugated tin.**
- **Window Putty (2'x2' Window)**
- **Window Putty (4'x5' window)**

I Hereby Attest:

The inspection report has been made available to me. I will inform all subcontractors of the location and types of materials containing asbestos. I am authorized to sign on behalf of my company.

Contractor:	_____	Owner's Rep:	_____
Signature:	_____	Signature:	_____
Print Name:	_____	Print Name:	_____
Title:	_____	Title:	_____
Date:	_____	Date:	_____

Section 4.0

Lead-Based Paint Screening Summary

Quite Cove | "O" Avenue & 2nd Street Anacortes, Washington

The inspection and testing performed on the interior and exterior painted surfaces of the subject Property **did identify** lead-based paint concentrations at or above the EPA/HUD standard of 1.0 mg/m² on the following components:

Sample#	Substrate	Component/Side	Description/Location	Color	Result*	Pbc mg/cm ²
8	Metal	Corrugated tin wall.	Garage 1, west wall.	Gray	Positive	11.0
9	Metal	Corrugated tin wall	Garage 1 East wall.	Gray	Positive	6.0
15	Wood	Wall	Garage 1, bathroom south wall.	White	Positive	1.5
16	Wood	Old bathroom door casing.	Garage 1, bathroom.	White	Positive	15.6
17	Wood	Wall bead board.	Garage 1, east wall.	White	Positive	18.7
18	Wood	Bead board wall.	Garage 1, west wall.	White	Positive	15.8
20	Metal	Corrugated tin wall.	Garage 1, area 2, north wall.	White	Positive	5.1
25	Wood	Roof rake facia.	Garage 1. West end.	White	Positive	1.5
26	Wood	Horizontal facia.	Garage 1 north side.	White	Positive	6.3
28	Metal	Corrugated tin wall	Garage 2, north wall.	Silver	Positive	10.1
31	Wood	Rake facia.	Garage 2 north side.	White	Positive	2.5
51	Wood	Window frame	Office 2 at front entry.	Gray	Positive	2.3

The XRF sample results are provided in Appendix D.

The Performance Characteristic Sheet for the Niton XLp 300, September 24, 2004, is provided in Appendix E.

General Information:

It is important to keep in mind that although the EPA/HUD standard uses a criterion of 5,000 parts per million dry weight or 1.00 milligrams per square centimeter (1.00 mg/cm²) for lead-based paint, there still may be lead present in those results reported as negative. In the event that lead is present, Federal OSHA and Washington State Department of Labor & Industries regulations will still apply, since neither agency has established a concentration of lead in paint below which the lead in construction standards do not apply.

Workers wearing respiratory protection and who have received proper training in the handling of lead contaminated materials must be used for any construction activities (including manual scraping, manual/power sanding, heat gun applications, general cleanup, and demolition) that affect a paint film containing lead.

If the building is to be renovated or remodeled there are procedures regarding the disturbance or removal of the lead-based paints that **can** be followed (i.e. initial air monitoring, clearance sampling, etc.). These procedures can be found in *HUD-0006700 Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*. It is not required that these regulations/procedures be utilized on this project, however because these are the only available guidelines for the removal of lead-based paints PRE feels it necessary to inform you of these guidelines.

The only state rules or regulations that currently apply to lead-based paints are WAC 296-155-17603 Scope* and WAC 296-155-17607 Permissible Exposure Limit**. The WAC code states that if lead is detectable in the workplace in any quantity, initial air monitoring must be performed on employees doing demolition, renovation or remodeling work in areas found to have materials containing lead. Also, workers performing lead removal must be trained in accordance with WAC 296-155-17625.

Section 5.0 Universal Waste Inventory

Quite Cove | "O" Avenue & 2nd Street Anacortes, Washington

Universal Waste Rules

The Universal Waste Rule (UWR) establishes alternative, streamlined waste management standards in place of most of the Dangerous Waste Regulations, Chapter 173-303 WAC, except for, WAC 173-303-050, 173-303-145 and 173-303-960.

The following lamp types may be characterized as universal waste: fluorescent tubes, high intensity discharge (HID) lamps (mercury vapor, metal halide, high pressure sodium) and compact fluorescent.

The following Universal Waste was identified:

- **Approximately 30 four-foot fluorescent tubes**

The universal waste must be removed and properly disposed of or recycled prior to building demolition.

Disposal of individual lamps is not regulated. However, disposal of large quantities of lamps is subject to dangerous waste regulations (WAC 173-303) and the waste stream must be subjected to TCLP (Toxicity Characteristic Leaching Procedure) analysis to determine the amount of mercury that could leach out of the waste. The TCLP limit for mercury is 0.2 mg/L.

PCBs belong to a broad family of organic chemicals known as chlorinated hydrocarbons. PCBs are produced by the combination of one or more chlorine atoms and a biphenyl molecule. PCBs range in consistency from heavy oily liquids to waxy solids. Prior to 1979, PCBs were widely used in electrical equipment such as transformers, capacitors, switches, and voltage regulators.

A copy of the Washington State Department of Ecology *The Universal Waste Rule WAC 173-303-573*, Publication # 98-407, December 2005, is provided in Appendix F.

Appendix A: Asbestos Inspection Summary

Inspection Summary

Project Information

Job Number	16596
Project Name	Port of Anacortes Quite Cove Site
Project Address:	Seattle, WA
Client:	GeoEngineers, Inc.
Date of Survey:	15-Apr-2019
PacRim Technician:	Matt DeDominces

Limitations:

Exterior Photo:



Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	1	Homogenous Material Number	1
Material Description	Sheetrock (GWB)		
Sample Location	Garage 1, area 1, east wall.		
Quantity	32	Unit of Measure	Square Feet
Asbestos Type/%	None Detected (Both Layers)		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Surfacing
Sample Number	2	Homogenous Material Number	2
Material Description	Coatings On corrugated tin.		
Sample Location	Garage 1, area 2, North wall.		
Quantity	350	Unit of Measure	Square Feet
Asbestos Type/%	Tremolite <1%		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Surfacing
Sample Number	3	Homogenous Material Number	3
Material Description	Coatings On corrugated tin roof.		
Sample Location	Garage 1 roof.		
Quantity	1180	Unit of Measure	Square Feet
Asbestos Type/%	None Detected.		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	4	Homogenous Material Number	4
Material Description	Flooring sheet vinyl		
Sample Location	Garage 1, bathroom floor.		
Quantity	36	Unit of Measure	Square Feet
Asbestos Type/%	None Detected (Both Layers)		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	5	Homogenous Material Number	5
Material Description	Waterproofing felt		
Sample Location	Garage 1, at shed roof.		
Quantity	300	Unit of Measure	Square Feet
Asbestos Type/%	None Detected.		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	6	Homogenous Material Number	6
Material Description	rolled roofing		
Sample Location	Garage 1, at shed roof.		
Quantity	300	Unit of Measure	Square Feet
Asbestos Type/%	None Detected.		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	7	Homogenous Material Number	7
Material Description	Putty / caulk		
Sample Location	Garage 1, at shed roof to corrugated wall penetration.		
Quantity	30	Unit of Measure	Lineal Feet
Asbestos Type/%	Chrysotile 7-10%		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	8	Homogenous Material Number	8
Material Description	rolled roofing		
Sample Location	Garage 2 roof.		
Quantity	370	Unit of Measure	Square Feet
Asbestos Type/%	None Detected (Both Layers)		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	9	Homogenous Material Number	9
Material Description	Waterproofing felt		
Sample Location	Garage 2 roof.		
Quantity	370	Unit of Measure	Square Feet
Asbestos Type/%	None Detected.		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	10	Homogenous Material Number	10
Material Description	Window Putty		
Sample Location	Garage 2 west exterior.		
Quantity	8 windows at 2ft x 2ft	Unit of Measure	Each
Asbestos Type/%	Tremolite <1%		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	11	Homogenous Material Number	11
Material Description	Putty / caulk		
Sample Location	Garage 2, at west exterior, at corrugated tin to fiberglass seam, of wall.		
Quantity	50	Unit of Measure	Lineal Feet
Asbestos Type/%	None Detected.		
Sample Photo			

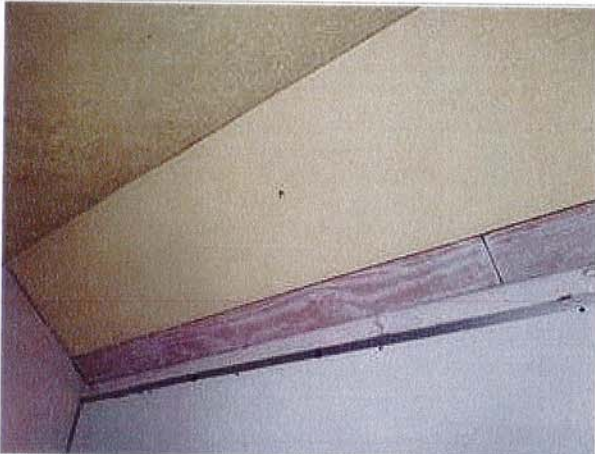
Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Surfacing
Sample Number	12	Homogenous Material Number	12
Material Description	Texture on GWB		
Sample Location	Garage 2, coat storage area, ceiling.		
Quantity	190	Unit of Measure	Square Feet
Asbestos Type/%	None Detected (Both Layers)		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Surfacing
Sample Number	13	Homogenous Material Number	12
Material Description	Texture on GWB		
Sample Location	Garage 2, at coat storage area, ceiling.		
Quantity	See sample 12 for total quantity.	Unit of Measure	Square Feet
Asbestos Type/%	None Detected (Both Layers)		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	14	Homogenous Material Number	13
Material Description	Gypsum Wall Board/Tape/Joint Compound		
Sample Location	Garage 2, east wall.		
Quantity	400	Unit of Measure	
Asbestos Type/%	None Detected (All Layers)		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Surfacing
Sample Number	15	Homogenous Material Number	14
Material Description	Texture on GWB		
Sample Location	Office 1 ceiling.		
Quantity	250	Unit of Measure	Square Feet
Asbestos Type/%	None Detected (Both Layers)		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Surfacing
Sample Number	16	Homogenous Material Number	14
Material Description	Texture on GWB		
Sample Location	Office 1, ceiling.		
Quantity	See sample 15 for total quantity.	Unit of Measure	Square Feet
Asbestos Type/%	None Detected (All Layers)		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Surfacing
Sample Number	17	Homogenous Material Number	14
Material Description	Texture on GWB		
Sample Location	Office 1, ceiling.		
Quantity	See sample 15 for total quantity.	Unit of Measure	Square Feet
Asbestos Type/%	None Detected (Both Layers)		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	18	Homogenous Material Number	15
Material Description	Sheetrock (GWB)		
Sample Location	Office 1, south wall.		
Quantity	400	Unit of Measure	Square Feet
Asbestos Type/%	None Detected.		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Surfacing
Sample Number	19	Homogenous Material Number	16
Material Description	Coatings silver on black.		
Sample Location	On roof corrugated tin of office 1 entry.		
Quantity	7000	Unit of Measure	Square Feet
Asbestos Type/%	Layer 1 (Silver coating): None Detected. Layer 2 (Black mastic): Chrysotile 10-15%		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Surfacing
Sample Number	20	Homogenous Material Number	16
Material Description	Coatings silver on black.		
Sample Location	At front door entry of office 2 roof corrugated tin.		
Quantity	See sample 19 for total quantity.	Unit of Measure	Square Feet
Asbestos Type/%	Layer 1 (Silver coating): None Detected. Layer 2 (Black mastic): Chrysotile 3-5%		
Sample Photo			

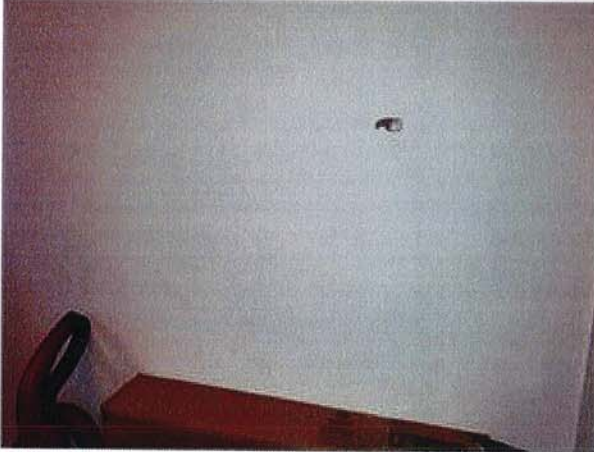
Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	21	Homogenous Material Number	17
Material Description	Window Putty		
Sample Location	Office 2, to the right of front entry.		
Quantity	One window at 4' by 5'	Unit of Measure	Each
Asbestos Type/%	Layer 1 (Putty): Tremolite <1% Layer 2 (Substrate): None Detected.		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	22	Homogenous Material Number	18
Material Description	Carpet Mastic		
Sample Location	Office 2 floor.		
Quantity	285	Unit of Measure	Square Feet
Asbestos Type/%	None Detected.		
Sample Photo			

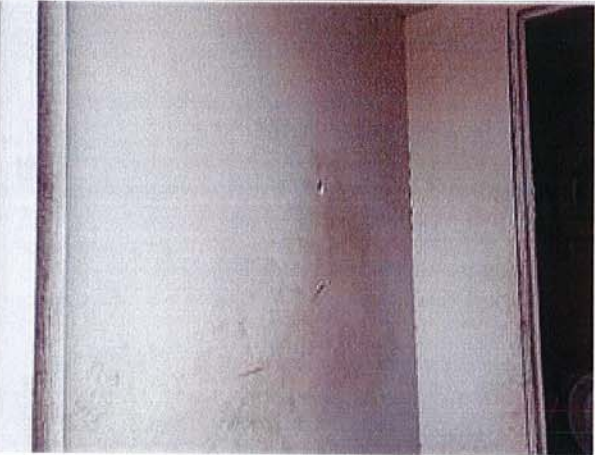
Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	23	Homogenous Material Number	19
Material Description	Sheetrock (GWB)		
Sample Location	Office 2, south wall.		
Quantity	480	Unit of Measure	Square Feet
Asbestos Type/%	None Detected.		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	24	Homogenous Material Number	20
Material Description	Ceiling tile, 31 inch by 16 inch .		
Sample Location	Office 2 ceiling.		
Quantity	285	Unit of Measure	Square Feet
Asbestos Type/%	None Detected.		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	25	Homogenous Material Number	21
Material Description	Ceiling tile 12" x 12"		
Sample Location	Office 2 ,storage Room ceiling.		
Quantity	160	Unit of Measure	Square Feet
Asbestos Type/%	None Detected.		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	26	Homogenous Material Number	22
Material Description	Sheetrock (GWB)		
Sample Location	Office 2 storage area East wall.		
Quantity	300	Unit of Measure	Square Feet
Asbestos Type/%	None Detected.		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	27	Homogenous Material Number	23
Material Description	Flooring sheet vinyl, 2 inseparable layers.		
Sample Location	Office 2 storage Room floor.		
Quantity	160	Unit of Measure	Square Feet
Asbestos Type/%	Layers 1-4: None Detected. Layer 5 (White backing): Chrysotile 35-40% Layers 6-7: None Detected.		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	28	Homogenous Material Number	24
Material Description	Sheetrock (GWB)		
Sample Location	Garage 1, bathroom, north wall.		
Quantity	120	Unit of Measure	Square Feet
Asbestos Type/%	None Detected.		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	29	Homogenous Material Number	25
Material Description	Roofing tar		
Sample Location	At the North West corner of office 2, on cement slab.		
Quantity	16	Unit of Measure	Square Feet
Asbestos Type/%	Chrysotile 1-3%		
Sample Photo			

Sample			
Project Name	Port of Anacortes Quite Cove Site		
Sample Type	Physical Sample	AHERA Category	Miscellaneous
Sample Number	30	Homogenous Material Number	26
Material Description	Vapor Barrier brown brittle.		
Sample Location	Around the top of the outside of the ceiling of office 2.		
Quantity	200	Unit of Measure	Square Feet
Asbestos Type/%	None Detected.		
Sample Photo			

Appendix B: Bulk Sample Analysis Report



Pacific Rim Environmental Inc.

Bulk Sample Analysis Report



Page: 1 of 8

Customer Name: GeoEngineers, Inc.
600 Stewart St., Ste. 1700
Seattle
WA 98101

PacRim Number: 16596
Report Number: 2019-04-0226
Date Received: 4/17/2019
Analysis Start Date: 4/22/2019
Analysis End Date: 4/24/2019
Turnaround Time: 3-5 Days
Report Date: 4/24/2019
Report By: William F. Golloway
Analyst(s): Sandra H. Rice

Customer Project Number: None Given
Project Name: Port of Anacortes Quite Cove Site
Project Address: 202 O Avenue
Anacortes
WA 98221

PO Number: None Given
Sample Date: 15-APR-2019
Total Samples: 30

Samples Analyzed for this report
Beginning Laboratory ID Number: 2019-04-0226
Ending Laboratory ID Number: 2019-04-0255

Sample Set Number
2019-1972

The bulk samples submitted were analyzed for asbestos content using Polarized Light Microscopy (PLM). Analysis was performed in accordance with Appendix E to Subpart E of 40 CFR Part 763 and EPA/600/R93/116.

The test results pertain only to the samples submitted for analysis. Unless otherwise noted, the samples were inhomogeneous; subsamples of components were analyzed to achieve representative analysis. Separate layers of layered samples were analyzed and reported separately. Unless otherwise stated, asbestos content was quantified by calibrated visual estimation (CVES). CVES concentrations are reported in two to three percent ranges for fiber concentrations ranging from one to ten percent, and usually five percent ranges for concentrations greater than ten percent. Samples in which asbestos was not observed are reported as "None Detected".

Limitations and Uncertainty:

Factors such as sample quality, sample size, interfering matrix material, fiber size, and fiber concentration contribute to the uncertainty in asbestos concentration estimates in bulk materials. Relative errors exceeding 100% may occur in samples containing less than ten percent asbestos. Relative errors are typically below thirty percent in samples having greater than ten percent asbestos, and approach zero as asbestos concentrations approach 100%.

Asbestos fibers with diameters less than approximately 0.25 microns are not detectable by PLM. Fibers with larger diameters may not be visible if obscured by interfering matrix materials. These extremely fine fibers may occur in floor tiles, adhesives, products with cement binders, and other non-friable or semi-friable materials. This limitation can be overcome using alternate analytical methods, such as Transmission Electron Microscopy (TEM).

This report cannot be represented by the customer to claim product endorsement by the National Voluntary Accreditation Program (NVLAP), or any agency of the United States government. This report shall not be reproduced except in full without written permission from Pacific Rim Environmental, Inc. (PacRim).

NVLAP Accredited Lab #: 101631-0

Samples Submitted by: PacRim

Report

Reviewed by:

William F. Golloway
Approved Signatory



Pacific Rim Environmental Inc. Bulk Sample Analysis Report



Page: 2 of 8

Customer Name: GeoEngineers, Inc.
Customer Project Number: None Given
Project Name: Port of Anacortes Quite Cove Site
Sample Date: 15-APR-2019
Report Date: 4/24/2019
Report By: William F. Golloway

Sample Set Number
2019-1972

PacRim Number: 16596
Report Number: 2019-04-0226
Date Received: 4/17/2019
Analysis Start Date: 4/22/2019
Analysis End Date: 4/24/2019
Analyst(s): Sandra H. Rice

Field Sample Number: 1
Lab ID: 2019-04-0226
Field Sample Description: Sheetrock (GWB)
Field Sample Location: Garage 1, area 1, east wall.
Analyst: SHR
Analysis Date: 4/22/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
Layer: 1 White chalky wall texture with white paint	None Detected	Cellulose <1%	Binder, Mineral Aggregate
Layer: 2 White chalky drywall with paper backing	None Detected	Cellulose 35-40%	Binder, Mineral Aggregate

Field Sample Number: 2
Lab ID: 2019-04-0227
Field Sample Description: Coatings On corrugated tin.
Field Sample Location: Garage 1, area 2, North wall.
Analyst: SHR
Analysis Date: 4/22/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
White/silver/grey inseparable textured coatings	Tremolite <1%	Talc 1-3% Cellulose <1%	Binder, Mineral Aggregate

Field Sample Number: 3
Lab ID: 2019-04-0228
Field Sample Description: Coatings On corrugated tin roof.
Field Sample Location: Garage 1 roof.
Analyst: SHR
Analysis Date: 4/22/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
White/silver/grey inseparable textured coating	None Detected	Cellulose <1%	Binder, Mineral Aggregate

Field Sample Number: 4
Lab ID: 2019-04-0229
Field Sample Description: Flooring sheet vinyl
Field Sample Location: Garage 1, bathroom floor.
Analyst: SHR
Analysis Date: 4/22/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
Layer: 1 Grey/white sheet vinyl flooring	None Detected	No Other Fibers Detected	Vinyl, Binder, Mineral Aggregate
Layer: 2 Off-white fibrous backing	None Detected	Cellulose 20-25% Fibrous Glass 7-10%	Binder, Mineral Aggregate

Field Sample Number: 5
Lab ID: 2019-04-0230
Field Sample Description: Waterproofing felt
Field Sample Location: Garage 1, at shed roof.
Analyst: SHR
Analysis Date: 4/22/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
Dark brown/black fibrous roofing felt	None Detected	Cellulose <1% Fibrous Glass 25-30%	Binder, Mineral Aggregate



Pacific Rim Environmental Inc.

Bulk Sample Analysis Report



Page: 3 of 8

Customer Name: GeoEngineers, Inc.
Customer Project Number: None Given
Project Name: Port of Anacortes Quite Cove Site
Sample Date: 15-APR-2019
Report Date: 4/24/2019
Report By: William F. Golloway

PacRim Number: 16596
Report Number: 2019-04-0226
Date Received: 4/17/2019
Analysis Start Date: 4/22/2019
Analysis End Date: 4/24/2019
Analyst(s): Sandra H. Rice

Field Sample Number: 6 Field Sample Description: rolled roofing Field Sample Location: Garage 1, at shed roof. Analyst: SHR
Lab ID: 2019-04-0231 Analysis Date: 4/22/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
Dark brown/black fibrous roofing felt and mastic	None Detected	Cellulose 25-30%	Binder, Mineral Aggregate

Field Sample Number: 7 Field Sample Description: Putty / caulk Field Sample Location: Garage 1, at shed roof to corrugated wall penetration. Analyst: SHR
Lab ID: 2019-04-0232 Analysis Date: 4/22/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
Black fibrous tarry roofing mastic with grey paint	Chrysotile 7-10%	No Other Fibers Detected	Binder, Mineral Aggregate

Field Sample Number: 8 Field Sample Description: rolled roofing Field Sample Location: Garage 2 roof. Analyst: SHR
Lab ID: 2019-04-0233 Analysis Date: 4/22/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
Layer: 1 Black fibrous roofing felt and mastic with green/white aggregate	None Detected	Cellulose <1% Fibrous Glass 20-25%	Binder, Mineral Aggregate
Layer: 2 Tan sticky adhesive	None Detected	Cellulose <1%	Binder, Mineral Aggregate

Field Sample Number: 9 Field Sample Description: Waterproofing felt Field Sample Location: Garage 2 roof. Analyst: SHR
Lab ID: 2019-04-0234 Analysis Date: 4/22/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
Dark brown fibrous roofing felt	None Detected	Cellulose 45-50%	Binder, Mineral Aggregate

Field Sample Number: 10 Field Sample Description: Window Putty Field Sample Location: Garage 2 west exterior. Analyst: SHR
Lab ID: 2019-04-0235 Analysis Date: 4/22/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
White fibrous brittle window putty	Tremolite <1%	Cellulose <1%	Binder, Mineral Aggregate



Pacific Rim Environmental Inc.

Bulk Sample Analysis Report



Page: 4 of 8

Customer Name: GeoEngineers, Inc. PacRim Number: 16596
 Customer Project Number: None Given Report Number: 2019-04-0226
 Project Name: Port of Anacortes Quite Cove Site Date Received: 4/17/2019
 Sample Date: 15-APR-2019 Analysis Start Date: 4/22/2019
 Report Date: 4/24/2019 Sample Set Number: 2019-1972 Analysis End Date: 4/24/2019
 Report By: William F. Golloway Analyst(s): Sandra H. Rice

Field Sample Number: **11** Field Sample Description: Putty / caulk Field Sample Location: Garage 2, at west exterior, at corrugated tin to fiberglass seam, of wall. Analyst: SHR
 Lab ID: **2019-04-0236** Analysis Date: 4/22/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
Grey/clear rubbery caulk with white/silver paint/coating	None Detected	Cellulose 1-3% Fibrous Glass <1%	Binder, Mineral Aggregate

Field Sample Number: **12** Field Sample Description: Texture on GWB Field Sample Location: Garage 2, coat storage area, ceiling. Analyst: SHR
 Lab ID: **2019-04-0237** Analysis Date: 4/22/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
Layer: 1 Yellow textured ceiling paint/coating	None Detected	Cellulose <1%	Perlite, Binder, Mineral Aggregate
Layer: 2 White chalky drywall with paper backing	None Detected	Cellulose 35-40% Fibrous Glass 1-3%	Binder, Mineral Aggregate

Field Sample Number: **13** Field Sample Description: Texture on GWB Field Sample Location: Garage 2, at coat storage area, ceiling. Analyst: SHR
 Lab ID: **2019-04-0238** Analysis Date: 4/22/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
Layer: 1 Yellow textured ceiling paint	None Detected	Cellulose <1%	Perlite, Binder, Mineral Aggregate
Layer: 2 White chalky drywall with paper backing	None Detected	Cellulose 35-40% Fibrous Glass 1-3%	Mica, Binder, Mineral Aggregate

Field Sample Number: **14** Field Sample Description: Gypsum Wall Board/Tape/Joint Compound Field Sample Location: Garage 2, east wall. Analyst: SHR
 Lab ID: **2019-04-0239** Analysis Date: 4/22/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
Layer: 1 White joint compound with white paint	None Detected	Cellulose <1%	Glass fragments, Binder, Mineral Aggregate
Layer: 2 White chalky drywall with paper backing	None Detected	Cellulose 25-30%	Binder, Mineral Aggregate
Layer: 3 Light pink fibrous insulation	None Detected	Fibrous Glass 90-95%	Binder



Pacific Rim Environmental Inc.

Bulk Sample Analysis Report



Testing
NVLAP Lab Code 101631-0

Page: 5 of 8

Customer Name: GeoEngineers, Inc.

Customer Project Number: None Given

Project Name: Port of Anacortes Quite Cove Site

Sample Date: 15-APR-2019

Report Date: 4/24/2019

Report By: William F. Golloway

PacRim Number: 16596

Report Number: 2019-04-0226

Date Received: 4/17/2019

Analysis Start Date: 4/22/2019

Analysis End Date: 4/24/2019

Analyst(s): Sandra H. Rice

Field Sample Number: **15**

Lab ID: **2019-04-0240**

Field Sample Description:

Texture on GWB

Field Sample Location:

Office 1 ceiling.

Analyst: SHR

Analysis Date: 4/23/2019

Lab Sample Description

Asbestos Type/%

Non-Asbestos Fibers

Non-Fibrous Materials

Layer: 1 Yellow textured ceiling paint

None Detected

Cellulose <1%

Perlite, Binder, Mineral Aggregate

Layer: 2 White chalky drywall with paper backing

None Detected

Cellulose 30-35%
Fibrous Glass 1-3%

Binder, Mineral Aggregate

Field Sample Number: **16**

Lab ID: **2019-04-0241**

Field Sample Description:

Texture on GWB

Field Sample Location:

Office 1, ceiling.

Analyst: SHR

Analysis Date: 4/23/2019

Lab Sample Description

Asbestos Type/%

Non-Asbestos Fibers

Non-Fibrous Materials

Layer: 1 Yellow textured ceiling paint

None Detected

Cellulose <1%

Perlite, Binder, Mineral Aggregate

Layer: 2 White chalky joint compound

None Detected

Cellulose <1%

Binder, Mineral Aggregate

Layer: 3 White chalky drywall with paper backing

None Detected

Cellulose 40-45%
Fibrous Glass <1%

Binder, Mineral Aggregate

Field Sample Number: **17**

Lab ID: **2019-04-0242**

Field Sample Description:

Texture on GWB

Field Sample Location:

Office 1, ceiling.

Analyst: SHR

Analysis Date: 4/23/2019

Lab Sample Description

Asbestos Type/%

Non-Asbestos Fibers

Non-Fibrous Materials

Layer: 1 Yellow textured ceiling paint

None Detected

No Other Fibers Detected

Perlite, Binder, Mineral Aggregate

Layer: 2 White chalky drywall with paper backing

None Detected

Cellulose 45-50%
Fibrous Glass 1-3%

Binder, Mineral Aggregate

Field Sample Number: **18**

Lab ID: **2019-04-0243**

Field Sample Description:

Sheetrock (GWB)

Field Sample Location:

Office 1, south wall.

Analyst: SHR

Analysis Date: 4/23/2019

Lab Sample Description

Asbestos Type/%

Non-Asbestos Fibers

Non-Fibrous Materials

White chalky drywall with paper backing and white paint

None Detected

Cellulose 40-45%
Fibrous Glass 1-3%

Mica, Binder, Mineral Aggregate



Pacific Rim Environmental Inc.

Bulk Sample Analysis Report



Page: 6 of 8

Customer Name: GeoEngineers, Inc.

Customer Project Number: None Given

Project Name: Port of Anacortes Quite Cove Site

Sample Date: 15-APR-2019

Report Date: 4/24/2019

Report By: William F. Golloway

PacRim Number: 16596

Report Number: 2019-04-0226

Date Received: 4/17/2019

Analysis Start Date: 4/22/2019

Analysis End Date: 4/24/2019

Analyst(s): Sandra H. Rice

Field Sample Number: 19

Lab ID: 2019-04-0244

Field Sample Description:

Coatings silver on black.

Field Sample Location:

On roof corrugated tin of office 1 entry.

Analyst: SHR

Analysis Date: 4/23/2019

Lab Sample Description

Asbestos Type/%

Non-Asbestos Fibers

Non-Fibrous Materials

Layer: 1 Silver roof coating

None Detected

Cellulose <1%
Fibrous Glass 1-3%

Binder, Mineral Aggregate

Layer: 2 Black fibrous tarry roofing mastic

Chrysotile 10-15%

Cellulose <1%
Fibrous Glass 3-5%

Binder, Mineral Aggregate

Field Sample Number: 20

Lab ID: 2019-04-0245

Field Sample Description:

Coatings silver on black.

Field Sample Location:

At front door entry of office 2 roof corrugated tin.

Analyst: SHR

Analysis Date: 4/23/2019

Lab Sample Description

Asbestos Type/%

Non-Asbestos Fibers

Non-Fibrous Materials

Layer: 1 Silver roof coating

None Detected

Cellulose <1%

Binder, Mineral Aggregate

Layer: 2 Black fibrous tarry roofing mastic with white/tan paint

Chrysotile 3-5%

Cellulose <1%

Binder, Mineral Aggregate

Field Sample Number: 21

Lab ID: 2019-04-0246

Field Sample Description:

Window Putty

Field Sample Location:

Office 2, to the right of front entry.

Analyst: SHR

Analysis Date: 4/23/2019

Lab Sample Description

Asbestos Type/%

Non-Asbestos Fibers

Non-Fibrous Materials

Layer: 1 White malleable window putty with light grey paint

Tremolite <1%

Cellulose <1%

Binder, Mineral Aggregate

Layer: 2 Brown woody substrate

None Detected

No Other Fibers Detected

Wood, Binder

Field Sample Number: 22

Lab ID: 2019-04-0247

Field Sample Description:

Carpet Mastic

Field Sample Location:

Office 2 floor.

Analyst: SHR

Analysis Date: 4/23/2019

Lab Sample Description

Asbestos Type/%

Non-Asbestos Fibers

Non-Fibrous Materials

Yellow/tan fibrous carpet mastic

None Detected

Cellulose <1%
Synthetics 1-3%

Binder, Mineral Aggregate

Field Sample Number: 23

Lab ID: 2019-04-0248

Field Sample Description:

Sheetrock (GWB)

Field Sample Location:

Office 2, south wall.

Analyst: SHR

Analysis Date: 4/23/2019

Lab Sample Description

Asbestos Type/%

Non-Asbestos Fibers

Non-Fibrous Materials

White chalky drywall with paper backing and white paint

None Detected

Cellulose 30-35%
Fibrous Glass 3-5%

Binder, Mineral Aggregate



Pacific Rim Environmental Inc.

Bulk Sample Analysis Report



Page: 7 of 8

Customer Name: GeoEngineers, Inc.
Customer Project Number: None Given
Project Name: Port of Anacortes Quite Cove Site
Sample Date: 15-APR-2019
Report Date: 4/24/2019
Report By: William F. Golloway

Sample Set Number
2019-1972

PacRim Number: 16596
Report Number: 2019-04-0226
Date Received: 4/17/2019
Analysis Start Date: 4/22/2019
Analysis End Date: 4/24/2019
Analyst(s): Sandra H. Rice

Field Sample Number: 24
Lab ID: 2019-04-0249

Field Sample Description:
Ceiling tile, 31 inch by 16
inch .

Field Sample Location:
Office 2 ceiling.

Analyst: SHR
Analysis Date: 4/23/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
------------------------	-----------------	---------------------	-----------------------

Light brown fibrous ceiling tile
with white paint

None Detected

Cellulose 80-85%

Binder, Mineral Aggregate

Field Sample Number: 25
Lab ID: 2019-04-0250

Field Sample Description:
Ceiling tile 12" x 12"

Field Sample Location:
Office 2 , storage Room
ceiling.

Analyst: SHR
Analysis Date: 4/23/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
------------------------	-----------------	---------------------	-----------------------

Light brown fibrous ceiling tile
with white paint

None Detected

Cellulose 75-80%

Binder, Mineral Aggregate

Field Sample Number: 26
Lab ID: 2019-04-0251

Field Sample Description:
Sheetrock (GWB)

Field Sample Location:
Office 2 storage area East
wall.

Analyst: SHR
Analysis Date: 4/23/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
------------------------	-----------------	---------------------	-----------------------

White chalky drywall with paper
backing and white paint

None Detected

Cellulose 30-35%
Fibrous Glass 1-3%

Binder, Mineral Aggregate

Field Sample Number: 27
Lab ID: 2019-04-0252

Field Sample Description:
Flooring sheet vinyl, 2
inseparable layers.

Field Sample Location:
Office 2 storage Room
floor.

Analyst: SHR
Analysis Date: 4/24/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
------------------------	-----------------	---------------------	-----------------------

Layer: 1 Grey/tan/white sheet vinyl
flooring

None Detected

No Other Fibers Detected

Vinyl, Binder, Mineral
Aggregate

Layer: 2 White fibrous backing

None Detected

Cellulose 20-25%
Fibrous Glass 3-5%

Binder, Mineral Aggregate

Layer: 3 Yellow sticky mastic

None Detected

Cellulose 1-3%

Binder, Mineral Aggregate

Layer: 4 Yellow/brown sheet vinyl
flooring

None Detected

No Other Fibers Detected

Binder, Vinyl, Mineral
Aggregate

Layer: 5 White fibrous backing

Chrysotile 35-40%

Cellulose 7-10%

Binder, Mineral Aggregate

Layer: 6 Brown brittle mastic

None Detected

Cellulose 1-3%

Binder, Mineral Aggregate

Layer: 7 Brown woody subfloor material

None Detected

No Other Fibers Detected

Wood, Binder



Pacific Rim Environmental Inc.

Bulk Sample Analysis Report



Testing
NVLAP Lab Code 101631-0

Page: 8 of 8

Customer Name: GeoEngineers, Inc.

Customer Project Number: None Given

Project Name: Port of Anacortes Quite Cove Site

Sample Date: 15-APR-2019

Report Date: 4/24/2019

Report By: William F. Golloway

PacRim Number: 16596

Report Number: 2019-04-0226

Date Received: 4/17/2019

Analysis Start Date: 4/22/2019

Analysis End Date: 4/24/2019

Analyst(s): Sandra H. Rice

Field Sample Number: 28

Lab ID: 2019-04-0253

Field Sample Description:

Sheetrock (GWB)

Field Sample Location:

Garage 1, bathroom,
north wall.

Analyst: SHR

Analysis Date: 4/24/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
White chalky drywall with paper backing and white paint	None Detected	Cellulose 35-40% Fibrous Glass 1-3%	Binder, Mineral Aggregate

Field Sample Number: 29

Lab ID: 2019-04-0254

Field Sample Description:

Roofing tar

Field Sample Location:

At the North West corner
of office 2, on cement
slab.

Analyst: SHR

Analysis Date: 4/24/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
Black fibrous tarry roofing mastic	Chrysotile 1-3%	Cellulose 3-5%	Binder, Mineral Aggregate

Field Sample Number: 30

Lab ID: 2019-04-0255

Field Sample Description:

Vapor Barrier brown brittle.

Field Sample Location:

Around the top of the
outside of the ceiling of
office 2.

Analyst: SHR

Analysis Date: 4/24/2019

Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
Brown fibrous vapor barrier	None Detected	Cellulose 85-90%	Binder

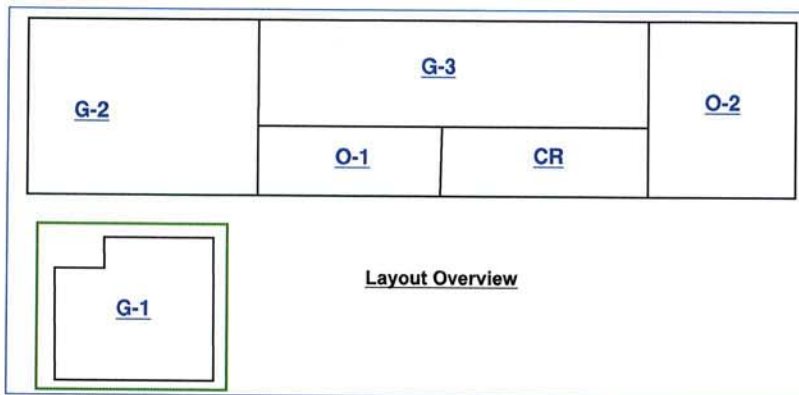
Appendix C: Sample Location Drawing

Site Sketch

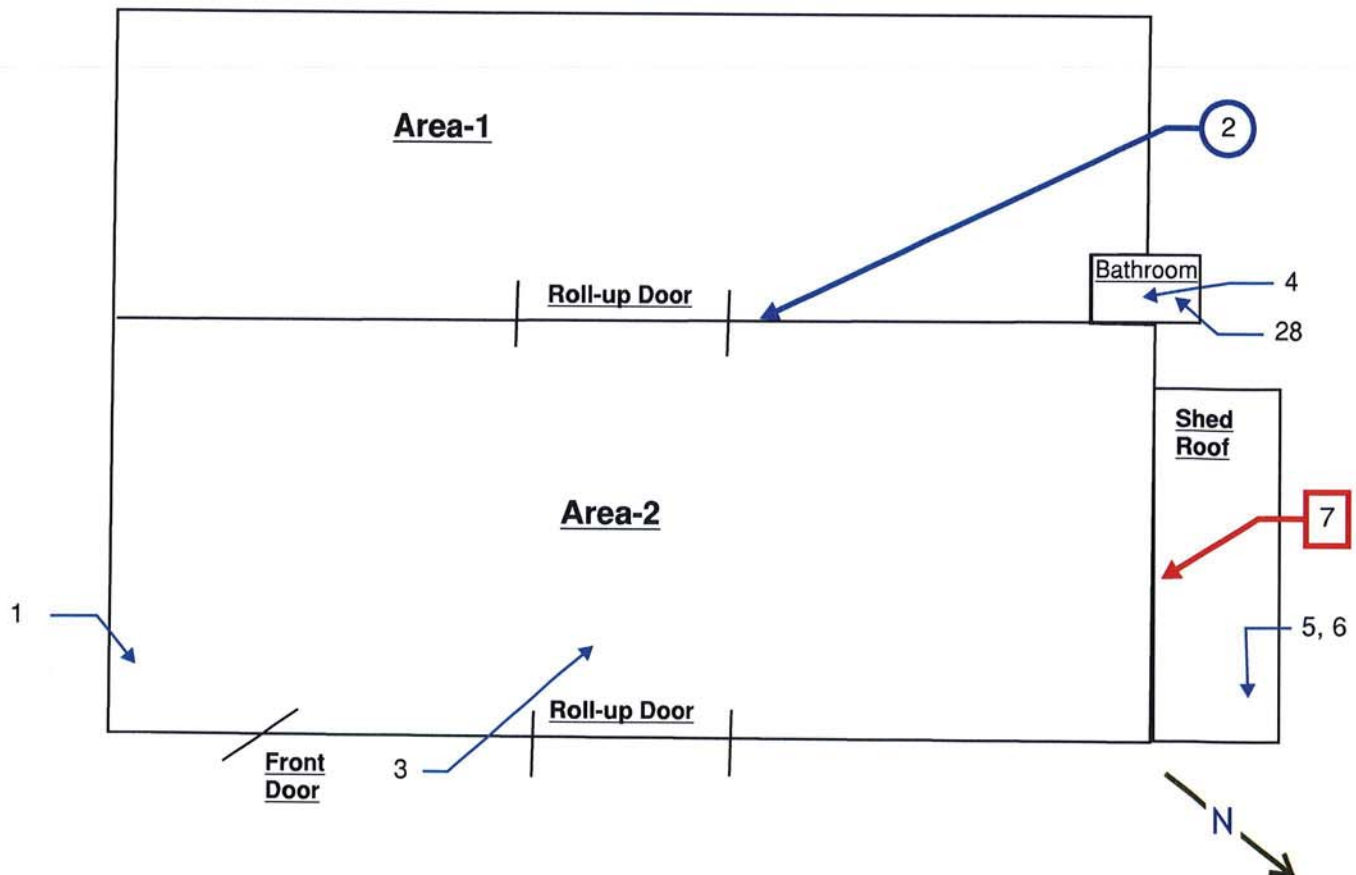
Samples positive for asbestos appear in squares EX: #

Visual samples presumed to be asbestos-containing appear in triangles EX: #

Samples less than one percent asbestos appear in circles EX: #



Garage-1



GeoEngineers, Inc.

Port of Anacortes
Quite Cove
202 O Avenue
Anacortes, WA 98122

Pacific Rim Environmental, Inc.

6510 Southcenter Boulevard, #40
Seattle, WA 98188

Tel. (206) 244-8965

pacrimenv.com

Project # : 16596

Drawing # : 01 of 04

Sampling Date: 4/15/19

Drawing by : M. Sandefur

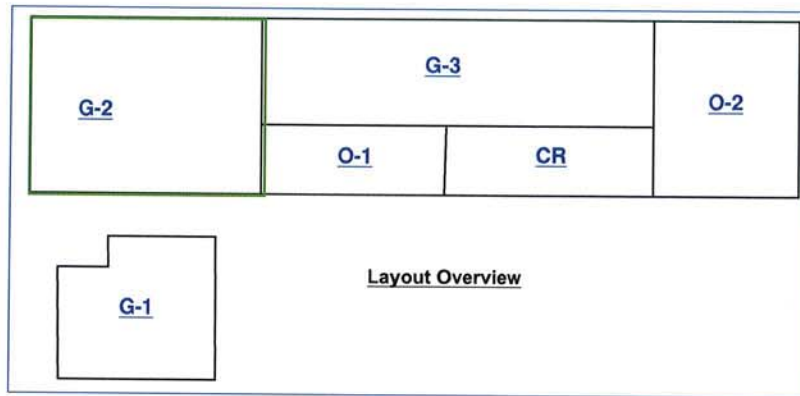
Drawing Not To Scale

Site Sketch

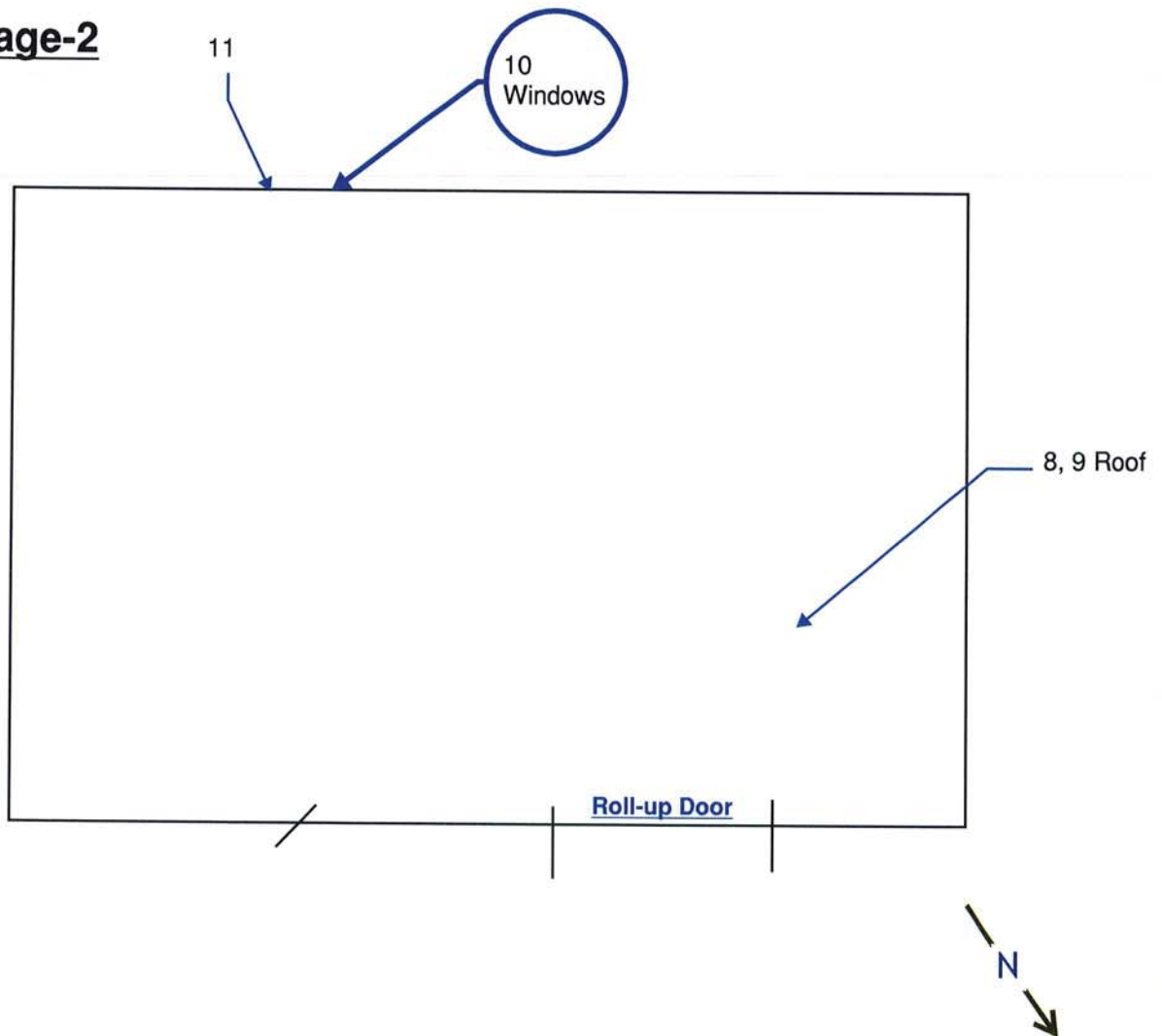
Samples positive for asbestos appear in squares EX: #

Visual samples presumed to be asbestos-containing appear in triangles EX: #

Samples less than one percent asbestos appear in circles EX: #



Garage-2



GeoEngineers, Inc.

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Project # : 16596

Drawing # : 02 of 04

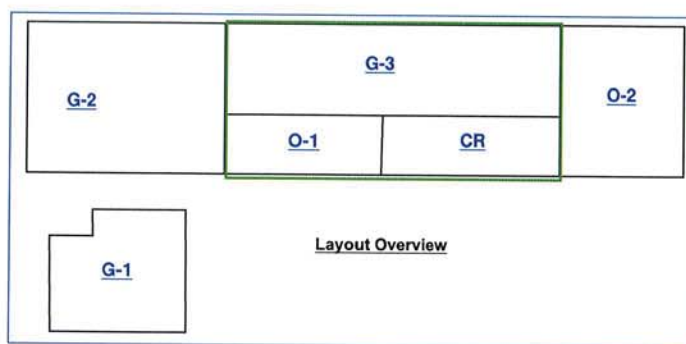
Sampling Date: 4/15/19

Drawing by : M. Sandefur

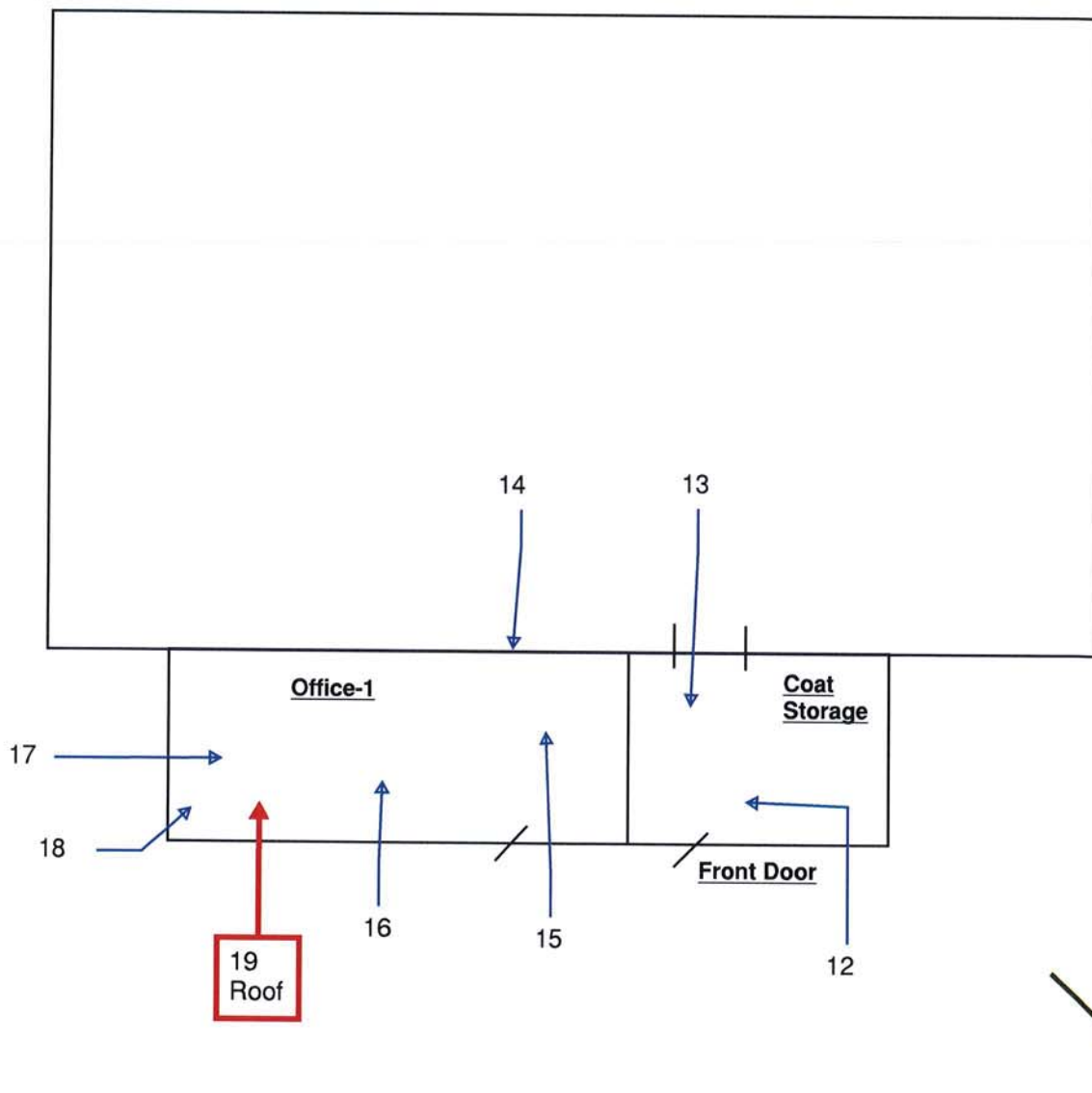
Drawing Not To Scale

Site Sketch

Samples positive for asbestos appear in squares EX: #
 Visual samples presumed to be asbestos-containing appear in triangles EX: #
 Samples less than one percent asbestos appear in circles EX: #



Garage-3



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Project # : 16596

Drawing # : 03 of 04

Sampling Date: 4/15/19

Drawing by : M. Sandefur

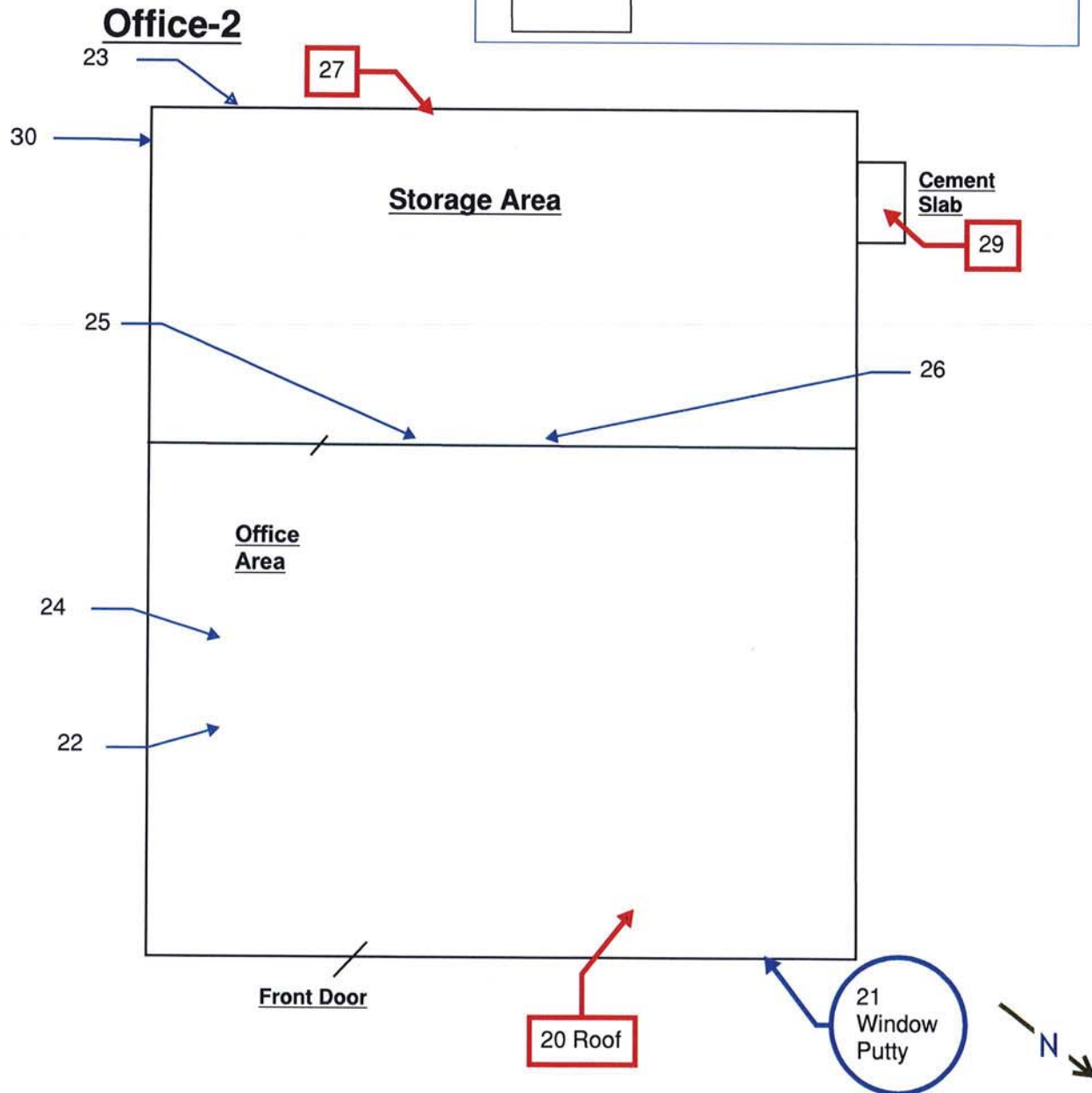
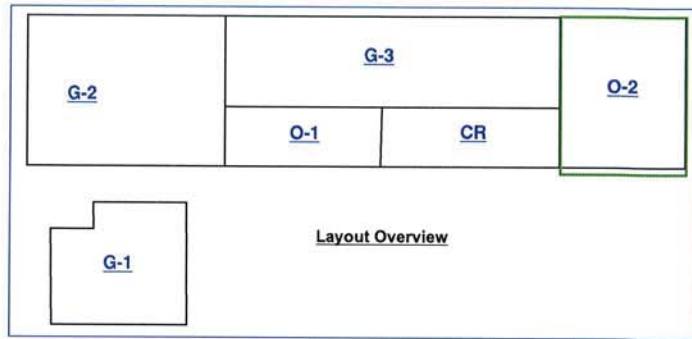
Drawing Not To Scale

Site Sketch

Samples positive for asbestos appear in squares EX: #

Visual samples presumed to be asbestos-containing appear in triangles EX: #

Samples less than one percent asbestos appear in circles EX: #



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Project # : 16596

Drawing # : 04 of 04

Sampling Date: 4/15/19

Drawing by : M. Sandefur

Drawing Not To Scale

Appendix D: Lead-Based Paint (XRF) Data Sheets



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Lead-Based Paint (XRF) Data Sheet

Client:	GeoEngineers, Inc.	XRF Serial #:	80662
Project:	Port of Anacortes Quite Cove Site	Inspection Date:	15-Apr-2019
Project Address:	Seattle, WA	Inspection By:	Matt DeDominces
Reviewed by:	Allison Lewis	Pacrim Job#	16596

Sample#	Calibration	Substrate	Component/Side	Description/Location	Color	Result*	Pb mg/cm ²
4	Yes					Positive	1.2
5	Yes					Positive	1.0
6	Yes					Positive	1.0
7		Wood	Vertical siding	Garage 1, south wall.	Gray	Negative	.00
8		Metal	Corrugated tin wall.	Garage 1, west wall.	Gray	Positive	11.0
9		Metal	Corrugated tin wall	Garage 1 East wall.	Gray	Positive	6.0
10		Metal	Roll up door	Garage 1, north side.	Gray	Negative	.00
11		Wood	Garage door casing	Garage 1, north side.	Gray	Negative	.00
12		Wood	Door	Garage 1, front door.	Gray	Negative	.00
13		Wood	Window casing	Garage 1, north side.	White	Negative	.00
14		Metal	Door	Garage 1, bathroom.	White	Negative	.04
15		Wood	Wall	Garage 1, bathroom south wall.	White	Positive	1.5

PacRim #16596 Page 1/4

* HUD standard is 1.0 mg/cm² WISHA standard is any amount of lead is considered lead containing material
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Sample#	Calibration	Substrate	Component/Side	Description/Location	Color	Result*	Pbc mg/cm ²
16		Wood	Old bathroom door casing.	Garage 1, bathroom.	White	Positive	15.6
17		Wood	Wall bead board.	Garage 1, east wall.	White	Positive	18.7
18		Wood	Bead board wall.	Garage 1, west wall.	White	Positive	15.8
19		Concrete	Floor	Garage 1, area 1.	Gray	Negative	.08
20		Metal	Corrugated tin wall.	Garage 1, area 2, north wall.	White	Positive	5.1
21		Wood	Wall	Garage 1, area 1, north wall.	White	Negative	.00
22		Wood	Wall	Garage 2, east wall.	Gray	Negative	.00
23		Metal	Door	Garage 2, east side.	Gray	Negative	.00
24		Metal	Corrugated tin wall	Garage 2, south wall.	Gray	Negative	.12
25		Wood	Roof rake facia.	Garage 1. West end.	White	Positive	1.5
26		Wood	Horizontal facia.	Garage 1 north side.	White	Positive	6.3
27		Metal	Corrugated metal roof	Garage 1, roof.	White	Negative	.12
28		Metal	Corrugated tin wall	Garage 2, north wall.	Silver	Positive	10.1
29		Metal	Corrugated metal tin wall.	Garage 2, west wall.	Gray	Negative	-0.22
30		Wood	Wall	Garage 2, north wall.	Green	Negative	.00
31		Wood	Rake facia.	Garage 2 north side.	White	Positive	2.5
32		Wood	Horizontal facia.	At Office 1	White	Negative	.07

PacRim #16596 Page 2/4

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Sample#	Calibration	Substrate	Component/Side	Description/Location	Color	Result*	Pbc mg/cm ²
33		Metal	Corrugated tin roof	At Office 1	Silver	Negative	.18
34		Metal	Gutter	At Office 1	White	Negative	.01
35		Wood	Vertical siding	Office 1, at east wall.	Gray	Negative	.05
36		Wood	Window trim	At office 1, east side.	White	Negative	.00
37		Wood	Roof vent soffit.	At office 1 east side.	White	Negative	.00
38		Metal	Corrugated tin wall siding.	North wall of office 2	Gray	Negative	.24
39		Wood	Window trim.	Office 1 at North wall window 1	White	Negative	.00
40		Drywall	Wall	Office 1 West wall.	White	Negative	.00
41		Metal	Cabinet face.	Office 1 on West wall.	White	Negative	.00
42		Drywall	Ceiling	Office 1 ceiling.	Yellow	Negative	.00
43		Metal	Door	Office 1 front door.	Gray	Negative	.00
44		Wood	Door casing	Coat storage area entry.	White	Negative	.00
45		Wood	Door	Coat storage area front entry.	Gray	Negative	.00
46		Drywall	Ceiling	Coat storage area ceiling.	Yellow	Negative	.00
47		Drywall	Wall	Garage 3 East wall.	White	Negative	.00
48		Wood	Wall	Garage 3, north wall.	White	Negative	.01
49		Wood	Floor	Garage 3	Red	Negative	.01

PacRim #16596 Page 3/4

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Sample#	Calibration	Substrate	Component/Side	Description/Location	Color	Result*	Pbc mg/cm ²
50		Wood	Floor	Coat storage area.	White	Negative	.04
51		Wood	Window frame	Office 2 at front entry.	Gray	Positive	2.3
52		Wood	Window sill	Office 2 at front entry.	White	Negative	.10
53		Wood	Deck post	Office 2 at Deck	Gray	Negative	.00
54		Wood	Deck boards	Office 2 front deck.	Gray	Negative	.00
55		Drywall	Wall	Office 2 South wall.	White	Negative	.00
56	Yes					Positive	1.0
57	Yes					Positive	1.1
58	Yes					Positive	1.0

PacRim #16596 Page 4/4

* HUD standard is 1.0 mg/cm² WISHA standard is any amount of lead is considered lead containing material
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Appendix E: XRF Performance Characteristic Sheet

Performance Characteristic Sheet

EFFECTIVE DATE: September 24, 2004

EDITION NO.: 1

MANUFACTURER AND MODEL:

Make: Niton LLC

Tested Model: XLp 300

Source: ^{109}Cd

Note: This PCS is also applicable to the equivalent model variations indicated below, for the Lead-in-Paint K+L variable reading time mode, in the XLi and XLp series:

XLi 300A, XLi 301A, XLi 302A and XLi 303A.

XLp 300A, XLp 301A, XLp 302A and XLp 303A.

XLi 700A, XLi 701A, XLi 702A and XLi 703A.

XLp 700A, XLp 701A, XLp 702A, and XLp 703A.

Note: The XLi and XLp versions refer to the shape of the handle part of the instrument. The differences in the model numbers reflect other modes available, in addition to Lead-in-Paint modes. The manufacturer states that specifications for these instruments are identical for the source, detector, and detector electronics relative to the Lead-in-Paint mode.

FIELD OPERATION GUIDANCE

OPERATING PARAMETERS:

Lead-in-Paint K+L variable reading time mode.

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm² (inclusive)

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm² in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm² film).

If readings are outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instruments into control before XRF testing proceeds.

SUBSTRATE CORRECTION:

For XRF results using Lead-in-Paint K+L variable reading time mode, substrate correction is not needed for:

Brick, Concrete, Drywall, Metal, Plaster, and Wood

INCONCLUSIVE RANGE OR THRESHOLD:

K+L MODE READING DESCRIPTION	SUBSTRATE	THRESHOLD (mg/cm ²)
Results not corrected for substrate bias on any substrate	Brick	1.0
	Concrete	1.0
	Drywall	1.0
	Metal	1.0
	Plaster	1.0
	Wood	1.0

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* ("HUD Guidelines"). Performance parameters shown on this sheet are calculated from the EPA/HUD evaluation using archived building components. Testing was conducted in August 2004 on 133 testing combinations. The instruments that were used to perform the testing had new sources; one instrument's was installed in November 2003 with 40 mCi initial strength, and the other's was installed June 2004 with 40 mCi initial strength.

OPERATING PARAMETERS:

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

SUBSTRATE CORRECTION VALUE COMPUTATION:

Substrate correction is not needed for brick, concrete, drywall, metal, plaster or wood when using Lead-in-Paint K+L variable reading time mode, the normal operating mode for these instruments. If substrate correction is desired, refer to Chapter 7 of the HUD Guidelines for guidance on correcting XRF results for substrate bias.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing. Use the K+L variable time mode readings.

Conduct XRF retesting at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below.

Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. Do not correct the original or retest results for substrate bias. In single-family housing a result is defined as the average of three readings. In multifamily housing, a result is a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF results.

Compute the average of all ten re-test XRF results.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

For the Lead-in-Paint K+L variable reading time mode, the instrument continues to read until it is moved away from the testing surface, terminated by the user, or the instrument software indicates the reading is complete. The following table provides testing time information for this testing mode. The times have been adjusted for source decay, normalized to the initial source strengths as noted above. Source strength and type of substrate will affect actual testing times. At the time of testing, the instruments had source strengths of 26.6 and 36.6 mCi.

Testing Times Using K+L Reading Mode (Seconds)						
	All Data			Median for laboratory-measured lead levels (mg/cm ²)		
Substrate	25 th Percentile	Median	75 th Percentile	Pb < 0.25	0.25 ≤ Pb < 1.0	1.0 ≤ Pb
Wood Drywall	4	11	19	11	15	11
Metal	4	12	18	9	12	14
Brick Concrete Plaster	8	16	22	15	18	16

CLASSIFICATION RESULTS:

XRF results are classified as positive if they are greater than or equal to the threshold, and negative if they are less than the threshold.

DOCUMENTATION:

A document titled *Methodology for XRF Performance Characteristic Sheets* provides an explanation of the statistical methodology used to construct the data in the sheets, and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. For a copy of this document call the National Lead Information Center Clearinghouse at 1-800-424-LEAD.

This XRF Performance Characteristic Sheet was developed by the Midwest Research Institute (MRI) and QuanTech, Inc., under a contract between MRI and the XRF manufacturer. HUD has determined that the information provided here is acceptable when used as guidance in conjunction with Chapter 7, Lead-Based Paint Inspection, of HUD's *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*.



Focus

Universal Waste Rule for Dangerous Waste Lamps WAC 173-303-573

Background

The Universal Waste Rule (UWR) establishes alternative, streamlined waste management standards in place of most of the Dangerous Waste Regulations, Chapter 173-303 WAC, except for, WAC 173-303-050, 173-303-145 and 173-303-960. Universal wastes are certain dangerous wastes that are frequently generated, and that are able to be managed appropriately under less stringent regulatory requirements. The Universal Waste Rule for batteries and mercury-containing thermostats has been in place in Washington State since 1998. For more information on the original UWR, refer to Ecology publication number 98-407 (Revised).

In June 2000, Ecology added lamps that are dangerous waste to the UWR. This rule replaces the "Interim Policy on Waste Management of Spent Fluorescent Light Tubes," dated January 30, 1995.

Universal Waste Categories of Lamps

The types of lamps that may be universal waste include:

- Fluorescent tubes
- High density (HID) lamps (mercury vapor, metal halide, high pressure sodium)
- Compact fluorescent
- Neon lamps¹
- Any other lamps that are dangerous waste

¹"Neon" lamp manufacturers do not always use the inert gas neon, some are manufactured using mercury and phosphor powder.

June 2000

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Publication # 00-04-020

Why Do We Care About Lamps?

Nationally, about 600 million lamps are disposed of annually, most to solid waste disposal facilities, including landfills and solid waste incinerators. In fluorescent lamps, mercury is the main concern and is present in lamps primarily in vapor form.

- The average mercury content in a fluorescent tube manufactured in 1999 is approximately 12 milligrams.
- Pre-1999 manufactured fluorescent tubes can have from 15 to 50 milligrams.
- High intensity discharge lamps may contain up to 250 milligrams, depending on the lamp wattage.

During solid waste handling and disposal many lamps break releasing mercury vapor and potentially exposing solid waste handlers to inhalation of those vapors. Solid waste incineration of mercury containing lamps also releases the mercury into the atmosphere. Mercury in the atmosphere is eventually deposited back to the earth.



Some lamps may also contain lead in the glass and lead solder used in the lamp base. Lead is a toxic metal that may leach from solid waste landfills into the ground water.

Manufacturers are eliminating the lead by using nonleaded glass and solders in newer lamps.

How to Know if a Lamp is Dangerous Waste

Lamps are known to designate as dangerous waste because of their mercury and/or lead content. Lamps may be assumed to be dangerous waste, they may be “book designated” using manufacturers’ information, or they may be designated through sampling and testing.

Certain “green” lamps are available that contain less mercury and do not designate as dangerous waste. Ask your lamp manufacturer for data sheets to use when making waste determinations for these lamps. Check with your local health department, solid waste agency, or landfill for recycling or disposal options.

Should Fluorescent Lamps Still be Used?

YES! Fluorescent tubes use one-quarter of the energy used by incandescent lamps for the same amount of light and last as much as ten times longer than incandescent bulbs. Compact fluorescent lamps last far longer than conventional tubes. The lamps used for lighting streets, playfields, and parking lots should also be selected for energy conservation. Energy conservation reduces mercury emissions from fossil fuel burning power plants. Using less electricity – which we can do by using energy-saving lighting – is the best protection for health and the environment.

Who is Affected by the UWR for Lamps?

- Regulated generators of dangerous waste (Medium Quantity and Large Quantity Generators)
- Businesses that generate or accumulate dangerous waste lamps in regulated quantities (this category may include commercial building/property owners that maintain the lighting for tenants)
- Businesses that provide collection and management services (e.g., lighting contractors)

Regulated generators of dangerous waste generate over 220 pounds of total dangerous waste per month or batch (or 2.2 pounds of extremely hazardous waste), or accumulate greater than 2,200 pounds of dangerous waste (or 2.2 pounds of extremely hazardous waste) at any time. As a point of reference, four (4) four-foot long, linear fluorescent tubes equal approximately 2.2 pounds. It would take about 400 of those tubes to equal 220 pounds and approximately 4,000 of those tubes to equal 2,200 pounds.

NOTE: Small Quantity Generators (SQGs) are exempt from the UWR (they are subject to WAC 173-303-070(8)) and can manage dangerous waste lamps as SQG dangerous waste. Households are also exempt from the rule. Local governments and/or landfills, however, may restrict disposal by SQGs and households. (If a SQG generates dangerous waste lamps in quantities that would put them into a higher generator category, they should choose to manage those lamps as universal waste to retain their SQG status.)

Under the UWR, there are small quantity handlers, large quantity handlers, transporters and destination facilities.

- Handlers are the generators of the universal waste or businesses that receive and collect universal waste before shipping to another handler or to a destination facility.
- Transporters transport the lamps between handlers, or to a destination facility.
- Destination facilities recycle the lamps, or provide treatment, storage and disposal to a dangerous waste landfill.

NOTE: Businesses that generate and manage dangerous wastes and universal wastes are considered both a dangerous waste generator, and a universal waste handler.

Significant Benefits

Benefits for managing dangerous waste lamps as universal waste include:

- Waste is not counted toward waste generation totals to determine generator status.
- Waste is not reported on the Dangerous Waste Annual Report.
- Waste does not need to be manifested when sent off-site.
- Accumulation time limit for universal waste is increased to one year.

What is the Difference Between the 1998 UWR and the UWR with Lamps?

There is one significant difference regarding when a lamp handler becomes a large quantity handler, subject to more requirements:

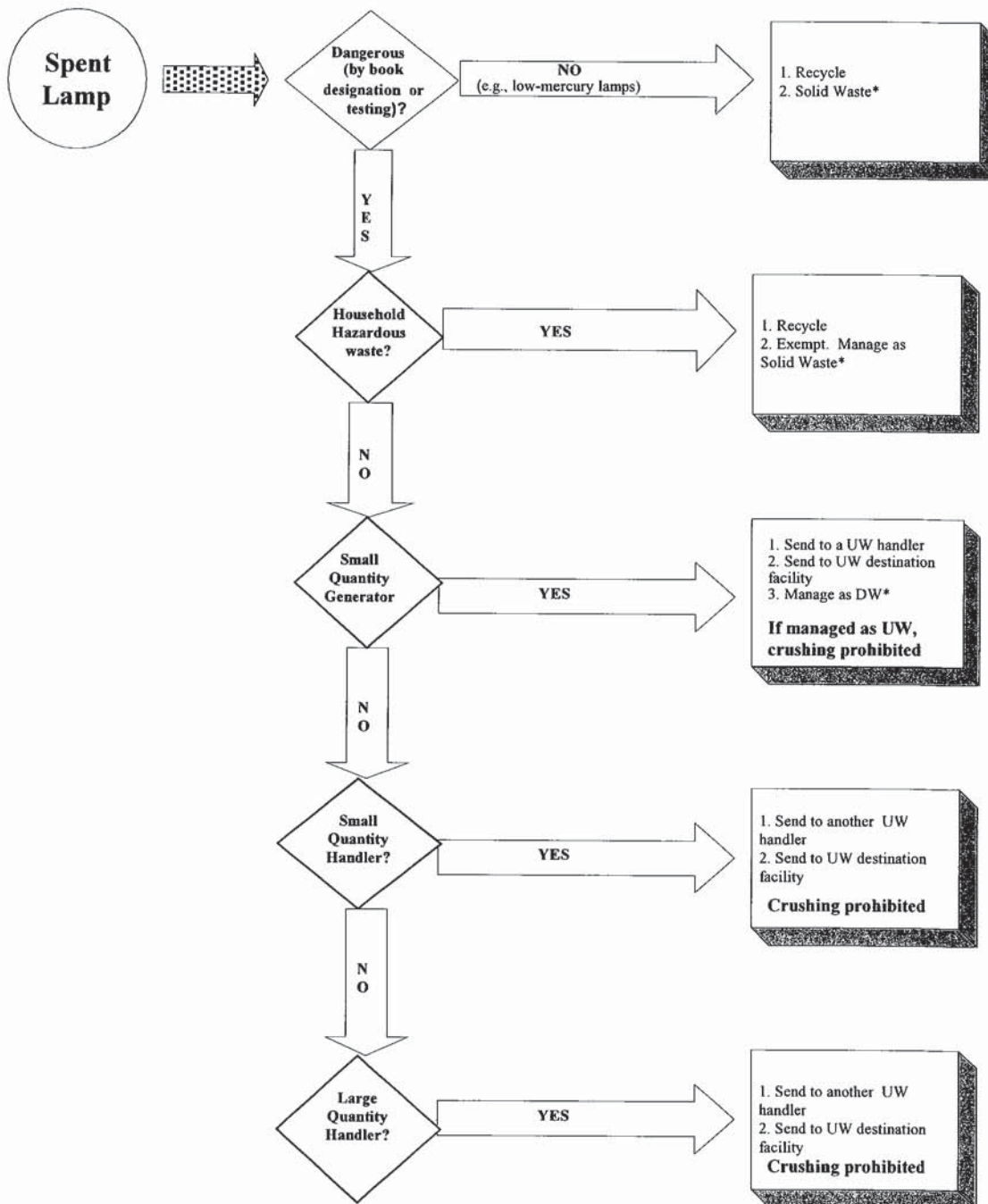
Handler Type	Pre-2000 Rule	New Rule with Lamps
Small Quantity Handler	Accumulate less than 11,000 pounds of Universal Waste	Accumulate less than 2,200 pounds of lamps, or less than 11,000 pounds of total universal waste, including lamps.
Large Quantity Handler	Accumulate 11,000 or more pounds of Universal Waste	Accumulate 2,200 or more pounds of dangerous waste lamps or 11,000 pounds of total universal waste (including lamps)

Is On-Site Lamp Crushing to Reduce Volume Allowed?

Universal waste lamp handlers and transporters cannot dispose of or treat universal waste lamps. **This prohibition on treatment includes lamp crushing.** Lamp crushing is considered a treatment-by-generator activity, subject to full regulation under the *Dangerous Waste Regulations*. Crushed lamps must be managed as dangerous waste unless they are shown to be non-dangerous through the designation process.

Attachment 1

GENERATOR MANAGEMENT OPTIONS FOR WASTE LAMPS



*Check with local health department, solid waste agency or solid waste landfill operator

Attachment 2

UNIVERSAL WASTE LAMP MANAGEMENT REQUIREMENTS

NOTE: Small Quantity Generators (SQGs) are exempt from the UW Rule for shipments of WAC 173-303-0090 and can package dangerous waste lamps as SQG dangerous waste. Having hazardous waste lamps in your facility is not enough to make you a SQG. SQGs are defined as those who generate dangerous waste lamps in quantities that would not require a hazardous waste manifest.

REQUIREMENTS	SMALL QUANTITY HANDLER	LARGE QUANTITY HANDLER	UW TRANSPORTER	UW DESTINATION FACILITY
Notification and EPA I.D.#	Not required	YES	Not required	YES
Immediately contain by placing in a container any lamps showing evidence of leakage, damage, etc.	YES	YES	YES	Regulated as a TSD or 24 hour recycler (WAC 173-303-140, 173-303-141, 173-303-280 through 173-303-525, 173-303-600 through 173-303-695, 173-303-800 through 173-303-840. OR, if a 24 hour recycler, WAC 173-303-120(d)(c)).
Containerize in closed, structurally sound, compatible containers	YES	YES	YES	
Cardboard/fiber containers may be used (inside storage only)	YES	YES		
Container label required: "Waste Lamps", or "Universal Waste Lamps"	YES	YES		
Track length of time since waste lamp generation. Acceptable methods of proof: date on label, inventory system, etc.	YES	YES		
Response to Releases - Contain releases; determine if DW; if so, manage as specified in Chapter 173-303, WAC	YES	YES	YES	
Prohibited from disposing of Universal Waste	YES	YES	YES	
Treatment (includes crushing) prohibited	YES	YES	YES	
Accumulation Time Limit	One year (longer if proved necessary for proper management)	One year (longer if proved necessary for proper management)	10 days or less at UW transfer facility; otherwise becomes UW handler	
Employee Training	Inform appropriate employees of proper handling and emergency procedures	Ensure appropriate employees are thoroughly familiar with proper handling and emergency procedures	Not required under rule, but recommended	
Tracking of Waste Shipments	Recommended, but not required	Keep records (invoice, manifest, etc.) for 3 years of all shipments received and all shipments sent off-site	If UW is hazardous material under 49CFR171.8, describe in shipping papers per 49CFR Part 172	Keep records (invoice, manifest, etc.) for 3 years of all shipments received
Exporting	EPA Acknowledgment of Consent form from receiving country	EPA Acknowledgment of Consent form from receiving country	EPA Acknowledgment of Consent form must accompany shipment	EPA Acknowledgment of Consent form must accompany shipment
If UW is hazardous material under 49CFR171.8, follow applicable Dept. of Transportation regulations in 49CFR Part 171-180	If self-transporting, defined as a Universal Waste Transporter	If self-transporting, defined as a Universal Waste Transporter	YES	If self-transporting, defined as a Universal Waste Transporter

Attachment 3

FREQUENTLY ASKED QUESTIONS ABOUT UNIVERSAL WASTE LAMPS

Q What types of lamps are included in the UW rule?

A The rule includes, but is not limited to, fluorescent tubes, compact fluorescent, mercury vapor, metal halide, high-pressure sodium and neon lamps. The rule targets those lamps that are frequently used by businesses, institutions, government and utilities, and that are known to have hazardous properties that may cause them to be a dangerous waste, such as mercury and lead. Other types of lamps, such as incandescent, may also have hazardous properties, such as lead in the lamp base, that can cause them to be dangerous waste and as such could be managed as universal waste.

Q What is the difference between a generator and a handler under the UW rule?

A Under the universal waste rule a generator of universal waste is also considered a handler. A handler can be the generator of the lamp, or a business that receives, collects and then sends lamps on to another handler, or to a destination facility.

Q What does the UW rule mean for regulated generators of dangerous waste (medium quantity and large quantity generators)?

A Regulated generators of dangerous waste that also generate dangerous waste lamps should begin managing those lamps as universal waste. The benefits of managing the lamps as universal waste include no counting, no manifesting, no reporting on annual reports, and a longer accumulation time. The January 1995 policy on fluorescent tubes is being replaced by the universal waste rule, so regulated generators no longer have the option of sending their dangerous waste fluorescent tubes to a Municipal Solid Waste landfill.

Q A business doesn't generate any other dangerous waste, but they do have a lot of fluorescent lamps that get changed out – how does the UW rule affect them?

A The affect of the rule on the business depends on a few things. The first is whether or not the lamps are dangerous waste. If the lamps are dangerous waste, then the number of lamps generated and the local regulations for business lamp disposal will affect that business. For such a business, the quantity of dangerous waste lamps generated is going to determine their regulatory status. If the business generates more than 220 pounds of lamps at one time or during one month or accumulates more than 2,200 pounds of lamps at any time, then they would become a regulated dangerous waste generator unless they manage the lamps under the universal waste rule. If the business generates less than 220 pounds of dangerous waste lamps, then they would be considered a small quantity generator (SQG) and subject to the less stringent small quantity generator regulations found at WAC 173-303-070(8). They could choose to manage the lamps as universal waste, or choose to manage the lamps as SQG dangerous waste. The business should check with their local health department, solid waste agency or landfill operator for requirements.

Q A business is currently a small quantity generator (SQG) of dangerous waste, how does the UW rule affect them?

A A business that generates dangerous waste at the small quantity generator level may be affected by the rule. If, in addition to other dangerous wastes they generate, they generate or accumulate dangerous waste lamps in quantities that may push them over the SQG quantity exclusion limits, then they should manage those lamps as universal waste to retain their SQG status. If a business generates dangerous wastes, including dangerous waste lamps, under the SQG

quantity exclusion limits, then they may manage the lamps as SQG dangerous waste. The business should check with their local health department, solid waste agency or landfill operator for requirements.

Q Are manufacturers making lamps that are non-dangerous waste?

A The major lamp manufacturers are producing lamps that pass both the federal Toxicity Characteristic Leaching Procedure (TCLP) test and Ecology's static acute fish toxicity test for state criteria. Check with the lamp manufacturer, your local lamp distributor, or lighting contractor for more information on specific lamp models.

Q Can those non-dangerous waste lamps be managed as solid waste or do they need to be managed as universal waste?

A The universal waste rule only requires that dangerous waste lamps be managed as universal waste. Lamp models that have been shown to be non-dangerous waste would be eligible for disposal to a Municipal Solid Waste landfill, subject to local regulations and landfill operator approval. Of course, the non-dangerous waste lamps still have recyclable components, including glass and the aluminum end caps and metal bases. Additionally, these types of "green" lamps still contain mercury, and pass the TCLP not simply because of the lower mercury content, but because there are other unique lamp components or additives that aid in binding up the mercury so that it doesn't leach during the TCLP test. The manufacturers have all stated that removal of the unique components or additives will generally cause these lamps to fail the TCLP. As always, Ecology recommends recycling over disposal.

Q Will on-site lamp crushing to reduce volume space be allowed under the UW rule?

A No, Ecology did not include an on-site lamp crushing management option in the final universal waste rule. During the rule development, it was determined that the as-proposed performance-based lamp crushing standards were not enough to ensure that uncontrolled releases of mercury and other hazardous constituents would not occur from the use of lamp crushing units currently on the market. Because of this, Ecology could not ensure that handlers would be crushing lamps properly and in a way that did not release mercury or other hazardous constituents into the environment. To address this issue, Ecology would need to add layers of complexity to the universal waste rule in explaining such requirements as engineering controls and maintenance schedules. Adding more complex language and requirements would conflict with the purpose of the universal waste management system.

Q What happens if a universal waste lamp handler mismanages universal wastes?

A The universal waste rule is a subset of the full dangerous waste regulations, and a handler that mismanages universal waste is subject to enforcement. A handler that receives universal waste from others and mismanages the waste would be held liable for the actual regulatory violation, but the other handlers would also be responsible for that mismanagement under our state cleanup law, the Model Toxics Control Act. Since universal wastes are still dangerous wastes, persons remain liable under dangerous waste and cleanup regulations for remediation of any releases from universal waste management.

Q Can a handler of universal waste lamps self-transport universal wastes to another handler or destination facility?

A Yes, that handler may self-transport, but in doing so, must meet the UW transporter requirements.

Q **Is a Hazardous Waste Manifest needed if a UW lamp handler chooses to send their UW lamps to a destination facility located in a state that hasn't adopted the universal waste rule for lamps?**

A If those lamps are considered hazardous waste in the state the destination facility is located, then a Hazardous Waste Manifest would be required by the receiving state. Additionally, interstate transport of UW lamps may take the lamps through states that have not adopted the universal waste rule for lamps. Those states that have not adopted the universal waste rule for lamps may require a Hazardous Waste Manifest for the portion of the trip those lamps are in their state. Check with the destination facility and/or the states the lamps will travel through to be sure of the requirements.

Q **Can I be a generator and a handler?**

A Yes, a business that generates dangerous waste, (for example, a flammable solvent) and that generates and manages their universal waste would be considered both a dangerous waste generator and a universal waste handler. A handler of universal waste could also become a generator of dangerous waste. For example, a universal waste handler of lamps may have some lamps break, releasing mercury. The residue from the spill would most likely designate as a dangerous waste and would need managed as such. Residues from such spills could not continue to be managed as universal waste.

Attachment 4

SERVICES DIRECTORY FOR LAMPS AND BALLASTS

The Department of Ecology does not assume any liability for the accuracy or completeness of this information. A listing of a firm in this directory does not constitute a recommendation.

Able Clean-Up Technologies	Spokane	WA	(509) 466-5255	ksilverh2o@email.msn.com	Transportation of lamps and ballasts
Advanced Environmental Solutions	Seattle	WA	(206) 652-2323	justin@advenvironmental.com	Equipment & containers
Big Sky Industrial	Spokane	WA	(509) 624-4949	bigsky@iea.com	Arrange for ballast disposal
Creative Environmental Technologies	Tacoma	WA	(888) 627-3347, (253) 627-3347	ceit@ceitnw.com	Arrange for lamp and ballast transportation
Earth Protection Services	Lake Oswego	OR	(503) 620-2466 (800) 588-7190	earthpro@cyberhighway.net	Lamp recycling and ballast management
Eastern Environmental Technologies	Port Chester	NY	(800) 808-PCBS	eet@erols.com	Lamp recycling and ballast management
Eco Lights NW	Seattle	WA	(206) 343-1247	amyf@totalreclaim.com	Full service lamp recycler and ballast management
Envrotech Systems	Seattle	WA	(800) 922-9395	envsys1@aol.com	Arrange for lamp recycling and ballast disposal
Evergreen Environmental	Aberdeen	WA	(360) 533-6141	LarryM@olynet.com	Arrange for ballast disposal
FBN Enterprises	Kirkland	WA	(425) 820-8115		Arrange for lamp and ballast recycling or disposal
Foss Environmental Services	Seattle	WA	(206) 768-1426	seattleinfo@foss.com	Transportation of lamps and ballasts
Lighting Resources	Phoenix	AZ	(800) 572-9253	ben@voidnet.com	Lamp recycling and ballast management
MCS Environmental	Spokane	WA	(509) 924-9236	mcspok@ez.eznet	Arrange for lamp and ballast recycling or disposal
Mercury Technologies of Minnesota	Pine City	MIN	(800) 864-3821	merctech@ecenet.com	Lamp recycling and ballast management
Midwest Recycling & Recovery Services	Dubuque	IA	(800) 311-9636		Arrange for lamp and ballast recycling or disposal
NSSI Recovery Services	Houston	TX	(713) 641-0391	rdgallagher@nssihouston.com	Limited lamp and ballast disposal services
Nu-Life Industries	Aldergrove	BC	(604) 857-5588	info@nu-life-ind.com	Lamp recycling and non-PCB ballast management
Onyx Environmental Services, LLC	Tukwila	WA	(206) 241-3900 or (800) 334-2387	jim_beck@wastemanagement.com	Transportation of lamps and ballasts

Philip Services	Renton	WA	(425) 227-0311 or (800) 228-7872	londanmay@philip-serv.com	Transportation of lamps and ballasts
Philip Services	Washougal	WA	(800) 547-2436	londanmay@philip-serv.com	Transportation of lamps and ballasts
Phoenix Environmental	Fife	WA	(253) 779-8474		Limited transportation of lamps and ballasts
Prezant Associates	Seattle	WA	(206) 368-4252 or (206) 281-8858	prezant@prezant.com	Industrial hygiene, safety and health consulting
Recyclights West LLC	Glendora Las Vegas	CA NV	(626) 335-3042 (702) 633-7900	recwest@aol.com	Lamp recycling at Las Vegas facility – no ballast management
Romic Environmental	Tacoma	WA	(253) 229-6569	gregc@romic.com	Transportation of lamps and ballasts to CA facility
RTW	University Place	WA	(253) 566-5819	mthinc@foxinternet.net	Arrange for lamp and ballast recycling or disposal
Safety Kleen, Auburn	Auburn	WA	(206) 939-2022		Transportation of lamps and ballasts
Safety Kleen, Lynnwood	Lynnwood	WA	(425) 775-7030		Transportation of lamps and ballasts
Safety Kleen, Pasco	Pasco	WA	(509) 547-8771	mikekendall@safetyskleen.com	Transportation of lamps and ballasts
Safety Kleen, Spokane	Spokane	WA	(509) 928-8353	DavidBlackham@safetyskleen.com	Transportation of lamps and ballasts
Superior Special Services (formerly Salesco Systems)	Phoenix	AZ	(800) 368-9095	mdezelon@ssusa.com	Lamp recycling and ballast management
Van Waters & Rogers, Kent	Kent	WA	(800) 909-4897	kraen.troutman@dw-inc.com	Arrange for lamp recycling and ballast management
Van Waters & Rogers, Spokane	Spokane	WA	(800) 909-4897	ietxp@wr-inc.com	Arrange for lamp recycling and ballast management
WasteXpress	Portland	OR	(503) 224-3206	wastex@easystreet.com	Transportation of lamps and ballasts

Appendix G: Less Than One Percent Asbestos Impact Guidelines



PACIFIC RIM ENVIRONMENTAL, INC.

SEATTLE www.pacrimenv.com ANCHORAGE

Summary of regulatory requirements for materials containing less than 1% asbestos:

Environmental Protection Agency

If less than 1% the EPA does not regulate it as an asbestos-containing material.

Washington State Department of Labor and Industries

Air Monitoring

Exposure monitoring (NEA) – yes
Pre-abatement monitoring - unclear
Post abatement monitoring - unclear

Work Practices and Work Area Control

Regulated area required – yes
Change area required - yes
Warning signs required - yes
Universal controls required - yes

- Wet Methods
- HEPA vacuums
- Prompt Disposal

Leak tight containers required - yes

Personal Protective Equipment

Respirator protection – yes, 1/2 mask APR with HEPA required until air monitoring results determine exposure below PELs
Medical surveillance required – yes, because of negative pressure APR use
Other personal protective equipment – yes, required until air monitoring results determine exposure below PELs

Communication of Hazard

Warning labels on in-place materials required – no
Warning labels on disposal containers – no
Training – 2-hour awareness, hazard communication (specific to situation)
Competent Person required - yes

- Training – unclear how much training is required
- Must have knowledge and authority

Things that are not required:

Labeled bags
Worker or supervisor certification
No pre-demolition removal requirement
No notification to L&I or PSCAA

Appendix H: Inspector / Laboratory Certifications

Certificate of Completion

This is to certify that
Matt R. DeDomines
has satisfactorily completed
4 hours of refresher training as an
AHERA Building Inspector

to comply with the training requirements of
TSCA Title II, 40 CFR 763 (AHERA)

EPA Provider # 1085

169816
Certificate Number



Oct 17, 2018 Expires in 1 year.

Date(s) of Training

Exam Score: N/A
If appropriate:

A handwritten signature in black ink, appearing to read "D. J. White".

Instructor

ARGUS PACIFIC, INC. / 21905 64th AVE W, SUITE 100 / MOUNTLAKE TERRACE, WASHINGTON 98043 / 206.285.3373 / ARGUSPACIFIC.COM

United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 101631-0

Pacific Rim Environmental, Inc.
Tukwila, WA

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services,
listed on the Scope of Accreditation, for:*

Asbestos Fiber Analysis

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality
management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).*

2019-04-01 through 2020-03-31
Effective Dates



For the National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

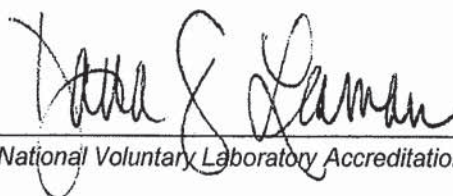
Pacific Rim Environmental, Inc.
6510 Southcenter Boulevard
Suite #40
Tukwila, WA 98188
Mr. William F. Golloway
Phone: 206-244-8965 Fax: 206-244-9096
Email: fgolloway@pacrimenv.com
<http://www.pacrimenv.com>

ASBESTOS FIBER ANALYSIS

NVLAP LAB CODE 101631-0

Bulk Asbestos Analysis

<u>Code</u>	<u>Description</u>
18/A01	EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials



For the National Voluntary Laboratory Accreditation Program

APPENDIX G

Health and Safety Plan

Health and Safety Plan

Quiet Cove Property
Anacortes, Washington
Ecology Agreed Order No. DE 11346

for

**Washington State Department of Ecology
on Behalf of Port of Anacortes**

June 12, 2019



GEOENGINEERS 
Earth Science + Technology

Health and Safety Plan

Quiet Cove Property
Anacortes, Washington
Ecology Agreed Order No. DE 11346

for

**Washington State Department of Ecology
on Behalf of Port of Anacortes**

June 12, 2019



Fourth and Blanchard Building
2101 4th Avenue, Suite 950
Seattle, Washington 98121
206.728.2674

Health and Safety Plan
Quiet Cove Property
Anacortes, Washington
Ecology Agreed Order No. DE 11346

File No. 5147-024-07

June 12, 2019

Prepared for:

Washington State Department of Ecology
P.O. Box 47600
Olympia, Washington 98504-7600

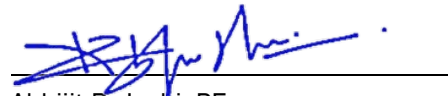
Attention: Arianne Fernandez

On Behalf of:

Brad Tesch
Port of Anacortes
100 Commercial Avenue
Anacortes, Washington 98221

Prepared by:

GeoEngineers, Inc.
Fourth and Blanchard Building
2101 4th Avenue, Suite 950
Seattle, Washington 98121
206.728.2674



Abhijit R. Joshi, PE
Senior Environmental Engineer



John M. Herzog, PhD, LG
Senior Principal

CTB:ARJ:JMH:can

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ATTACHMENTS

- Form 1. Health and Safety Pre-Entry Briefing and Acknowledgement of the Site Health and Safety Plan for GeoEngineers' Employees, Subcontractors and Visitors
- Form 2. Safety Meeting Record
- Form 3. Accident/Exposure Report Form

GEOENGINEERS, INC.
SITE HEALTH AND SAFETY PLAN
QUIET COVE
FILE NO. 5147-024-07

This Health and Safety Plan (HASP) is to be used in conjunction with the GeoEngineers, Inc. (GeoEngineers) Safety Programs. Together, the written safety programs and this HASP constitute the site safety plan for this site. This plan is to be used by GeoEngineers personnel on this site and must be available on site. If the work entails potential exposures to other substances or unusual situations, additional safety and health information will be included, and the plan will need to be approved by the GeoEngineers Health and Safety Program Manager. Plans are to be used in conjunction with current standards and policies outlined in the GeoEngineers Health and Safety Programs.

Liability Clause: If requested by subcontractors, this site HASP may be provided for informational purposes only. In this case, Form 1 shall be signed by the subcontractor. Please be advised that this site-specific HASP is intended for use by GeoEngineers employees only. Nothing herein shall be construed as granting rights to GeoEngineers' subcontractors or any other contractors working on this site to use or legally rely on this HASP. GeoEngineers specifically disclaims any responsibility for the health and safety of any person not employed by the company.

1.0 GENERAL PROJECT INFORMATION

Project Name:	Quiet Cove Property, Interim Cleanup Action (IA)
Project Number:	5147-024-07
Type of Project:	Site preparation including traffic control, erosion and sediment control, demolition, and utility management; remedial excavation including soil handling, stockpiling, transportation and off-site disposal; monitoring well installation; groundwater and soil sampling.
Start/Completion:	IA construction is expected to start in spring/summer 2020 and the construction duration is estimated to be approximately 4 months.
Subcontractors:	Earthwork contractor, Driller, and utility locate contractor

Chain of Command	Title	Name	Telephone Numbers
1	Project Manager	John Herzog	(c) 206.406.6431 (o) 206.239.3252
2	Site Safety Officer	TBD	TBD
3	Field Engineer/Geologist	TBD	TBD
4	Health and Safety Program Manager	Mary Lou Sullivan	(c) 360.633.9821 (o) 253.722.2425
N/A	Current Owner	Brad Tesch Project Coordinator Port of Anacortes	(c) 360.302.0974 (o) 360.299.1830
N/A	Subcontractor(s)	TBD	TBD

1.1. Functional Responsibility

1.1.1. Project Manager

The Project Manager (PM) is responsible for fulfilling contractual and administrative control of the project. The Project Manager's duties include defining the project approach and tasks, selecting project team members and establishing budgets and schedules.

The Project Manager's duties also include implementing the project approach and tasks, overseeing project team members during performance of project tasks, adhering to and communicating the status of budgets and schedules to the Port, providing technical oversight, and providing overall production and review of project deliverables. The Project Manager shall maintain the official, approved Interim Action Work Plan and supporting documents, and shall be responsible for distributing updated documents to the project team.

1.1.2. Site Safety Officer

The Site Safety Officer (SSO) will have the on-site responsibility and authority to modify and stop work, or remove personnel from the site if working conditions change that may affect on-site and off-site health and safety. The SSO will be the main contact for any on-site emergency situation. The SSO is First Aid and CPR qualified, and has current Hazardous Waste Operations and Emergency Response (HAZWOPER) training. The SSO is responsible for implementing and enforcing the project safety program and safe work practices during site activities. The SSO shall conduct daily safety meetings, perform air monitoring as required, conduct site safety inspections as required, coordinate emergency medical care, and ensure personnel are wearing the appropriate personal protective equipment (PPE). The SSO shall have advanced field work experience and shall be familiar with health and safety requirements specific to the project. The SSO has the authority to suspend site activities if unsafe conditions are reported or observed.

Duties of the SSO include the following:

- Implementing the HASP in the field and monitoring compliance with its guidelines by staff.
- Being sure that GeoEngineers field personnel have met the training and medical examination requirements. Advising other contractor employees of these requirements.
- Maintaining adequate and functioning safety supplies and equipment at the site.
- Setting up work zones, markers, signs and security systems, if necessary.
- Performing or supervising air quality measurements. Communicating information on these measurements to GeoEngineers field staff and subcontractor personnel.
- Communicating health and safety requirements and site hazards to field personnel, subcontractors and contractor employees, and site visitors.
- Directing personnel to wear PPE and guiding compliance with health and safety practices in the field.
- Consulting with the PM regarding new or unanticipated site conditions, including emergency response activities. If monitoring detects concentrations of potentially hazardous substances at or above the established exposure limits, notify/consult with the PM. Consult with the PM and the Health and Safety Program Manager (HSM) regarding new or unanticipated site conditions, including emergency

response activities. If field monitoring indicates concentrations of potentially hazardous substances at or above the established exposure limits, the HSM must be notified and corrective action taken.

- Documenting site accidents, illnesses and unsafe activities or conditions, and reporting them to the PM and the HSM.
- Directing decontamination operations of equipment and personnel.

1.1.3. Field Engineer/Geologist

The Field Engineer/Geologist working on-site that has the potential of coming in contact with hazardous substances or physical hazards is responsible for participating in the health and safety program and complying with the site-specific HASP. These personnel are required to:

- Participate and be familiar with the health and safety program as described in this manual.
- Notify the SSO when there is need to stop work to address an unsafe situation.
- Comply with the HASP and acknowledge understanding of the plan.
- Report to the SSO, PM or HSM any unsafe conditions and all facts pertaining to incidents or accidents that could result in physical injury or exposure to hazardous materials.
- Participate in health and safety training, including initial 40-hour Occupational Safety and Health Administration (OSHA) course, annual 8-hour HAZWOPER refresher, and First Aid/cardiopulmonary resuscitation (CPR) training.
- Participate in the medical surveillance program if applicable.
- Schedule and take a respirator fit test annually.
- Any field employee working onsite may stop work if the employee believes the work is unsafe.

1.1.4. Health and Safety Program Manager

The Health and Safety Program Manager (HSM) is responsible for implementing and promoting employee participation in the program. The HSM issues directives, advisories and information regarding health and safety to the technical staff. Additionally, the HSM has the authority to audit on-site compliance with Health and Safety Plans (HASP), suspend work or modify work practices for safety reasons, and dismiss from the site any GeoEngineers or subcontractor employees whose conduct on the site endangers the health and safety of themselves or others.

1.1.5. Port of Anacortes Project Coordinator

The Port of Anacortes (Port) Project Coordinator's duties consist of implementing the project approach and tasks, overseeing the project team members during performance of project tasks.

1.1.6. Subcontractors Under GeoEngineers Supervision

Subcontractors working on the site under GeoEngineers supervision or direct control that have the potential of coming in contact with hazardous substances or physical hazards shall have their own health and safety program that is in line with the site-specific HASP.

1.2. List of Field Personnel and Training

Anticipated field personnel include the following:

- Nate Solomon
- Dexter Chan
- Katy Atakturk

Field personnel will have appropriate training and up to date certifications.

1.3. Site Description

The Quiet Cove property is located at 202 O Avenue in Anacortes, Washington, southeast of Guemes Channel. The property is approximately 0.8 acres in size and is located at the intersection of 2nd Street and O Avenue. The Site is bordered to the north by 2nd Street, east by O Avenue and south by 3rd Street. The western portion of the property borders a Port of Anacortes owned storage yard and a bulk fuel distribution facility owned and operated by Texaco/Reisner.

The Quiet Cove Property is generally flat. The property and surrounding area is paved with concrete or asphalt with the exception of planter strips located on the 2nd and 3rd Street, and O Avenue Rights-of-Way (ROW) and surface areas of 2nd Street, adjacent Port and Texaco/Reisner properties located in the west are primarily contain gravel surface. Stormwater runoff at the Site is collected in catch basins that discharge to the City of Anacortes stormwater system. Currently, two warehouse buildings are present in the northwest portion of the property. One of the warehouse building also has a combined office. A chain link fence surrounds the property preventing general public access. Vehicle and pedestrian access to the property is through gated entrance south of 2nd Street.

1.4. Site History

The property was historically used for bulk fuel distribution from 1909 to at least 1977 (the date when fuel operations ceased is unknown). Fuel (primarily gasoline and diesel) was supplied to the facility from product lines routed from the property north across 2nd Street to the pier face of Curtis Wharf. While operating as a bulk fuel storage and distribution facility, fuel was stored in above ground storage tanks (ASTs) for general distribution. During the late 1970s, the bulk fuel facility was decommissioned and all of the ASTs and associated structures removed. Between 1977 and 2014, the property was operated as a storage yard for marine vessels and recreational vehicles, and leased office and warehouse space to various tents for sales and marine services. In 2013, the property was purchased by the Port as part of their plans for expansion and improvements to the Curtis Wharf International Shipping Terminal.

2.0 WORK PLAN

2.1. Project Description and Objectives

Remedial excavation activities will be completed to remove contaminated soil within the Property boundary where historical uses have resulted in a release or releases to the environment. The scope of work for GeoEngineers includes:

- Observing site preparation activities including installation of temporary traffic controls, erosion and sediment control, demolition of two existing buildings on the Property, utility location and management, etc.
- Assisting the cleanup contractor in identifying the contact between overburden and underlying contaminated soil;
- Identifying the initial limits of excavation based on field screening results;
- Obtaining soil samples from the limits of excavation and submitting soil samples to an Ecology accredited laboratory for chemical analysis;
- Observing excavated material handling, stockpiling and loading activities;
- Oversight of backfill and the placement of oxygen releasing chemicals for enhancing biodegradation of residual contaminants that are expected to remain in place adjacent to the Property in the east, north and west;
- Site restoration oversight following completion of remedial excavation activities;
- Observing installation and development of groundwater monitoring wells following the completion of interim action construction activities; and
- Obtaining groundwater samples from existing and newly installed monitoring wells to evaluate post-construction groundwater conditions at the Site. Groundwater samples will be submitted for chemical analysis to an Ecology-accredited laboratory.

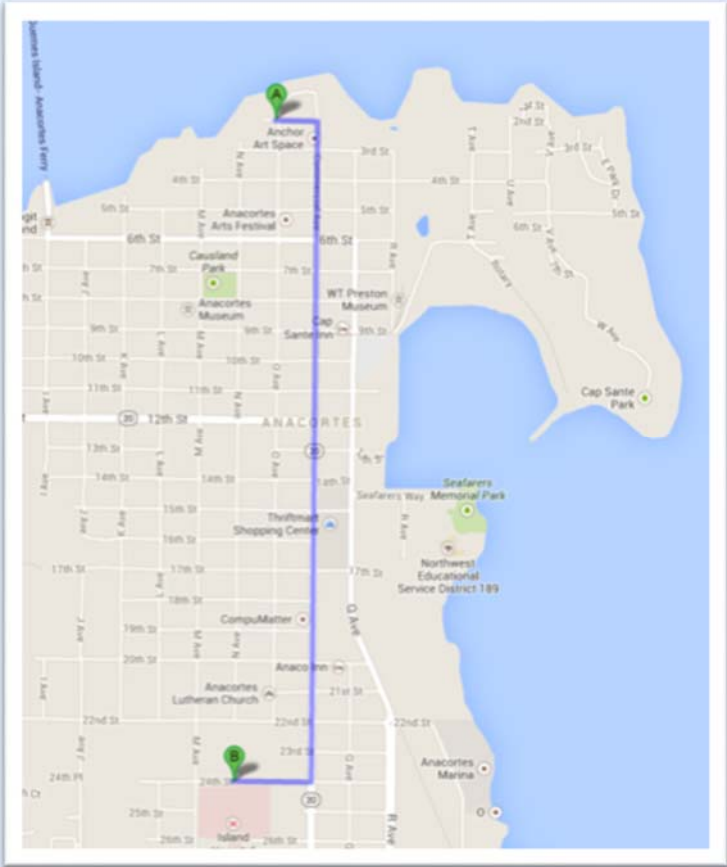
The interim action remedial excavation will remove contaminated soil on the Quiet Cove property, to the extents practicable. The remedial excavation activities, including sample locations and laboratory analyses are detailed in the Interim Action Work Plan.

2.2. List of Field Activities

Anticipated field activities to be completed during the project:

Y/N	Field Activity	Y/N	Field Activity
Y	Site Reconnaissance	N	Vapor Measurements
N	Exploratory Borings	N	Product Sample collection
Y	Construction Monitoring	Y	Soil Stockpile Testing
Y	Surveying	Y	Remedial Excavation
N	Test Pit Exploration	N	Recovery of Free Product
Y	Soil Sample Collection	Y	Monitoring Well Installation
Y	Groundwater Sampling	Y	Monitoring Well Development
N	Sediment Sampling	N	Underground Storage Tank (UST) Removal Monitoring
Y	Groundwater Depth/Free Product Measurement	N	Other:

3.0 EMERGENCY INFORMATION

Hospital Name and Address:	Island Hospital 1211 24 th Street Anacortes, WA 98221
Phone Numbers (Hospital ER):	Phone: 360.468.3185/360.299.1300
Distance:	1.5 Miles
Route to Hospital: 1) Head east on 2nd St toward O Ave – 410 feet 2) Turn right onto Commercial Ave – 1.2 mile 3) Turn right onto 24th Street – 0.1 mile 4) Arrive at 1211 24th St, Anacortes	
Ambulance:	9-1-1
Poison Control:	Seattle 206.253.2121; Other 800.732.6985
Police:	9-1-1
Fire:	9-1-1
Location of Nearest Telephone:	Cell phones are carried by field personnel.
Nearest Fire Extinguisher:	Located in the GeoEngineers vehicle on-site.
Nearest First-Aid Kit:	Located in the GeoEngineers vehicle on-site.

3.1. Standard Emergency Procedures

- Get help

- Send another worker to phone 9-1-1 (if necessary)
- As soon as feasible, notify GeoEngineers' Project Manager
- Reduce risk to injured person
 - Turn off equipment
 - Move person from injury location (if in life-threatening situation only)
 - Keep person warm
 - Perform CPR (if necessary)
- Transport injured person to medical treatment facility (if necessary)
 - By ambulance (if necessary) or GeoEngineers vehicle
 - Stay with person at medical facility
 - Keep GeoEngineers Project Manager apprised of situation and notify Human Resources Manager of situation

3.2. Emergency Response

- Visual contact should be maintained between “pairs” on site, with the team remaining in proximity to assist each other in case of emergencies.
- If any member of the field crew experiences any adverse exposure symptoms while on site, the entire field crew should immediately halt work and act according to the instructions provided by the SSO.
- The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the field team, contact of the PM, and reevaluation of the hazard and the level of protection required.
- If an accident occurs, the Site Safety Officer and the injured person are to complete, within 24 hours, an Accident Report (Form 3) for submittal to the PM, the HSPM, and HR. The PM should ensure that follow-up action is taken to correct the situation that caused the accident or exposure.

4.0 HAZARD ANALYSIS

A hazard analysis has been completed as part of preparation of this HASP. The hazard analysis was performed taking into account the known and potential hazards at the site and surrounding areas, as well as the planned work activities. The results of the hazard analysis are presented in this section. The hazard assessment will be evaluated each day before beginning work. Updates will be made as necessary and documented in the daily field log.

The following are known applicable hazards.

4.1. Physical Hazards and Mitigation Measures/Procedures

PHYSICAL HAZARDS (POTENTIALLY PRESENT AT THE SITE)

Y/N	Physical Hazard
Y	Drill rigs and Concrete Coring, including working inside a warehouse
Y	Backhoe

Y/N	Physical Hazard
Y	Trackhoe
N	Crane
Y	Front End Loader
Y	Excavations/trenching (1:1 slopes for Type B soil)
Y	Shored/braced excavation if greater than 4 feet of depth
Y	Overhead hazards/power lines
Y	Tripping/puncture hazards (debris on-site, steep slopes or pits)
Y	Unusual traffic hazard – Street traffic
Y	Heat/Cold, Humidity
Y	Utilities/ utility locate
Y	Noise
N	Other:

4.1.1. Mitigation Measures/Procedures

- A utility locate shall be completed, as required, for the location to prevent drilling or digging into utilities.
- Work areas will be marked with reflective cones, barricades and/or caution tape. High-visibility vests will be worn by on-site personnel to ensure they can be seen by vehicle and equipment operators.
- Field personnel will be aware of the location and motion of heavy equipment in the area of work to ensure a safe distance between personnel and the equipment. Personnel will be visible to the operator at all times and will remain out of the swing and/or direction of the equipment apparatus. Personnel will approach operating heavy equipment only when they are certain the operator has indicated that it is safe to do so through hand signal or other acceptable means.
- Heavy equipment and/or vehicles used on this site will not work within 20 feet of overhead utility lines without first ensuring that the lines are not energized. This distance may be reduced to 10 feet, depending on the client and the use of a safety watch.
- Personnel entry into unshored or unsloped excavations deeper than 4 feet is not allowed. Any trenching and shoring requirements will follow guidelines established in Washington Administrative Code (WAC) 296-155, the Washington State Construction Standards or OSHA 1926.651 Excavation Requirements. In the event that a worker is required to enter an excavation deeper than 4 feet, a trench box or other acceptable shoring will be employed or the side walls of the excavation will be sloped according to the soil type and guidelines as outlined in Department of Occupational Safety and Health (DOSH) and OSHA regulations. If the shoring/sloping deviates from that outlined in the WAC, it will be designed and stamped by a Professional Engineer (PE). Prior to entry, personnel will conduct air monitoring as described later in this plan. All hazardous encumbrances and excavated material will be stockpiled at least 2 feet from the edge of a trench or open pit. If concentrations of volatile gases accumulate within an open trench or excavation, the means of entering shall adhere to confined space entry and air monitoring procedures outlined under the air monitoring recommendations in this Plan and/or the GeoEngineers Health and Safety Programs.

- Personnel will avoid tripping hazards, steep slopes, pits and other hazardous encumbrances. If it becomes necessary to work within 6 feet of the edge of a pit, slope or other potentially hazardous area, appropriate fall protection measures will be implemented by the Site Safety Officer in accordance with OSHA/DOSH regulations and the GeoEngineers Health and Safety Program.
- Cold stress control measures will be implemented according to the GeoEngineers Health and Safety Program to prevent frost nip (superficial freezing of the skin), frost bite (deep tissue freezing), or hypothermia (lowering of the core body temperature). Heated break areas and warm beverages shall be available during periods of cold weather.
- Heat stress control measures required for this site will be implemented according to GeoEngineers Health and Safety Program with water provided on-site.

4.1.2. Engineering Controls

Y/N	Engineering Control
Y	Trench shoring (1:1 slope for Type B Soils)
Y	Location work spaces upwind/wind direction monitoring
N	Other soil covers (as needed)
N	Other (specify): Click here to enter text.

4.2. Biological Hazards and Mitigation Measures/Procedures

BIOLOGICAL HAZARDS (POTENTIALLY PRESENT AT SITE)

Y/N	Biological Hazard	Mitigation Measure/Procedure
N	Poison Ivy or other vegetation	Work gloves and long sleeve shirt
Y	Insects or snakes	Work gloves and long sleeve shirt
N	Hypodermic needles or other infectious hazards	Do not pick up or contact
N	Wildlife	
Y	Other: Bird droppings	Hard hat, gloves and long sleeve shirt

4.3. Ergonomic Hazards and Mitigation Measures/Procedures

4.3.1. Lifting Injuries

Back injuries often result from lifting objects that are too heavy or from using the wrong lifting technique. Keep your back healthy and pain-free by following common sense safety precautions.

- Minimize reaching by keeping frequently used items within arm's reach, moving your whole body as close as possible to the object.
- Avoid overextending by standing up when retrieving objects on shelves.
- Keep your back in shape with regular stretching exercises.
- Get help from a coworker or use a hand truck if the load is too heavy or bulky to lift alone.

4.3.2. Lifting Techniques

- Face the load; don't twist your body. Stand in a wide stance with your feet close to the object.
- Bend at the knees, keeping your back straight. Wrap your arms around the object.
- Let your legs do the lifting.
- Hold the object close to your body as you stand up straight. To set the load down, bend at the knees, not from the waist.

4.4. Chemical Hazards

CHEMICAL HAZARDS (POTENTIALLY PRESENT AT SITE)

Substance	Pathways
Petroleum Products Gasoline Diesel Heavy oil Waste oil	Air/Soil/Water
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs) and Naphthalenes	Air/Soil/Water
Halogenated Volatile Organic Compounds	Air/Soil/Water
Volatile Organic Compounds (VOCs) Benzene, ethylbenzene, toluene, xylenes (BETX) n-Hexane Methyl tertiary-butyl ether (MTBE) 1,2-dibromoethane (EDB) 1,2-dichloroethane (EDC)	Air/Soil/Water
Metals Arsenic Cadmium Chromium Lead Mercury	Air/Soil/Water

SPECIFIC CHEMICAL HAZARDS AND EXPOSURES (POTENTIALLY PRESENT AT SITE)

Chemical or Compound/Description	Exposure Limits/IDLH	Exposure Route	Immediate Symptoms of Exposure/Health Effects
Arsenic	PEL 0.05 mg/m ³ IDLH 5.0 mg/m ³	Inhalation, skin absorption, skin and eye contact, ingestion	Ulceration of nasal septum; dermatitis; GI disturbances; peripheral neuropathy; respiratory irritation; hyperpigmentation of skin

Chemical or Compound/ Description	Exposure Limits/ IDLH	Exposure Route	Immediate Symptoms of Exposure/Health Effects
Cadmium	PEL 0.005 mg/m ³ IDLH 9 mg/m ³	respiratory system, kidneys, prostate, blood	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]
Chromium	PEL 1 mg/m ³ IDLH 250 mg/m ³	Inhalation, ingestion, skin and eye contact	Irritated eyes, skin respiratory system
Lead	PEL 0.05 mg/m ³ IDLH 100 mg/m ³	Inhalation, ingestion, skin and eye contact	Lassitude; insomnia; facial pallor; abnormalities; weight loss, malnutrition, constipation, abdominal pain; colic; anemia; gingival lead line; tremors; paralysis of the wrist and ankles; encephalopathy; kidney disease; irritated eyes; hypertension
Mercury	PEL 0.05 mg/m ³ IDLH 10 mg/m ³	Inhalation, skin absorption, skin and eye contact, ingestion	Irritated eyes, skin; cough, chest pain, dyspnea, bronchitis, pneumonia; tremors, insomnia, irritability, indecision, headache, lassitude; stomatitis, salivation; GI disturbances, abnormalities, low weight; proteinuria
Gasoline (Unleaded) — clear liquid with a characteristic odor	PEL 300 ppm TLV 300 ppm STEL 500 ppm	Ingestion, inhalation, skin absorption, skin and eye contact	Irritated eyes, skin, and mucous membrane; fatigue; blurred vision; dizziness; slurred speech; confusion; convulsions; headache; dermatitis
Diesel Fuel — liquid with a characteristic odor	None established by OSHA, but ACGIH has adopted 100 mg/m ³ for a TWA (as total hydrocarbons)	Ingestion, inhalation, skin absorption, skin and eye contact	Irritated eyes, skin, and mucous membrane; fatigue; blurred vision; dizziness; slurred speech; confusion; convulsions; headache; dermatitis
Waste oil – may contain metals, gas, antifreeze and PAHs	Depends on the ancillary contaminants	Ingestion, inhalation, skin absorption, skin and eye contact	Depends on the ancillary contaminants.
Lube Oil/Mineral Oil – as a mist	The current OSHA PEL for mineral oil mist is 5 mg/m ³ of air as an 8-hr TWA	If the oil is not a mist, then route of exposure is skin and eye contact	Exposure to oil mists can cause eye, skin and upper respiratory tract irritation.

Chemical or Compound/ Description	Exposure Limits/ IDLH	Exposure Route	Immediate Symptoms of Exposure/Health Effects
Benzene	OSHA PEL 1 ppm Short term: 5 ppm ACGIH PEL 0.5 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritated eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]
Toluene	PEL 100 ppm IDLH 500 ppm	Inhalation, absorption, ingestion, direct contact	Irritation to eyes, nose, exhaustion, confusion, dizziness, headaches, dilated pupils, euphoria, anxiety, teary eyes, muscle fatigue, insomnia, paresthesia, dermatitis, liver and kidney damage.
Ethyl benzene	PEL 100 ppm IDLH 800 ppm	Inhalation, ingestion, direct contact	Irritation to eyes, skin, respiratory system, burning
Xylenes	PEL 100 ppm IDLH 900 ppm	Inhalation, skin absorption, ingestion, direct contact	Irritation to eyes, skin, nose, throat, dizziness, excitement, drowsiness, incoordination, staggering gait, corneal vacuolization, anorexia, nausea, vomiting, abdominal
MTBE	PEL 40 ppm	Ingestion, Inhalation, skin absorption, direct contact	Irritation to eyes, skin, nose, throat and lungs, aspiration, chemical pneumonia, nausea, vomiting, diarrhea, tremors, convulsions, loss of consciousness, headache, dizziness, loss of balance or coordination.
Polycyclic aromatic hydrocarbons (PAH) as coal tar pitch volatiles	PEL 0.2 mg/m ³ TLV 0.2 mg/m ³ REL 0.1 mg/m ³ IDLH 80 mg/m ³	Inhalation, ingestion, skin and/or eye contact	Dermatitis, bronchitis, potential carcinogen

Notes:

IDLH = immediately dangerous to life or health
 OSHA = Occupational Safety and Health Administration
 ACGIH = American Conference of Governmental Industrial Hygienists
 mg/m³ = milligrams per cubic meter
 TWA = time-weighted average (Over 8 hrs.)
 PEL = permissible exposure limit
 TLV = threshold limit value (over 10 hrs)
 STEL = short-term exposure limit (15 min)
 ppm = parts per million

4.4.1. Mitigation Measures/Procedures

- **Construction Observation, sample handling, packaging, and processing:** skin contact with contaminated media and preservative acids. Wear modified Level D personal protective equipment (PPE).

- **Groundwater Sampling:** Splash hazard associated with groundwater extraction and sample collection. Possible corrosion hazard associated with sample preservatives. Wear protective clothing and eye protection and chemical-resistant gloves are required when handling samples.
- **Decontamination of equipment:** inhalation or eye contact or skin contact with airborne mists or vapors, or contaminated liquids. Wear safety glasses; decontaminate clothing and skin prior to eating, drinking or other hand to mouth contact.

4.5. Additional Hazards

Update in Daily Report. Include evaluation of:

- Physical Hazards (excavations and shoring, equipment, traffic, tripping, heat stress, cold stress and others).
- Chemical Hazards (odors, spills, free product, airborne particulates and others present).
- Biological Hazards (snakes, spiders, other animals, discarded needles, poison ivy, pollen, bees/wasps and others present).

5.0 AIR MONITORING PLAN

An air monitoring plan has been prepared as part of development of this HASP. The air monitoring plan is based on the results of the chemical exposure assessment and the known and potential inhalation hazards on-site. The air monitoring plan addresses steps necessary to limit worker exposure. Non-occupational exposures are not addressed in this plan. When possible, position yourself up upwind of the field activity.

FIELD INSTRUMENTATION

Applicable Field Instrumentation	
X	Multi-Gas Detector (may include oxygen, carbon monoxide, hydrogen sulfide, lower explosive limit)
	Dust Monitor
	Other (i.e., detector tubes or badges) Please specify: Click here to enter text.

MONITORING FREQUENCY

Applicable Monitoring Frequency/Locations and Type	
X	Continuous during soil disturbance activities or handling samples
	15 minutes
	30 minutes
	Hourly

5.1. Action Levels for Volatile Organic Chemicals

- The workspace will be monitored using a photoionization detector (PID). These instruments must be properly maintained, calibrated and charged (refer to the instrument manuals for details). Zero this

meter in the same relative humidity as the area in which it will be used and allow at least a 10-minute warm-up prior to zeroing. Do not zero in a contaminated area.

- An initial vapor measurement survey of the site should be conducted to detect “hot spots” if contaminated soil is exposed at the surface. Vapor measurement surveys of the workspace should be conducted at least hourly or more often if persistent petroleum-related odors are detected. Additionally, if vapor concentrations exceed 5 parts per million (ppm) above background continuously for a 5-minute period as measured in the breathing zone, upgrade to Level C personal protective equipment (PPE) or move to a non-contaminated area.
- Standard industrial hygiene/safety procedure is to require that action be taken to reduce worker exposure to organic vapors when vapor concentrations exceed one-half the threshold limit value (TLV). Because of the variety of chemicals, the PID will not indicate exposure to a specific permissible exposure limit (PEL) and is therefore not a preferred tool for determining worker exposure to chemicals. If odors are detected, then employees shall upgrade to respirators with Organic Vapor cartridges and will contact the Health and Safety Program Manager for other sampling options.

AIR MONITORING ACTION LEVELS

Contaminant	Activity	Monitoring Device	Frequency of Monitoring Breathing Zone	Action Level	Action
Organic Vapors	Environmental Remedial Actions	PID	Start of shift; prior to excavation entry; every 30 to 60 minutes and in event of odors	Background to 5 ppm in breathing zone	Use Level D or Modified Level D PPE
Organic Vapors	Environmental Remedial Actions	PID	Start of shift; prior to excavation entry; every 30 to 60 minutes and in event of odors	5 to 50 ppm in breathing zone	Upgrade to Level C PPE *
Organic Vapors	Environmental Remedial Actions	PID	Start of shift; prior to excavation entry; every 30 to 60 minutes	> 50 ppm in breathing zone	Stop work and evacuate the area. Contact Health and Safety Program Manager for guidance.
Combustible Atmosphere	Environmental Remedial Actions	PID	Start of shift; prior to excavation entry; every 30 to 60 minutes	>10% LEL or >1,000 ppm	Depends on contaminant. The PEL is usually exceeded before the lower explosive limit (LEL).
Combustible Atmosphere	Environmental Remedial Actions	PID or 4-gas meter	Start of shift; prior to excavation entry; every 30 to 60 minutes	>10% LEL or >1,000 ppm	Stop work and evacuate the site. Contact Health and Safety Program Manager for guidance.

Contaminant	Activity	Monitoring Device	Frequency of Monitoring Breathing Zone	Action Level	Action
Oxygen Deficient/ Enriched Atmosphere	Environmental Remedial Actions Confined Spaces	Oxygen meter or 4-gas meter	Start of shift; prior to excavation entry; every 30 to 60 minutes	<19.5 >23.5%	Continue work if inside range. If outside range, evacuate area and contact Health and Safety Program Manager.

*Contact the HSPM and Project Manager

6.0 SITE CONTROL PLAN

Use this section to provide an up-to-date Site Control Plan for cleanup operations to minimize employee exposure to hazardous substances.

6.1. Traffic or Vehicle Access Control Plans

A Right-of-Way/Public Works Permit will be obtained from the City of Anacortes for excavation that may extend into or near sidewalks and on roads, including preparation of a streamlined traffic control plan, if needed. Flagging and traffic control, if needed, will be performed by the earthwork contractor or their subcontractor. All persons contracting to perform flagging will have on site a current flagging card indicating that they are trained.

Traffic control procedures and devices must be used in accordance with Part VI of the Manual on Uniform Traffic Control Devices (MUTCD) and Washington Safety and Health Standard WAC 296-155-305. Where flaggers are needed, supervisor must ensure that each flagger has the qualifications, training and equipment necessary to perform assigned task in accordance with the MUTCD. Training must be updated every 3 years. At a minimum, flaggers must have a stop/slow paddle, high visibility clothing, safety shoes, and a hard hat, before approaching any right of way to control traffic.

6.2. Site Work Zones

Fencing (chain link, orange construction netting, silt fence or similar), Survey Tape, Traffic Cones, Posted signage and/or barricades will be used to delineate the work zone and excluding non-site personnel from entering the work zone.

Exclusion zones will be established within approximately 10 feet around the remedial excavation, boring or well during drilling/sampling. Only persons with the appropriate training will enter this perimeter while work is being conducted there.

A contamination reduction zone will be established just outside the exclusion zone for the decontamination of sampling equipment. Care will be taken to prevent the spread of contamination. Equipment and personnel decontamination are discussed in the following sections, and the following types of equipment will be available to perform these activities:

- Scrub brushes
- Spray rinse applicator

- Plastic garbage bags
- Container of Alconox/water solution and Alconox powder
- Exclusion zone (Approximately 10 to 15 feet around boring locations).

METHOD OF DELINEATION/EXCLUDING NON-SITE PERSONNEL

Applicable Delineation/Exclusion Methods	
X	Fence
	Survey Tape
X	Traffic Cones
	Other

6.3. Buddy System

Personnel on-site should use the buddy system (pairs), particularly whenever communication is restricted. If only one GeoEngineers employee is on site, a buddy system can be arranged with subcontractor/contractor personnel.

6.4. Site Communication Plan

Positive communications (within sight and hearing distance or via radio) should be maintained between pairs on-site, with the pair remaining in proximity to assist each other in case of emergencies. The team should prearrange hand signals or other emergency signals for communication when voice communication becomes impaired (including cases of lack of radios or radio breakdown) and an agreed upon location for an emergency assembly area.

In instances where communication cannot be maintained, you should consider suspending work until it can be restored. If this is not an option, the following are some examples for communication:

- Hand gripping throat: Out of air, can't breathe.
- Gripping partner's wrist or placing both hands around waist: Leave area immediately, no debate.
- Hands on top of head: Need assistance.
- Thumbs up: Okay, I'm all right; or, I understand.
- Thumbs down: No, negative.

6.5. Emergency Action

In the event of an emergency, employees will convene in a designated area. Employees should communicate with others working on site and the PM to determine the Emergency Action Plan for each site. GeoEngineers employees and subcontractor(s) should be made aware of the Emergency Action for the site at each morning's safety tailgate meeting (drill rig shutoff switch, location of fire extinguishers, cell phone numbers, etc.). For medical assistance, see Section 3.0 above.

6.6. Decontamination Procedures

Decontamination, at a minimum, should include removing and disposing of PPE when exiting the exclusion zone and washing your hands. Decontamination may also consist of removing outer protective gloves and washing soiled boots and gloves using bucket and brush provided on-site in the contamination reduction zone. If needed, inner gloves will then be removed, and respirator, hands and face will be washed in either a portable wash station or a bathroom facility at the site. Employees will perform decontamination procedures and wash before eating, drinking or leaving the site.

6.7. Waste Disposal or Storage

Incidental waste including used PPE is to be placed in a plastic bag for disposal. Investigation derived waste (IDW) will be placed in 35/55-gallon drums and stored on site in a secure location pending characterization and disposal.

7.0 PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment (PPE) will consist of standard Level D equipment. Site activities include handling and sampling of soil, groundwater and sediment. Depth-to-groundwater measurements will be performed as well. Site hazards include potential exposure to hazardous materials, and physical hazards such as trips/falls, heavy equipment, and contaminant exposure.

Air monitoring will be conducted to determine the level of respiratory protection.

- Half-face combination organic vapor/high efficiency particulate air (HEPA) or P100 cartridge respirators will be available on site to be used as necessary. P100 cartridges are to be used only if PID measurements are below the site action limit. P100 cartridges are used for protection against dust, metals and asbestos, while the combination organic vapor/HEPA cartridges are protective against both dust and vapor. Ensure that the PID or TLV will detect the chemicals of concern on-site.
- Level D PPE, unless a higher level of protection is required, will be worn on the site. Potentially exposed personnel will wash gloves, hands, face and other pertinent items to prevent hand-to-mouth contact. This will be done prior to hand-to-mouth activities including eating, smoking, etc.
- Adequate personnel and equipment decontamination will be used to decrease potential ingestion and inhalation.

PERSONAL PROTECTIVE EQUIPMENT

Applicable Personal Protection Equipment	
Field Equipment (specify):	
X	Hardhat (if overhead hazards, or client requests)
X	Steel-toed boots (if crushing hazards are a potential or if client requests)
X	Safety glasses (if dust, particles, or other hazards are present or client requests)
X	Reflective vest (if working near traffic or equipment)
X	Hearing protection (if it is difficult to carry on a conversation 3 feet away)
X	Rubber boots (if wet conditions)
Gloves (specify):	
X	Nitrile
	Latex
	Liners
	Leather
	Other (specify) Click here to enter text.
Protective Clothing (specify):	
	Tyvek (if dry conditions are encountered, Tyvek is sufficient) (modified Level D or Level C)
	Saranex (personnel shall use Saranex if liquids are handled or splash may be an issue) (modified Level D or Level C)
X	Cotton (Level D)
X	Rain gear (as needed) (Level D)
X	Layered warm clothing (as needed) (Level D)
Inhalation Hazard Protection (specify):	
X	Level D (no respirator)
	Level C (respirators with organic vapor/HEPA P100 filters)
	Level B (Self Contained Breathing Apparatus— STOP, Consult the HSM)

7.1. Personal Protective Clothing Inspections

PPE clothing ensembles designated for use during site activities shall be selected to provide protection against known or anticipated hazards. However, no protective garment, glove or boot is entirely chemical-resistant, nor does any PPE provide protection against all types of hazards. To obtain optimum performance from PPE, site personnel shall be trained in the proper use and inspection of PPE. This training shall include the following:

- Inspect PPE before and during use for imperfect seams, non-uniform coatings, tears, poorly functioning closures or other defects. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.

- Inspect PPE during use for visible signs of chemical permeation such as swelling, discoloration, stiffness, brittleness, cracks, tears or other signs of punctures. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Disposable PPE should not be reused after breaks unless it has been properly decontaminated.

7.2. Respirator Selection, Use and Maintenance

If respirators are required, site personnel shall be trained before use on the proper use, maintenance and limitations of respirators. Additionally, they must be medically qualified to wear respiratory protection in accordance with 29 CFR 1910.134. Site personnel who will use a tight-fitting respirator must have passed a qualitative or quantitative fit test conducted in accordance with an OSHA-accepted fit test protocol. Fit testing must be repeated annually or whenever a new type of respirator is used. Respirators will be stored in a protective container.

7.3. Respirator Cartridges

If the action levels identified in the Air Monitoring Action Levels Table in Section 5.0, are exceeded, site personnel should don respiratory protection appropriate for the known or suspected chemical of concern. For most sites, a half-face or full-face air purifying respirator with a National Institute for Occupational Safety and Health (NIOSH)-approved organic vapor/HEPA P100 combination cartridge (Level C), will be appropriate for the known or suspected chemicals of concern. Monitoring frequency should be continuous while using Level C respiratory protection. The SSO closely monitor personnel using respiratory protection, including observing for signs of fatigue or respiratory distress, the potential for cartridge breakthrough or increased resistance to inhalation, and the need for changes in the level of respiratory protection based on air monitoring. The frequency and duration of breaks should be increased for personnel working in respiratory protection. If at any time on-site air monitoring indicates Level B respiratory protection is warranted, personnel should leave the exclusion zone and consult with the HSM.

If site personnel are required to wear air-purifying respirators, the appropriate cartridges shall be selected to protect personnel from known or anticipated site contaminants. The respirator/cartridge combination shall be approved and NIOSH-certified. A cartridge change-out schedule shall be developed based on known site contaminants, anticipated contaminant concentrations and data supplied by the cartridge manufacturer related to the absorption capacity of the cartridge for specific contaminants. Site personnel shall be made aware of the cartridge change-out schedule prior to the initiation of site activities. Site personnel shall also be instructed to change respirator cartridges if they detect increased resistance during inhalation or detect vapor breakthrough by smell, taste or feel, although breakthrough is not an acceptable method of determining the change-out schedule.

7.4. Respirator Inspection and Cleaning

The Site Safety Officer shall periodically (weekly) inspect respirators at the project site. Site personnel shall inspect respirators prior to each use in accordance with the manufacturer's instructions. In addition, site personnel wearing a tight-fitting respirator shall perform a positive and negative pressure user seal check each time the respirator is donned, to ensure proper fit and function. User seal checks shall be performed in accordance with the GeoEngineers respiratory protection program or the respirator manufacturer's instructions.

8.0 ADDITIONAL ELEMENTS

8.1. Heat/Cold Stress

8.1.1. Cold Stress Prevention

Working in cold environments presents many hazards to site personnel and can result in frost nip (superficial freezing of the skin), frost bite (deep tissue freezing), or hypothermia (lowering of the core body temperature).

The combination of wind and cold temperatures increases the degree of cold stress experienced by site personnel. Site personnel shall be trained on the signs and symptoms of cold-related illnesses, how the human body adapts to cold environments, and how to prevent the onset of cold-related illnesses. Heated break areas and warm beverages shall be provided during periods of cold weather.

8.1.2. Heat Stress Prevention

Keeping workers hydrated in a hot outdoor environment requires more water be provided than at other times of the year. When employee exposure is at or above an applicable temperature listed in the Heat Stress table below, Project Managers will ensure that:

- A sufficient quantity of drinking water is readily accessible to employees at all times; and
- All employees have the opportunity to drink at least one quart of drinking water per hour.

HEAT STRESS

Type of Clothing	Outdoor Temperature Action Levels
Nonbreathing clothes including vapor barrier clothing or PPE such as chemical resistant suits	52°
Double-layer woven clothes including coveralls, jackets and sweatshirts	77°
All other clothing	89°

8.2. Personnel Medical Surveillance

GeoEngineers employees are not in a medical surveillance program because they do not fall into the category of “Employees Covered” in OSHA 1910.120(f)(2), which states that a medical surveillance program is required for the following employees:

1. Employees who are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits or, if there is no permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year;
2. Employees who wear a respirator for 30 days or more a year or as required by state and federal regulations;
3. Employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation; and

4. Members of HAZMAT teams.

8.3. Spill Containment Plans (Drum and Container Handling)

Contractors or subcontractors will be responsible for developing and implanting Spill Prevention and Containment Plans for use during Site work.

8.4. Entry Procedures for Tanks or Vaults (Confined Spaces)

GeoEngineers employees shall not enter confined spaces to perform work unless they have been properly trained and with hands-on experience in the use of retrieval equipment. If a project requires confined space entry, please include a copy of the confined space permit and include the training documentation in this HASP.

Trenches greater than 4 feet in depth with the potential for buildup of a hazardous atmosphere are considered confined spaces.

8.5. Sanitation

Portable toilets will be provided during work activities.

8.6. Lighting

Work is anticipated to be performed during daylight hours. Artificial lighting will be used as necessary if work is conducted after daylight hours.

9.0 DOCUMENTATION TO BE COMPLETED FOR HAZWOPER PROJECTS

The following forms shall be completed:

- Daily Field Log (include the following information)
 - Updates on hazard assessments, field decisions, conversations with subcontractors, client or other parties, etc.;
 - Air monitoring/calibration results, including: personnel, locations monitored, activity at the time of monitoring, etc.;
 - Actions taken;
 - Action level for upgrading PPE and rationale; and
 - Meteorological conditions (temperature, wind direction, wind speed, humidity, rain, snow, etc.).
- FORM 1 – Health and Safety Pre-Entry Briefing and Acknowledgment of the Site Health and Safety Plan for GeoEngineers' Employees, Subcontractors and Visitors
 - FORM 2 – Safety Meeting Record
 - FORM 3 – Accident/Exposure Report Form

FORM 1
HEALTH AND SAFETY PRE-ENTRY BRIEFING AND ACKNOWLEDGEMENT OF THE SITE HEALTH AND
SAFETY PLAN FOR GEOENGINEERS' EMPLOYEES, SUBCONTRACTORS AND VISITORS
QUIET COVE PROPERTY
FILE NO. 5147-024-07

Inform employees, contractors and subcontractors or their representatives about:

- The nature, level and degree of exposure to hazardous substances they're likely to encounter;
- Site-related emergency response procedures; and
- Any identified potential fire, explosion, health, safety or other hazards.

Conduct briefings for employees, contractors and subcontractors, or their representatives as follows:

- A pre-entry briefing before any site activity is started.
- Additional briefings, as needed, to make sure that the Site-specific HASP is followed.
- Make sure employees working on the Site are informed of any risks identified and trained on how to protect themselves and other workers against the Site hazards and risks.
- Update information to reflect current sight activities and hazards.
- Personnel participating in this project must receive initial health and safety orientation. Thereafter, brief tailgate safety meetings will be held as deemed necessary by the Site Safety Officer.
- The orientation and the tailgate safety meetings shall include a discussion of emergency response, site communications and site hazards.

(GeoEngineers' Site workers shall complete this form, which should remain attached to the HASP and be filed with other project documentation). Please be advised that this site-specific HASP is intended for use by GeoEngineers employees only. Nothing herein shall be construed as granting rights to GeoEngineers' subcontractors or any other contractors working on this site to use or legally rely on this HASP. GeoEngineers specifically disclaims any responsibility for the health and safety of any person not employed by the company.

I hereby verify that a copy of the current HASP has been provided by GeoEngineers, Inc., for my review and personal use. I have read the document completely and acknowledge an understanding of the safety procedures and protocol for my responsibilities on Site. I agree to comply with the required, specified safety regulations and procedures.

Print Name

Signature

Date

FORM 3
ACCIDENT/EXPOSURE REPORT FORM
QUIET COVE
FILE NO. 5147-024-07

To (Supervisor): _____ From (Employee): _____
Telephone (with area code): _____

Name of injured or ill employee: _____

Date of accident: _____ Time of accident: _____ Exact location of accident: _____

Narrative description of accident/exposure (circle one):

Medical attention given on site:

Nature of illness or injury and part of body involved: _____ Lost Time? Yes ☐ No ☐

Probably Disability (check one):

Fatal	Lost work day with days away from work	Lost work day with days of restricted activity	No lost work day	First Aid only
☐	☐	☐	☐	☐

Corrective action taken by reporting unit and corrective action that remains to be taken (by whom and when):

Employee Signature: _____ Date: _____

Name of Supervisor: _____

Results of Preliminary Investigation of N Avenue Beach Contamination
May 25, 2005

History: The Anacortes Planning Commission made a site visit to the beach at the north end of N Avenue when Trident Seafoods applied for a shoreline permit to rebuild a bulkhead adjacent to the beach. One of the neighbors brought along a shovel and showed the Commission a deposit of black tarry sand about a foot below the surface of the beach in the City right-of-way. One of the Commissioners, Erica Pickett, arranged with a local biologist, Andrew Rice, to engage a class of his students to dig several test holes in the City street right-of-way in an attempt to gauge the extent of the oily contamination.

Methods: May 25, 2005, was selected as a perfect tide to do the survey. There was a -3.5 tide at 12:17 PM. Five transects were laid out parallel to the boundaries of the City street right-of-way. Holes were dug to a depth of at least 15" at approximately ten foot intervals from the top of the beach to a point landward of the eelgrass. The original plan had been to dig about 100 holes on a grid pattern. In the event, fourteen holes were dug.

Observations: The weather was warm and dry. We began our survey at about 12:15 and finished at about 1:30 PM. Though the test holes dug near the eelgrass showed a few worms, we found no evidence of living worms or clams in any of the holes dug higher up on the beach. The black sand of an anaerobic reducing environment was common, more especially nearer the eelgrass. This black sand did not seem to smell like diesel or other petrochemical product, but had the familiar, if faint, "rotten egg" smell of hydrogen sulfide.

The young students were keen to find oil and did most of their digging near the holes where their friends had run into a concentration of the tarry sand. Remarkably, evidence of the oil would be absent in a test hole just a few feet from one that had shown a lot of oil. The tarry, greasy sand with the unmistakable odor of a petrochemical product was easy to spot and of a very different character from the black sand of the anaerobic processes farther down the beach.

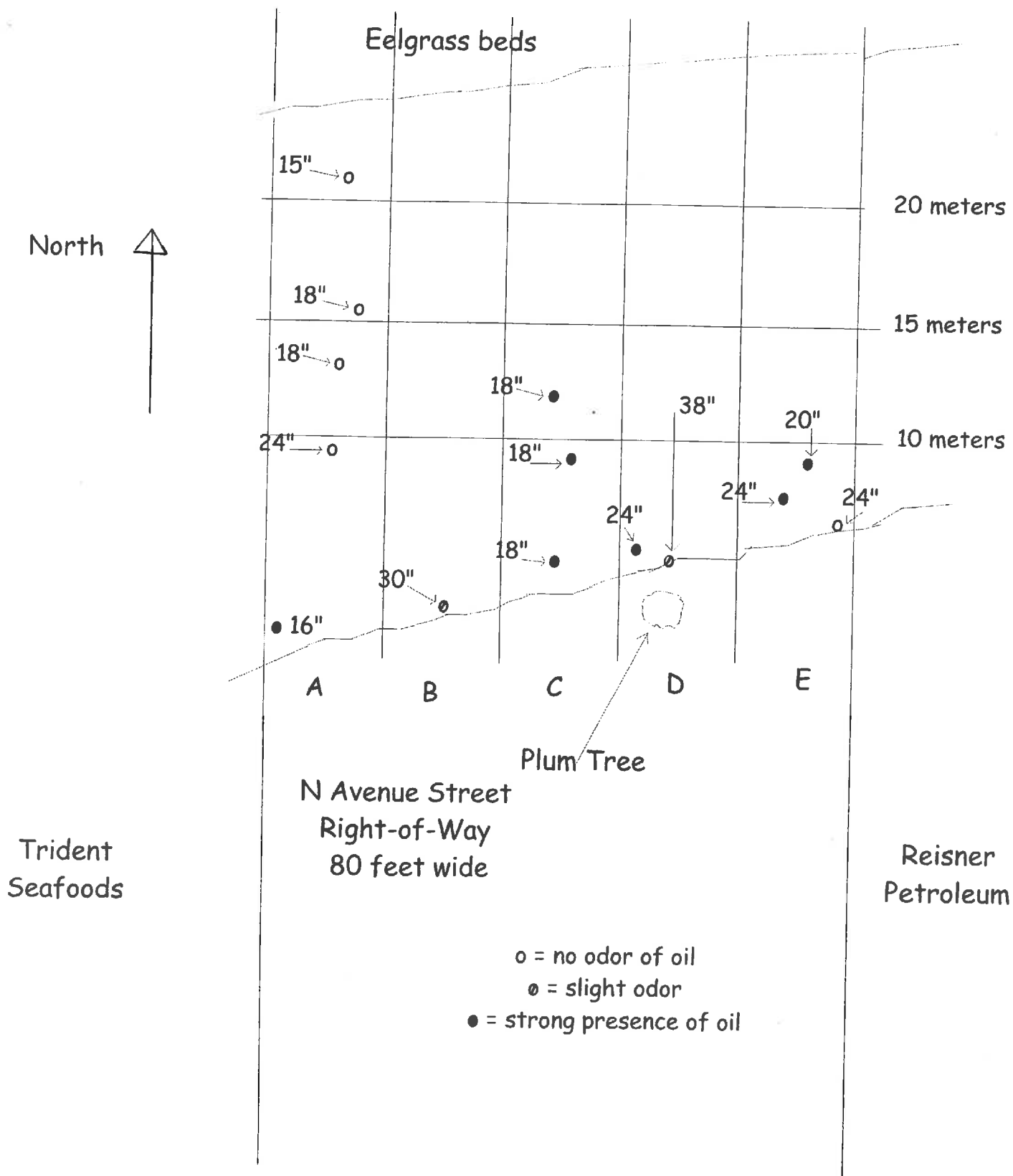
There was a rusty colored layer of sand about an inch thick which lay on top of the tarry layer. No attempt was made to assess the thickness of the tarry layer because of the danger of remobilizing the petroleum.

Attached is a rough map of the holes dug showing the depth of the holes and whether or not the tarry sand was seen in the hole.

Conclusions: It appears from the test holes that the extent of the oily contamination may be confined to the upper beach areas, see map. A more in-depth sediment analysis could determine the downslope effects of the evident sub surface oily layers. The fact that the distinct tarry sediment seems to be confined to the upper beach areas as indicated on the map suggests the potential for these sediments to be non-mobile and therefore be more readily removed. The scope of these results are in line with previous findings. An in-depth habitat analysis and down slope chemical testing of sediments is suggested, both to assess potential ecological impact and to further define the scope of the affected area.

Report written by Erica Pickett and Andrew Rice

Conclusions: Where the oily contamination exists, it is well consolidated and well defined. Before a professional assessment is done, it would be helpful to research the historical location of any pipelines around the beach to indicate where the worst contamination may exist.



Drawing not to scale



May 16, 2001

Mr. Tony Palagyi
Project Engineer
Texaco
10602 NE 38th Place
Kirkland, Washington 98033

(206) 624-9349 Phone
(206) 624-2839 Fax
www.retec.com

**Re: Removal of Contaminated Soils From the N-Street Right-of-Way
Reisner Petroleum Terminal
Corner of 3rd Street and N-Avenue
Anacortes, Washington**

Dear Tony:

ThermoRetec Consulting Corporation (ThermoRetec) has completed the removal of petroleum impacted soils from within the N-Avenue right-of-way in Anacortes. This letter report summarizes the field activities and presents the data collected during the cleanup.

1. Introduction and Background

The current scope of work was initiated by Texaco after the discovery by the City of Anacortes of soil containing elevated petroleum hydrocarbons within the N-Avenue right-of-way. That testing had demonstrated the presence of hydrocarbons contamination in soils within the right-of-way near underground metal piping.

In April of 2000, ThermoRetec performed confirmatory soil sampling to assess the nature and extent of the right-of-way contamination. The results of the ThermoRetec testing were summarized in a May 2000 report. That testing confirmed the presence of petroleum hydrocarbons in soils of the right-of-way and indicated that the metal piping within the right-of-way originated from the Reisner Petroleum Terminal property. Figure 1 shows sample locations and Tables 1 and 2 present data results of the April 2000 investigation.

After reviewing the results of the April 2000 investigation, Texaco submitted a permitting request to the City of Anacortes to conduct a soil excavation and remove the impacted soils. That request also included work to grout and/or remove the metal piping located in the work area. The work was incorporated into a Shoreline Permit Amendment which was authorized in January of 2001. The City subsequently provided Texaco a demolition permit pertaining to the proposed activities.

Cleanup activities were performed during March of 2001. Section 2 describes the soil and piping removal activities. Section 3 presents the confirmation sampling data for the soil excavation. Conclusions are presented in Section 4.

2. Field Activities

Site Preparation

All field activities were conducted consistent with the Shoreline Permit Amendment. Project coordination meetings were conducted with the City Public Works Department and with Reisner Petroleum. Health and safety requirements and air monitoring were implemented consistent with a site-specific health and safety plan.

A temporary security fence was installed around the work area for the duration of the project. The mean higher high water (MHHW) line was surveyed by Leonard Boudinot & Skodje surveyors. Silt fencing and security fencing were installed shore-side of the MHHW line, and soil removal activities were confined above this line. The locations of utilities within the work area were marked by both the City and a private locator, Applied Professional Services (APS).

Prior to initiating soil removal, test pits were excavated within the right-of-way to verify soil conditions. Observations from test pitting (including photo-ionization detector headspace screenings) confirmed that the contamination was localized around the metal piping and in the groundwater smear zone between the piping location and the edge of the beach.

Piping Removal

The ends of the underground lines were located, exposed and inspected. Four 4-inch diameter metal pipes were identified lying parallel to each other at the marked position shown on Figure 1. Two of the dock lines were open-ended and were empty, while the other two lines were capped. A trench was then excavated back toward the terminal to expose the tops of the lines to a point approximately 10 feet from the Reisner petroleum terminal fence. The piping included a number of flanged connections, but was otherwise continuous along the exposed area. Corrosion of the piping was visible.

Prior to disconnection of the piping, holes were drilled in each of the two capped lines to check for and to facilitate removal of any residual liquids. One of the capped lines contained approximately 10 gallons of Number 2 diesel fuel. The second capped line contained approximately 20 gallons of kerosene. The liquids were collected, transferred to a 55-gallon drum and ultimately were transported to Phillips Environmental for recycling. Each of the four pipelines was then cut using a pipe saw at the location shown in Figure 1. All four of the lines were permanently capped by a certified welder.

The balance of the piping was then removed from the trench. Extensive corrosion was noted during piping removal. Hydrocarbon contamination was also noted in the northwestern end of the piping trench. Contaminated soils from this area were stockpiled for off-site treatment. The piping removed from the trench was temporarily stockpiled and later shipped off-site for recycling as scrap metal.

Excavation and Backfill

Contaminated soil removal was initiated once the piping had been removed from the trench. Overburden soils were excavated and separately stockpiled. Consistent with the Shoreline Permit

Amendment, the existing grass was retained for replanting following completion of the excavation. Contaminated soils from the groundwater smear zone were temporarily placed in lined and covered stockpiles pending off-site shipment to TPS technologies for recycling by thermal treatment. A total of 582 tons of impacted soils were removed during the project.

Consistent with prior authorization from the City of Anacortes, a length of the former sanitary sewer outfall (see Figures 1 and 2) was removed to permit excavation of contaminated soils located beneath and to the east of that line. During pre-project meetings the City had confirmed that that outfall was no longer active. The concrete piping of the outfall was removed and contaminated soils in the vicinity of the piping were excavated.

During excavation, a continuous 4-inch diameter metal pipeline was encountered running parallel to the high-water line. The pipeline was of welded construction and was continuous across the work area. As the line was continuous, the source and contents of the line could not be determined. A utility locator was contracted from APS. Based on the locate readings provided by APS, the line did not appear to connect to the Reisner terminal. Rather, the line extended across the Port of Anacortes property and appeared to connect to the former Chevron terminal property. The western portion of the line was traced by APS onto the adjacent Trident Seafoods property. The western terminus of the line was not identified. After discussion with the City of Anacortes, and because the ownership and contents of the pipeline could not be verified, the pipeline was maintained in place without disruption.

Additional metal piping was encountered along the eastern side of the excavation. That piping included a 4-inch metal casing containing several smaller (1-inch diameter) lines, as well as an associated metal conduit. A trench was excavated and this piping was found to be discontinuous. This piping was removed completely. The abandoned electrical conduit was removed up to the fence-line. The conduit apparently continues onto the Reisner property as determined by additional utility locating by APS. No contaminated soil was observed in this location. The removed piping and conduit were recycled as scrap metal along with the other removed piping.

During excavation activities approximately 1,300 gallons of water were removed from the excavation. This water was a combination of groundwater seepage from the smear zone and contact stormwater. The water was collected in a temporary storage tank located on site for this purpose. After completion of the excavation and backfill activities, the water was transported to Phillips Environmental for treatment/disposal.

Backfill of the main excavation was conducted in three lifts. Clean overburden soils were placed at the base of the excavation. These were followed by pit run obtained from a local quarry. The final lift in the grass area consisted of topsoil obtained from a local supplier. Grass removed at the beginning of the excavation was replaced. Consistent with the shoreline permit conditions and discussions with the City, the silt fence remains in place pending full reestablishment of the beach grass.

Backfill of the piping trench was conducted using two soil lifts. Clean overburden was placed to 1 foot below ground surface and recompact. Gravel was placed in the final 1 foot lift. Recompaction testing confirmed that the parking area was restored to 95 percent compaction.

3. Results of Confirmation Testing

Table 3 summarizes the results of confirmation soil samples collected from the sidewalls and bottom of the excavation. Overburden characterization samples are also included. Figure 2 shows the sampling locations. Results confirm that the petroleum contamination associated with the piping was completely removed from the excavation bottom and from the south, east and west sidewalls of the excavation. Overburden samples confirm that the overburden soils were suitable for use as excavation backfill.

Sampling data from below the high-water line indicates a small area of beach sediments containing residual petroleum hydrocarbons. The area is immediately down-slope from the former piping and contains residual diesel and kerosene hydrocarbons. No benzene or other BTEX compounds were detected in these samples. Previous testing performed in this area in April of 2000 had indicated that the results were below Interim TPH Policy criteria for direct ingestion and for leaching scenarios. Additional Interim TPH Policy testing was performed as part of the confirmation sampling. The results are summarized in the attachments to this report. One of the samples (Shore-2) contained apparent creosoted wood (driftwood) and asphalt debris. That sample contained elevated PAH compounds and contained a hydrocarbon concentrations intermediate between residential and commercial cleanup levels. The other two samples contained hydrocarbon concentrations well below residential standards established under the Interim TPH Policy.

As described above, some asphalt debris and creosoted wood debris (driftwood) was noted in the beach area. Based on ThermoRetec interviews with area residents familiar with the site history, the asphalt debris present on the beach is associated with fill materials placed in this area by the City during the late 1970s or early 1980s. The source of the wood debris was assumed to be drift wood. Low levels of PAH compounds were detected in the beach samples. The concentrations of PAH in samples Shore-1, Shore-3 and Shore-5 were compared to Sediment Management Standards criteria (Table 4). The average PAH concentrations in the samples were below SMS minimum cleanup levels (MCUL) and do not warrant further evaluation under SMS (per WAC 173-204-510). Sample Shore-2 was excluded from this evaluation due to the presence of larger wood debris in the sample, making it unrepresentative of beach sediment conditions.

4. Conclusions

The petroleum-impacted soils in the N-Avenue right-of-way have been removed from the site, along with the apparent source (the underground piping). Some hydrocarbon impacts remain in beach sediments immediately below the MHHW line. This area was outside of the permit limits and was not removed during the current project. Diesel and kerosene hydrocarbon levels in that area do not pose a threat to human health or the environment and further action is not recommended. Residual hydrocarbon concentrations are expected to naturally attenuate due to the successful removal of the source, and the heavy weathering that occurs in coarse beach sediments.

It has been a pleasure working with you on this project. Please do not hesitate to contact me if you require further information.

Sincerely,
THERMORETEC CONSULTING CORPORATION



Mark Larsen
Project Manager

cc: Chris Houck / ThermoRetec
Janette Dulay / ThermoRetec
Project File: ESLL2-14865

Attachments

Table 1. Summary of Phase 2 Soil Analytical Data

Beach Samples (Collected by Hand Auger)												
Sample Location depth- ft Sample date	Storm Drain Area			Former Dock Area					N-Avenue			
	HA-2 2.3 4/5/00	HA-1 1.8 4/5/00	HA-4 1.8 4/5/00	HA-11 1.3 4/5/00	HA-12 1.3 4/5/00	HA-13 1.3 4/5/00	HA-10 1.3 4/5/00		Shoreline Edge of Gravel B4 B4-6 6 to 8 4/5/00	Along Dock Piling B3 (1) B3-2 2 to 4 4/5/00	Western Side B5 B5-4 4 to 6 4/5/00	Southern B6 B6-10 10 to 12 4/5/00
BTEX Compounds												
Benzene	<0.05	<0.05	<0.05	<2.5	<0.05	<0.05	<0.05					
Toluene	<0.05	<0.05	<0.05	<17.5	<0.05	<0.05	<0.05					
Ethylbenzene	<0.05	<0.05	<0.05	<35.0	<0.341	<0.05	<0.05					
Xylene	<0.1	<0.1	<0.1	<150	<0.21	<0.1	<0.1					
Petroleum Hydrocarbons												
Gasoline-Range Hydrocarbons	<5.0	<5.0	<5.0	5,770	30.3	<5.0	<5.0					
Diesel-Range Hydrocarbons	407	10.3	<10	1,590	113	<10	<10					
Oil-Range Hydrocarbons	227	<25	<25	<275	33.5	<25	<25					
Total Petroleum Hydrocarbons	634	10.3	ND	7,380	176.8	ND	ND					
Interim TPH Policy Testing												
Hazard Index (Residential, HI)	nt	nt	nt	0.78	nt	nt	nt					
Leaching Model (Well Estimate, mg/L)	nt	nt	nt	0.60	nt	nt	nt					
Right-of-Way Samples (Collected by Geoprobe)												
Sample Location depth- ft Sample date	N-Avenue			N-Avenue					N-Avenue			
	Shoreline Edge of Gravel B4 B4-6 6 to 8 4/5/00	B1 B1-6 6 to 8 4/5/00	B1-3 B1-8 8 to 10 4/5/00	B3 (1) B3-2 2 to 4 4/5/00	Along Dock Piling B2 B2-4 4 to 6 4/5/00	Western Side B5 B5-4 4 to 6 4/5/00	Southern B6 B6-10 10 to 12 4/5/00		Shoreline Edge of Gravel B4 B4-6 6 to 8 4/5/00	B1 B1-6 6 to 8 4/5/00	B1-3 B1-8 8 to 10 4/5/00	B3 (1) B3-2 2 to 4 4/5/00
BTEX Compounds												
Benzene	<0.05	<0.05	<0.05	0.0902	<0.05	<0.05	<0.05					
Toluene	<0.05	<0.05	<0.05	0.0803	<0.05	<0.05	<0.05					
Ethylbenzene	<0.05	<0.05	<0.05	0.13	<0.05	<0.05	<0.05					
Xylene	<0.1	<0.1	<0.1	0.193	<0.1	<0.15	<0.1					
Petroleum Hydrocarbons												
Gasoline-Range Hydrocarbons	<5.0	<5.0	<5.0	45.9	<5.0	11.6	<5.0					
Diesel-Range Hydrocarbons	15.5	48	<10	26.5	<10	2,110	<10					
Oil-Range Hydrocarbons	38.7	29.5	<25	25.6	<25	881	<25					
Total Petroleum Hydrocarbons	54.2	77.5	ND	98	ND	3,003	ND					
Interim TPH Policy Testing												
Hazard Index (Residential, HI)	nt	nt	nt	nt	nt	0.17	nt					
Leaching Model (Well Estimate, mg/L)	nt	nt	nt	nt	nt	0.84	nt					

Notes:

All concentrations are reported in mg/kg, except for Interim TPH Policy Testing Data.

Approximate sampling locations are shown in Figure 1.

1. Due to low sample recovery, a sample was not collected from boring B-3 at the 6-foot sample depth.

Table 2. Summary of Phase 2 Groundwater Analytical Data

Sample Location Sample Name depth- ft Sample date	N-Avenue, Along Dock Piping		
	Shoreline Area	Center of Right-of-Way	Adjacent to Terminal
	B1	B2	B3
	B1-8 8 to 12 4/6/00	B2-7.5 7.5 to 11.5 4/6/00	B3-6 6 to 10 4/6/00
BTEX Compounds (mg/L)			
Benzene	0.010	0.045	0.0675
Toluene	< 0.0005	< 0.0015	0.0046
Ethylbenzene	< 0.0005	< 0.0069	0.0339
Xylene	< 0.0024	< 0.0072	0.0055
Petroleum Hydrocarbons			
Gasoline Range Hydrocarbons	0.237	1.46	0.97
Diesel-Range Hydrocarbons	1.98	4.56	4.84
Oil-Range Hydrocarbons	< 0.75	< 1.51	< 0.75
<i>Total Petroleum Hydrocarbons</i>	2.217	6.02	5.81

Notes:

All concentrations are reported as mg/L.

Table 3 Summary of Confirmation Sampling Data

Sample Type Sample ID Sample Date Depth	Sidewall			Bottom			Overburden			
	15-75 3/12/01 5'	20-20 3/8/01 2'	55-75 3/9/01 5'	63-5 3/8/01 2'	35-80 3/12/01 7.5'	52-33 3/7/01 9'	60-57 3/12/01 7.5'	68-43 3/7/01 8'	35-32 3/7/01 4'	40-10 3/8/01 4'
Compound										
Method BSOPSPL003R07										
Dry Weight	80.3	86.5	80.1	80	82.4	79.4	77.4	87.9	82.2	81.2
Method WTPH-G										
Gasoline Range Hydrocarbons	< 5	< 5	31.4	17.6	< 5	< 5	13.2	5.05	< 5	19
Method WTPH-D										
Diesel Range Hydrocarbons	< 10	167	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Heavy Oil Range Hydrocarbons	< 25	94.4	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25
Method EPA 8021B										
Benzene	--	--	< 0.091	--	--	< 0.05	--	< 0.05	< 0.05	--
Ethylbenzene	--	--	< 0.371	--	--	< 0.05	--	< 0.05	< 0.05	--
Toluene	--	--	< 0.06	--	--	< 0.05	--	< 0.05	< 0.05	--
Xylenes (total)	--	--	< 0.63	--	--	< 0.1	--	< 0.1	< 0.1	--

Sample Type Sample ID Sample Date Depth	Removal			Beach			Shore-5	
	30-5 3/8/01 3'	44-47 3/7/01 8"	52-35 3/7/01 7'	27-47 3/7/01 7'	Shore-1 3/13/01 9"	Shore-2 3/13/01 6"	Shore-3 3/13/01 6"	Shore-5 3/13/01 6"
Compound								
<i>Method BSOPSPLO03R07</i>								
Dry Weight	84.8	80.5	82	79.7	80.7	69.3	79.7	78.9
<i>Method WTPH-G</i>								
Gasoline Range Hydrocarbons	979	82	< 5	< 5	5.63	644	< 5	3,650
<i>Method WTPH-D</i>								
Diesel Range Hydrocarbons	703	10.6	23.1	< 10	62.4	3,030	< 10	1,600
Heavy Oil Range Hydrocarbons	95.6	< 25	< 25	< 25	< 25	724	< 25	< 275
<i>Method EPA 8021B</i>								
Benzene	< 0.5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.2	< 0.05	< 2.5
Ethylbenzene	< 2.1	< 0.062	< 0.05	< 0.05	< 0.05	< 0.4	< 0.05	< 8.5
Toluene	< 0.8	< 0.05	< 0.05	< 0.05	< 0.05	< 0.6	< 0.05	< 4.5
Xylenes (total)	< 2.7	< 0.54	< 0.1	< 0.1	< 0.1	< 6	< 0.1	< 17.5

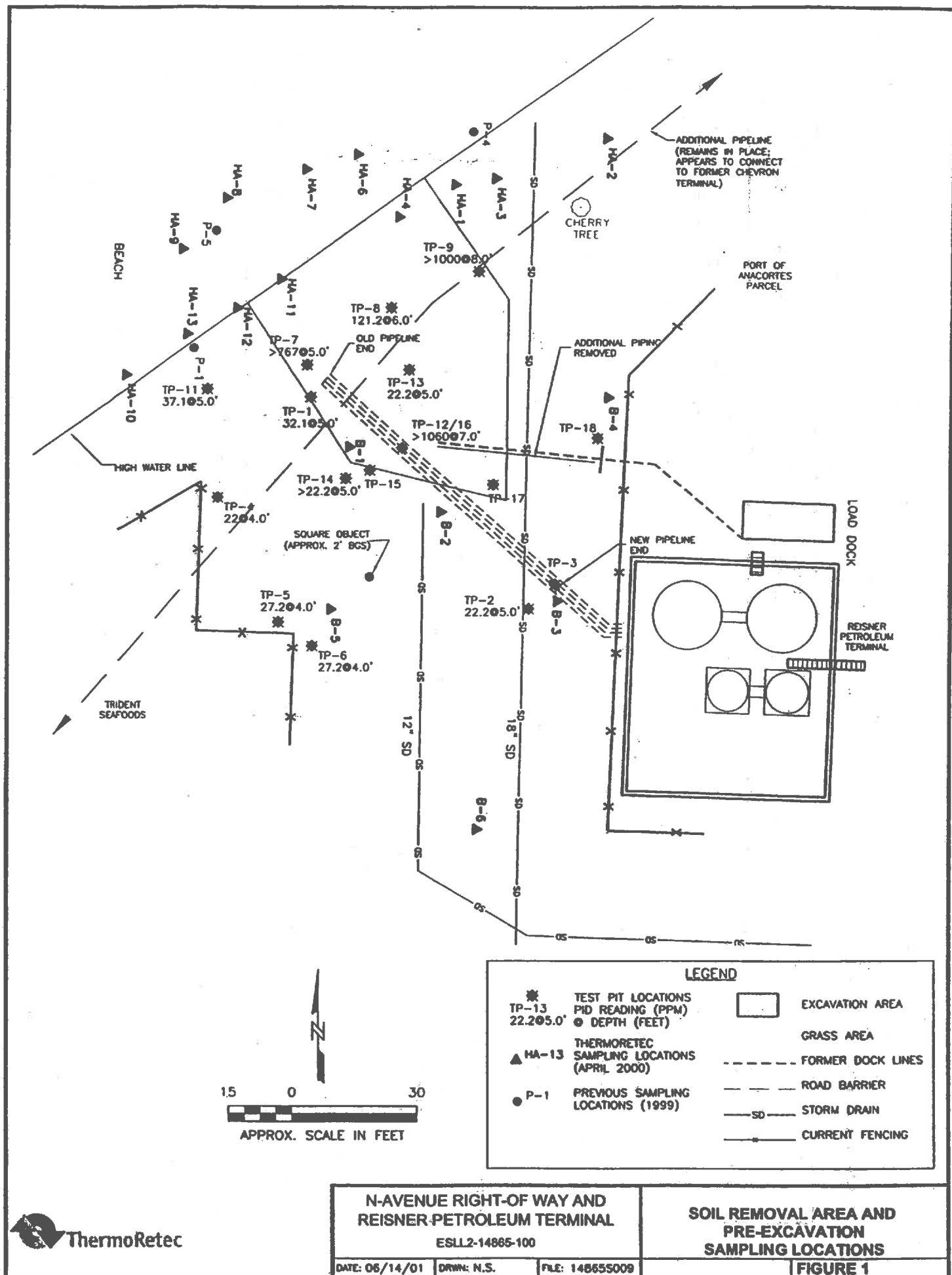
Note: All units in mg/kg.

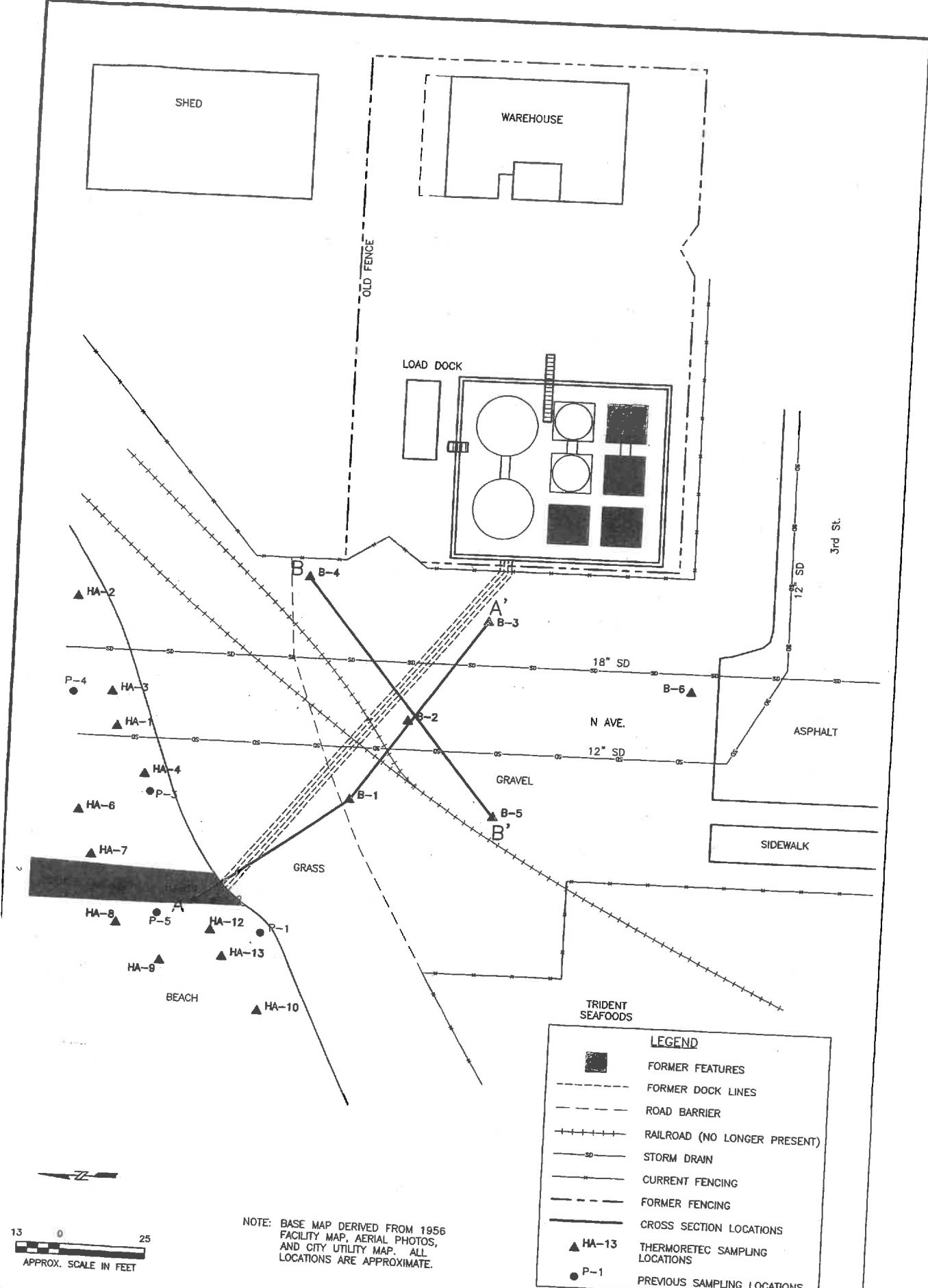
Table 4 PAH Data for Beach Samples

Sample ID	Shore-1 (dry wt)	Shore-3 (dry wt)	Shore-5 (dry wt)	AVG ¹ (dry wt)	AVG (TOC normalized) ²	SMS Criteria SQS	MCUL
<i>Method EPA 9060 mod</i> TOC (Ave.%)	--	--	0.722	--	0.722		
<i>Method GCMS-SIM</i> LPAHs							
2-Methylnaphthalene	<	<	--	0.01	1	38	64
Acenaphthene	<	0.01	<	0.107	15	16	57
Acenaphthylene		0.01	0.3	0.116	16	66	66
Anthracene		0.01	0.820	0.293	41	220	1,200
Fluorene		0.01	0.671	0.235	33	23	79
Naphthalene	<	0.01	0.3	0.107	15	99	170
Phenanthrene		0.01	3.36	1.167	162	100	480
Total LPAHs ^{3,5}	0.219	0.01	4.851	1.693	235	370	780
HPAHs							
Benzo (a) anthracene	0.146	<	0.747	0.301	42	110	270
Benzo (a) pyrene	0.169	<	0.658	0.279	39	99	210
Benzo (b) fluoranthene	0.173	<	0.747	0.310	43	230	450
Benzo (ghi) perylene	0.113	<	0.369	0.164	23	31	78
Benzo (k) fluoranthene	0.063	<	0.3	0.124	17	110	460
Chrysene	0.159	<	0.714	0.294	41	110	460
Dibenz (a,h) anthracene	0.019	<	0.3	0.110	15	12	33
Fluoranthene	0.301	0.013	2.32	0.878	122	160	1,200
Indeno (1,2,3-cd) pyrene	0.118	0.032	0.392	0.181	25	34	34
Pyrene	0.568	0.027	2.48	1.025	142	1,000	1,400
Total HPAHs ^{4,5}	1.261	0.045	5.947	2.418	335	960	5,300

Note: All units in mg/kg.

- 1) Avg indicates the average of samples Shore-1, Shore-3, and Shore-5. The reporting limit was used for undetected compounds.
- 2) A TOC % of 0.722 was used to determine the average for TOC normalized values.
- 3) The LPAH concentration represents the sum of the following compounds: acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene.
- 4) The HPAH concentration represents the sum of all the compounds listed excluding benzo (j) fluoranthene which was not reported by ARI.
- 5) Where chemical analyses detect one or more individual compounds, only the detected concentrations are added to represent the group sum for LPAHs and HPAHs.





NOTE: BASE MAP DERIVED FROM 1956 FACILITY MAP, AERIAL PHOTOS, AND CITY UTILITY MAP. ALL LOCATIONS ARE APPROXIMATE.

LEGEND

- FORMER FEATURES
- FORMER DOCK LINES
- ROAD BARRIER
- RAILROAD (NO LONGER PRESENT)
- STORM DRAIN
- CURRENT FENCING
- FORMER FENCING
- CROSS SECTION LOCATIONS
- ▲ HA-13 THERMORETEC SAMPLING LOCATIONS
- P-1 PREVIOUS SAMPLING LOCATIONS

13 0 25
APPROX. SCALE IN FEET

ThermoRetec

ANACORTES, WASHINGTON			SITE MAP
ESLL2-14865-100			
DATE: 04/20/00	DRAWN: N.S.	FILE: 14865S001	FIGURE 2



ThermoRetec

ANACORTES, WASHINGTON

ESLL2-14865-100

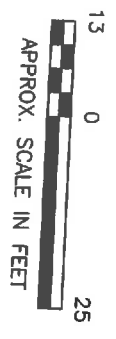
DATE: 04/20/00

DRWN: N.S.

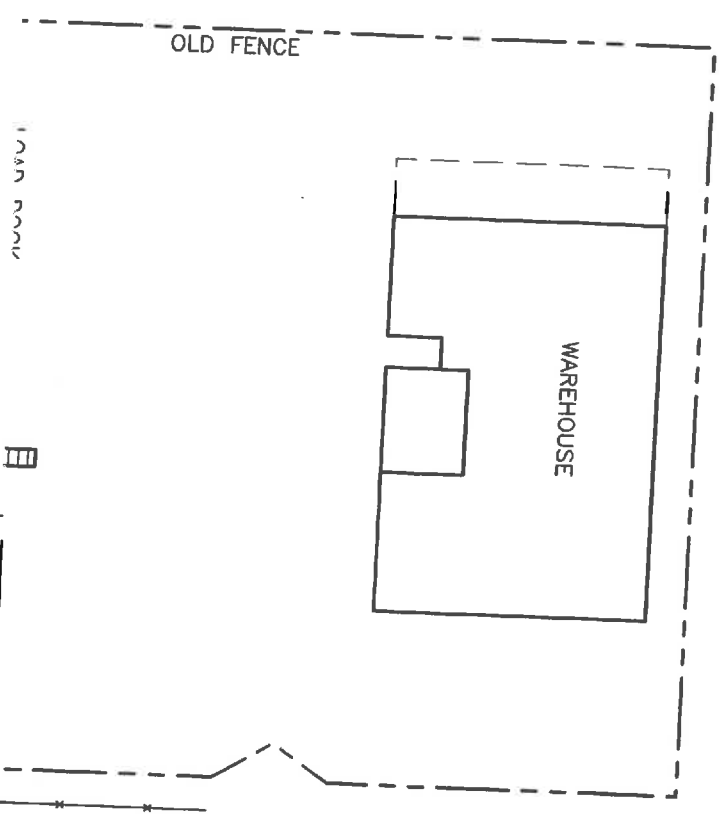
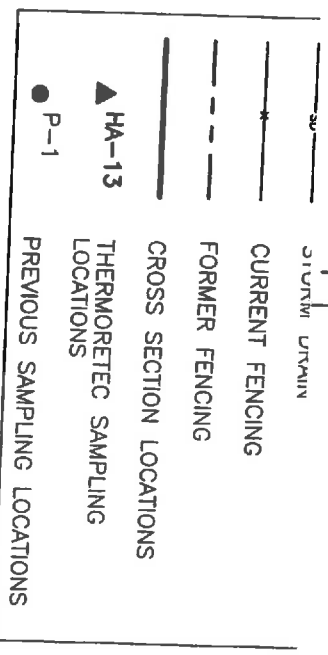
FILE: 148655001

SITE MAP

FIGURE 2



NOTE: BASE MAP DERIVED FROM 1956 FACILITY MAP, AERIAL PHOTOS, AND CITY UTILITY MAP. ALL LOCATIONS ARE APPROXIMATE.



Interim TPH Policy Testing Data: Leaching to Groundwater Pathway

MW (mg/mmol)	Fraction	Shore-1 mg/kg	Shore-2 mg/kg	Shore-3 mg/kg
81	EC 5-6 Aliphatics	< 5	< 20	< 5
100	EC >6-8 Aliphatics	< 5	49.3	< 5
130	EC >8-10 Aliphatics	< 5	96.7	< 5
160	EC >10-12 Aliphatics	17.7	135	< 5
200	EC >12-16 Aliphatics	232	909	< 5
270	EC >16-21 Aliphatics	178	428	< 5
312	EC >21-35 Aliphatics ¹	147	161	< 5
78	EC 5-7 Aromatics (Benzene)	< 0.05	< 0.2	< 0.05
92	EC >7-8 Aromatics (Toluene)	< 0.05	< 0.4	< 0.05
120	EC >8-10 Aromatics	< 5	< 20	< 5
130	EC >10-12 Aromatics	< 5	49.9	< 5
150	EC >12-16 Aromatics	48.7	248	< 5
190	EC >16-21 Aromatics	105	612	< 5
240	EC >21-35 Aromatics	72.9	873	< 5
TOTAL ²		667	3,421	28

Fraction	Fraction Concentration/MW (mmol/kg)		
EC 5-6 Aliphatics	0.0309	0.1235	0.0309
EC >6-8 Aliphatics	0.0250	0.4930	0.0250
EC >8-10 Aliphatics	0.0192	0.7438	0.0192
EC >10-12 Aliphatics	0.1106	0.8438	0.0156
EC >12-16 Aliphatics	1.1600	4.5450	0.0125
EC >16-21 Aliphatics	0.6593	1.5852	0.0093
EC >21-35 Aliphatics ¹	0.4712	0.5160	0.0080
EC 5-7 Aromatics (Benzene)	0.0003	0.0013	0.0003
EC >7-8 Aromatics (Toluene)	0.0003	0.0022	0.0003
EC >8-10 Aromatics	0.0208	0.0833	0.0208
EC >10-12 Aromatics	0.0192	0.3838	0.0192
EC >12-16 Aromatics	0.3247	1.6533	0.0167
EC >16-21 Aromatics	0.5526	3.2211	0.0132
EC >21-35 Aromatics	0.3038	3.6375	0.0104
TOTAL	3.23	17.32	0.19

<u>Fraction</u>		<u>Concentration in Well (mg/L)³</u>		
<u>Solubility (mg/L)</u>	<u>Fraction</u>			
28	EC 5-6 Aliphatics	1.34E-02	9.98E-03	2.23E-01
4.2	EC >6-8 Aliphatics	1.63E-03	5.98E-03	2.71E-02
0.33	EC >8-10 Aliphatics	9.83E-05	7.09E-04	1.64E-03
0.026	EC >10-12 Aliphatics	4.46E-05	6.33E-05	1.05E-04
0.00059	EC >12-16 Aliphatics	1.06E-05	7.74E-06	1.91E-06
0.000001	EC >16-21 Aliphatics	1.02E-08	4.58E-09	2.39E-09
0.000001	EC >21-35 Aliphatics ¹	7.30E-09	1.49E-09	2.07E-09
1780	EC 5-7 Aromatics (Benzene)	8.84E-03	6.59E-03	1.48E-01
520	EC >7-8 Aromatics (Toluene)	2.19E-03	3.26E-03	3.65E-02
65	EC >8-10 Aromatics	2.10E-02	1.56E-02	3.50E-01
25	EC >10-12 Aromatics	7.45E-03	2.77E-02	1.24E-01
5.8	EC >12-16 Aromatics	2.92E-02	2.77E-02	2.50E-02
0.51	EC >16-21 Aromatics	4.37E-03	4.74E-03	1.74E-03
0.01	EC >21-35 Aromatics	4.71E-05	1.05E-04	2.69E-05
TOTAL (mg/L)		0.0882	0.1025	0.9376

Notes:

1. Consistent with Interim TPH Policy guidance, the data for the C21-C35 aliphatic fraction has been excluded from the totals and leaching calculations. However the data are presented here for completeness. Molecular weight for EC > C21-35 aliphatic fraction is set equal to that of C22 n-alkane (312 mg/mmol). Fraction solubility for EC > C21-35 aliphatic fraction is set equal to solubility of EC > 16-21 aliphatic fraction.

² Non-detect values were set equal to one-half the detection limit for calculation of totals.

³ Concentration in well = (Mole Fraction) X (Fraction Solubility) / (Dilution Factor of 20)

Mole Fraction = (mmol/kg Fraction) / (mmol/kg Total)

Summary of Interim TPH Policy Testing Data: Direct Ingestion Pathway

	Shore-1	Shore-2 ⁽⁴⁾	Shore-3
	mg/kg	mg/kg	mg/kg
EC 5-6 Aliphatics	< 5	< 20	< 5
EC >6-8 Aliphatics	< 5	49.3	< 5
EC >8-10 Aliphatics	< 5	96.7	< 5
EC >10-12 Aliphatics	17.7	135	< 5
EC >12-16 Aliphatics	232	909	< 5
EC >16-21 Aliphatics	178	428	< 5
EC >21-35 Aliphatics	147	161	< 5
EC 5-7 Aromatics (Benzene)	< 0.05	< 0.2	< 0.05
EC >7-8 Aromatics (Toluene)	< 0.05	< 0.4	< 0.05
EC >8-10 Aromatics	< 5	< 20	< 5
EC >10-12 Aromatics	< 5	49.9	< 5
EC >12-16 Aromatics	48.7	248	< 5
EC >16-21 Aromatics	105	612	< 5
EC >21-35 Aromatics	72.9	873	< 5

Constituent	RfD-oral
Aliphatics	0.06
Aromatics	0.03
Toluene	0.20
Ethylbenzene	0.10
Total Xylenes	2.00
Scenario	Factor
Residential	1.25E-05
Commercial	3.13E-06
Industrial	2.86E-07

TOTAL ¹	667	3,421	28
Total Aliphatics (C5-C35) ¹	435	1,628	15
Total Aromatics (Benz + C8-C35)	232	1,793	13
Benzene	< 0.05	< 0.2	< 0.05
Toluene	< 0.05	< 0.4	< 0.05
Ethylbenzene	< 0.05	< 0.6	< 0.05
Total Xylenes	< 0.1	< 6	< 0.1
HAZARD INDEX ²			
Residential ³	0.19	1.09	0.01
Commercial	0.05	0.27	0.00
Industrial	0.00	0.02	0.00

Notes:

1. Sample Shore-2 contained pieces of creosoted wood debris (driftwood) and asphalt in addition to diesel and kerosene hydrocarbons.

¹ Non-detect values were set equal to one-half the detection limit for calculation of totals. Data for the aliphatic C21-C34 fraction has been excluded from the totals and HI calculations, consistent with Interim TPH Policy procedures.

² Hazard Index = the summation of (Soil Concentration - mg/kg) (Factor [Res, Com, or Ind]) / Oral-RfD for each compound or group of compounds (e.g., C5 - C35 aliphatics).

³ For example, the Residential Hazard Index for Sample Shore-1 is calculated as follows,

	Soil Conc. (mg/kg)	Factor _{Res}	RfD _{Oral}	Hazard Quotient (HQ)
Total Aliphatics (C5-C35)	435	1.25E-05	0.06	0.09
Total Aromatics (Benz + C8-C35)	232	1.25E-05	0.03	0.10
Toluene	0	1.25E-05	0.2	0.00
Ethylbenzene	0	1.25E-05	0.1	0.00
Total Xylenes	0	1.25E-05	2	0.00
Hazard Index (sum of HQs)				0.19

Table 1. Summary of Phase 2 Soil Analytical Data

Beach Samples (Collected by Hand Auger)

Site Area		Storm Drain Area			Former Dock Area			
Sample Location depth- ft Sample date	HA-2 2.3 4/5/00	HA-1 1.8 4/5/00	HA-4 1.8 4/5/00	HA-11 1.3 4/6/00	HA-12 1.3 4/6/00	HA-13 1.3 4/6/00	HA-10 1.3 4/5/00	
BTEX Compounds Benzene Toluene Ethylbenzene Xylene	<0.05 <0.05 <0.05 <0.1	<0.05 <0.05 <0.05 <0.1	<0.05 <0.05 <0.05 <0.1	<2.5 <17.5 <35.0 <150	<0.05 <0.05 <0.341 <0.21	<0.05 <0.05 <0.05 <0.1	<0.05 <0.05 <0.05 <0.1	
	Petroleum Hydrocarbons							
	Gasoline-Range Hydrocarbons	<5.0 407 227 634	<5.0 10.3 <25 10.3	<5.0 <10 <25 ND	5,770 1,590 <275 7,360	30.3 113 33.5 176.8	<5.0 <10 <25 ND	<5.0 <10 <25 ND
	Total Petroleum Hydrocarbons							
	Interim TPH Policy Testing							
Hazard Index (Residential, HI)	nt	nt	nt	0.78	nt	nt	nt	
Leaching Model (Well Estimate, mg/L)	nt	nt	nt	0.60	nt	nt	nt	

Right-of-Way Samples (Collected by Geoprobe)

Site Area	N-Avenue		N-Avenue		N-Avenue				
	Shoreline Edge of Gravel	Along Dock Piling	Western Side	Southern					
Sample Location Sample Name depth-ft Sample date	B4	B1	B3 (1)	B2	B5	B6			
BTEx Compounds	B4-6 6 to 8 4/6/00	B1-6 6 to 8 4/6/00	B1-8 8 to 10 4/6/00	B3-2 2 to 4 4/6/00	B3-10 10 to 12 4/6/00	B2-4 4 to 6 4/6/00	B5-4 4 to 6 4/6/00	B5-8 8 to 10 4/6/00	B6-10 10 to 12 4/6/00
	<0.05	<0.05	<0.05	0.0902	<0.05	<1.0	<0.05	<0.1	<0.05
	<0.05	<0.05	<0.05	0.0803	<0.05	<1.0	<0.05	<0.1	<0.05
	<0.05	<0.05	<0.05	0.13	<0.05	<4.0	<0.05	<0.16	<0.05
Xylene	<0.1	<0.1	<0.1	0.193	<0.1	<20.0	<0.15	<0.2	<0.1
Petroleum Hydrocarbons									
Gasoline-Range Hydrocarbons	<5.0	<5.0	<5.0	45.9	<5.0	1,970	11.6	80.8	<5.0
Diesel-Range Hydrocarbons	15.5	48	<10	26.5	<10	111	2,110	668	<10
Oil-Range Hydrocarbons	38.7	29.5	<25	25.6	<25	<25	881	207	<25
Total Petroleum Hydrocarbons	54.2	77.5	ND	98	ND	2,081	3,003	956	ND
Interim TPH Policy Testing									
Hazard Index (Residential, HI)	nt	nt	nt	nt	nt	0.17	0.11	nt	nt
Leaching Model (Well Estimate, mg/L)	nt	nt	nt	nt	nt	0.64	0.05	nt	nt

Notes:

All concentrations are reported in mg/kg, except for Interim TPH Policy Testing Data.
Approximate sampling locations are shown in Figure 1.

1. Due to low sample recovery, a sample was not collected from boring B-3 at the 6-foot sample depth.

Table 2. Summary of Phase 2 Groundwater Analytical Data

Sample Location Sample Name depth- ft Sample date	N-Avenue, Along Dock Piping		
	Shoreline Area B1 B1-8 8 to 12 4/6/00	Center of Right-of-Way B2 B2-7.5 7.5 to 11.5 4/6/00	Adjacent to Terminal B3 B3-6 6 to 10 4/6/00
BTEX Compounds (mg/L)			
Benzene	0.010	0.045	0.0675
Toluene	< 0.0005	< 0.0015	0.0046
Ethylbenzene	< 0.0005	< 0.0069	0.0339
Xylene	< 0.0024	< 0.0072	0.0055
Petroleum Hydrocarbons			
Gasoline Range Hydrocarbons	0.237	1.46	0.97
Diesel-Range Hydrocarbons	1.98	4.56	4.84
Oil-Range Hydrocarbons	< 0.75	< 1.51	< 0.75
<i>Total Petroleum Hydrocarbons</i>	2.217	6.02	5.81

Notes:

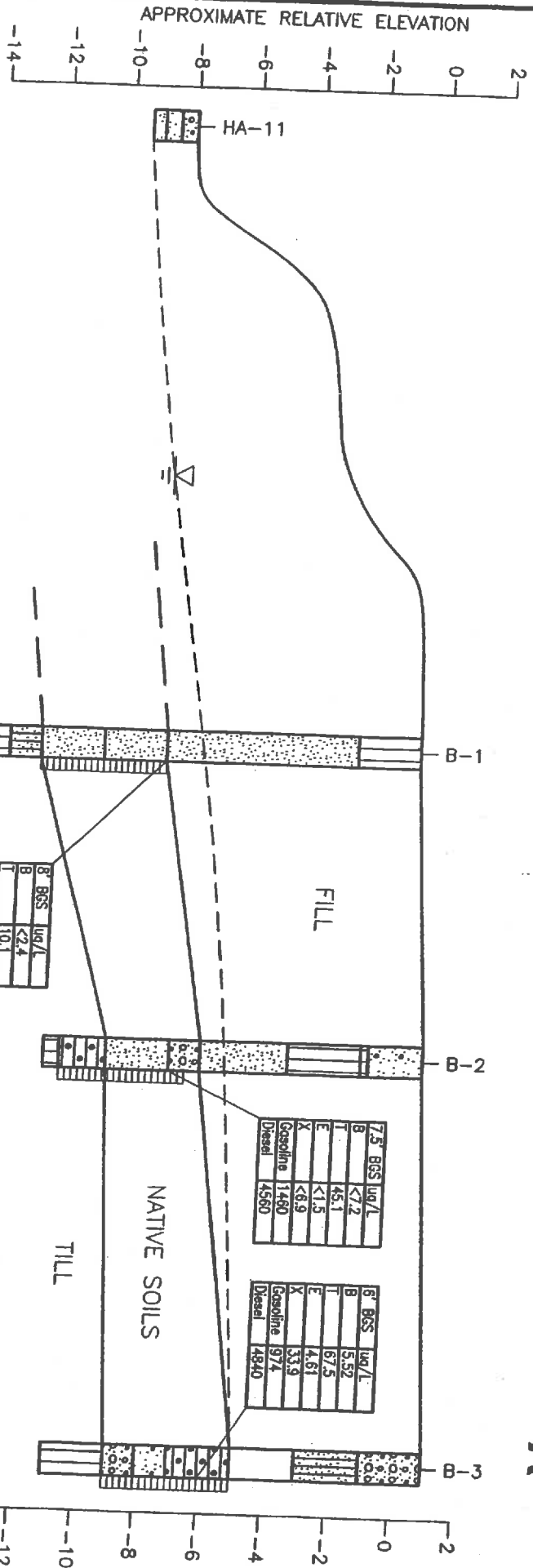
All concentrations are reported as mg/L.

NORTHWEST

A

SOUTHEAST

A'



NOTE: STREET LEVEL ASSIGNED ARBITRARY ELEVATION OF ZERO.



DATE: 05/09/00

ESL2-1465-100

DRWN: N.S.

FILE: 1465G004

CROSS SECTION A-A'

GROUNDWATER RESULTS

FIGURE 4

Table 1. Summary of Collected Soil Analytical Data

Beach Samples (Collected by Hand Auger)

Sample Location depth- ft Sample date	Storm Drain Area			Former Dock Area			
	HA-2 2.3 4/5/00	HA-1 1.8 4/5/00	HA-4 1.8 4/5/00	HA-11 1.3 4/6/00	HA-12 1.3 4/6/00	HA-13 1.3 4/6/00	HA-10 1.3 4/5/00
BTX Compounds							
Benzene	<0.05	<0.05	<0.05	<2.5	<0.05	<0.05	<0.05
Toluene	<0.05	<0.05	<0.05	<17.5	<0.05	<0.05	<0.05
Ethylbenzene	<0.05	<0.05	<0.05	<35.0	<0.341	<0.05	<0.05
Xylene	<0.1	<0.1	<0.1	<150	<0.21	<0.1	<0.1
Petroleum Hydrocarbons							
Gasoline-Range Hydrocarbons	<5.0	<5.0	<5.0	5,770	30.3	<5.0	<5.0
Diesel-Range Hydrocarbons	407	10.3	<10	1,590	113	<10	<10
Oil-Range Hydrocarbons	227	<25	<25	<275	33.5	<25	<25
Total Petroleum Hydrocarbons	634	10.3	ND	7,360	176.8	ND	ND
Interim TPH Policy Testing							
Hazard Index (Residential, HI)	nt	nt	nt	0.78	nt	nt	nt
Leaching Model (Well Estimate, mg/L)	nt	nt	nt	0.60	nt	nt	nt

Right-of-Way Samples (Collected by Geoprobe)

Site Area	N-Avenue			N-Avenue			N-Avenue		
	Shoreline Edge of Gravel	Along Dock Piling		Western Side		Southern			
Sample Location Sample Name depth- ft Sample date	B4	B1	B3-M	B2	B5	B6			
BTX Compounds	B4-6 6 to 8 4/6/00	B1-6 6 to 8 4/6/00	B1-8 8 to 10 4/6/00	B3-2 2 to 4 4/6/00	B3-10 10 to 12 4/6/00	B2-4 4 to 6 4/6/00	B5-4 4 to 6 4/6/00	B5-8 8 to 10 4/6/00	B6-10 10 to 12 4/6/00
Benzene	<0.05	<0.05	<0.05	0.0902	<0.05	<1.0	<0.05	<0.1	<0.05
Toluene	<0.05	<0.05	<0.05	0.0803	<0.05	<1.0	<0.05	<0.1	<0.05
Ethylbenzene	<0.05	<0.05	<0.05	0.13	<0.05	<4.0	<0.05	<0.16	<0.05
Xylene	<0.1	<0.1	<0.1	0.193	<0.1	<20.0	<0.15	<0.2	<0.1
Petroleum Hydrocarbons									
Gasoline-Range Hydrocarbons	<5.0	<5.0	<5.0	45.9	<5.0	1,970	11.6	80.8	<5.0
Diesel-Range Hydrocarbons	15.5	48	<10	26.5	<10	111	2,110	668	<10
Oil-Range Hydrocarbons	38.7	29.5	<25	25.6	<25	<25	881	207	<25
Total Petroleum Hydrocarbons	54.2	77.5	ND	98	ND	2,081	3,003	956	ND
Interim TPH Policy Testing									
Hazard Index (Residential, HI)	nt	nt	nt	nt	nt	0.17	0.11	nt	nt
Leaching Model (Well Estimate, mg/L)	nt	nt	nt	nt	nt	0.64	0.05	nt	nt

Notes:

All concentrations are in mg/L.

Notes:

All concentrations are reported in mg/kg, except for Interim TPH Policy Testing Data
Approximate sampling locations are shown in Figure 1.

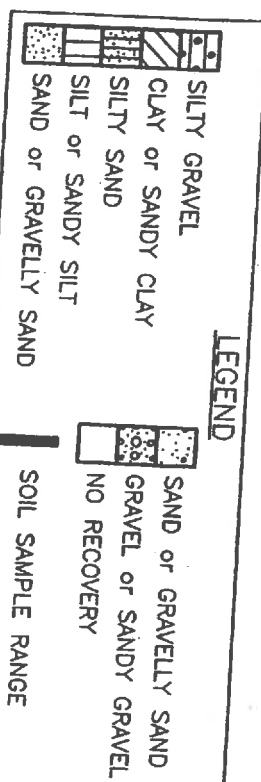
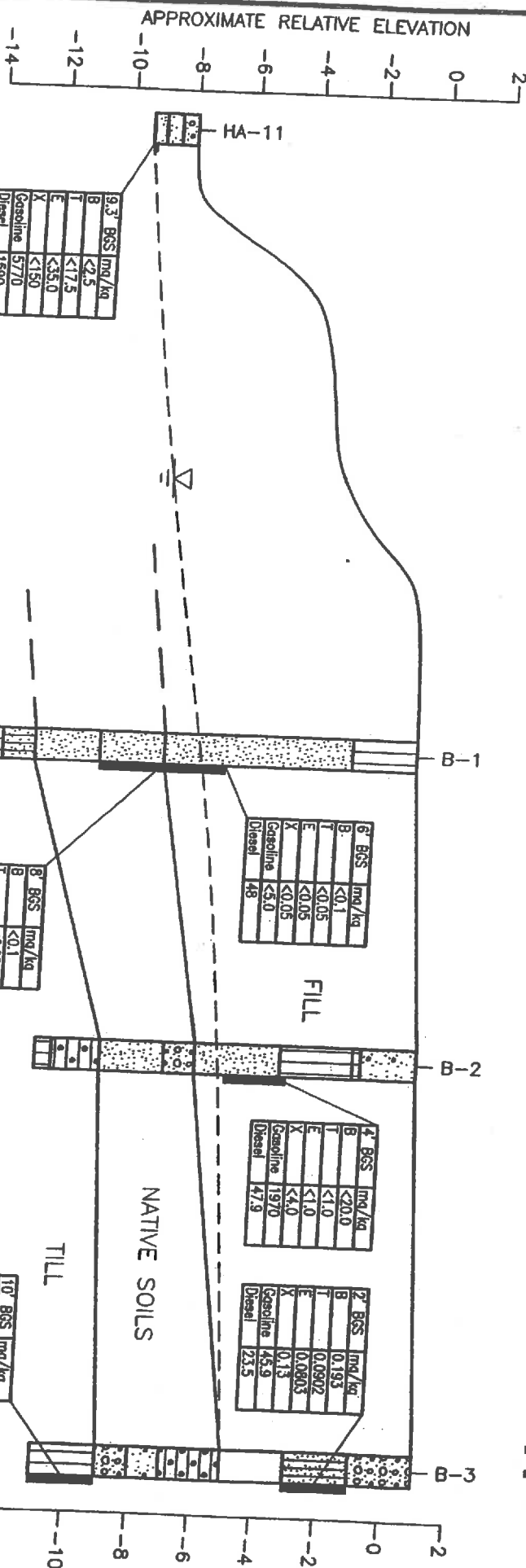
Copies of the analytical laboratory reports are included as attachments to this report.
1. Due to low sample recovery, a sample was not collected from boring B-3 at the 8-foot sample depth.

NORTHWEST

A

SOUTHEAST

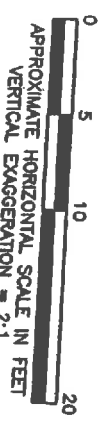
A'



NOTES:

DEPTH	mg/kg
B	<0.1
T	<0.05
E	<0.05
X	<0.05
Gasoline	<5.0
Diesel	<10.0

NOTE: STREET LEVEL ASSIGNED ARBITRARY ELEVATION OF ZERO.



DATE: 05/02/00

ESIL2-14865-100

DRWN: N.S.

FILE: 14865C002

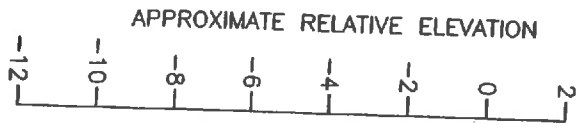
CROSS SECTION A-A'

SOIL RESULTS

FIGURE 3

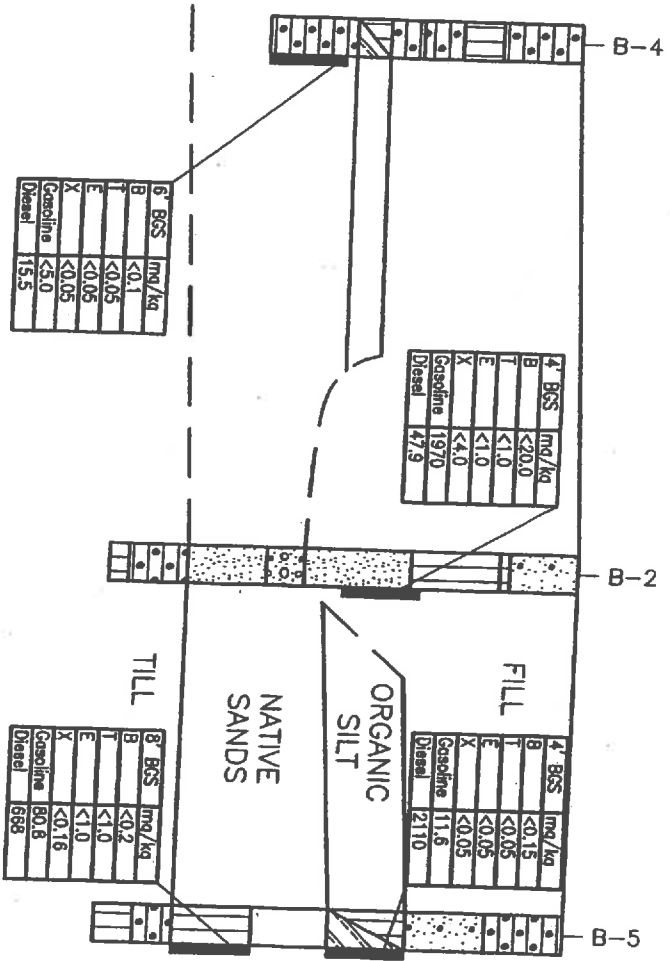
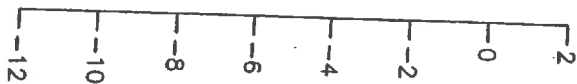
NORTHEAST

B



SOUTHWEST

B'

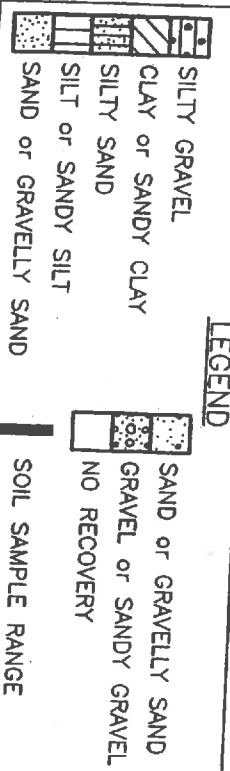


4' BGS	mg/kg
B	<20.0
T	<1.0
E	<1.0
X	<4.0
Gasoline	1970
Diesel	47.9

4' BGS	mg/kg
B	<0.15
T	<0.05
E	<0.05
X	<0.05
Gasoline	11.8
Diesel	12110

6' BGS	mg/kg
B	<0.1
T	<0.05
E	<0.05
X	<0.05
Gasoline	<5.0
Diesel	15.5

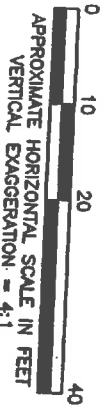
6' BGS	mg/kg
B	<0.2
T	<1.0
E	<1.0
X	<0.16
Gasoline	80.8
Diesel	668



NOTES:

DEPTH	mg/kg
B	<0.1
T	<0.05
E	<0.05
X	<0.05
Gasoline	<5.0
Diesel	<10.0

NOTE: STREET LEVEL ASSIGNED ARBITRARY ELEVATION OF ZERO.



DATE: 05/02/00
DRAWN: N.S.
ESL2-14865-100

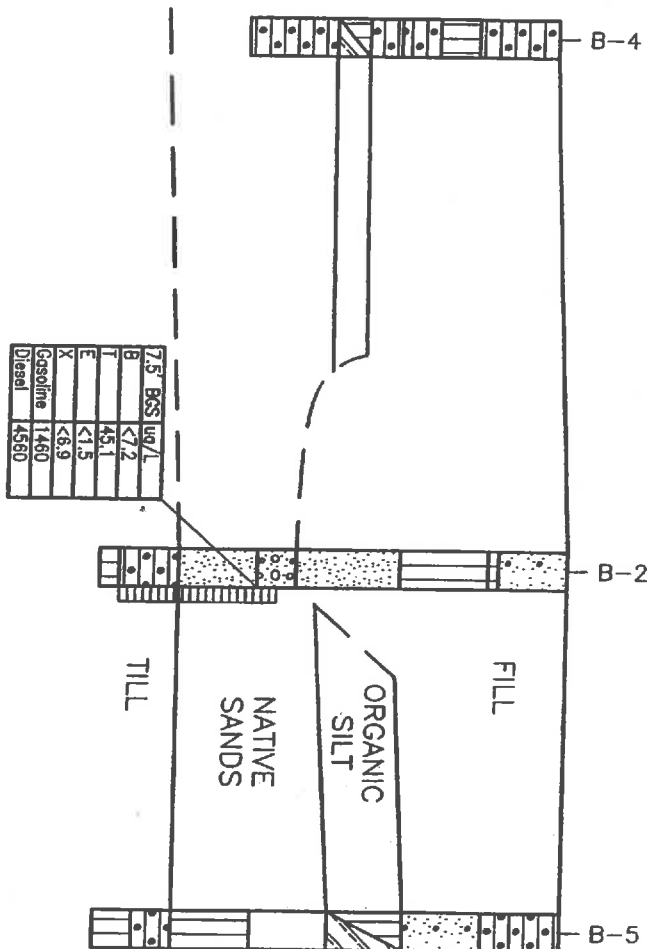
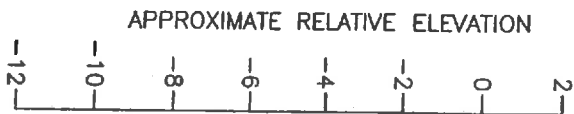
FILE: 14865G003

CROSS SECTION B-B'
SOIL RESULTS

FIGURE 5

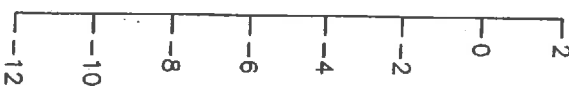
NORTHEAST

B

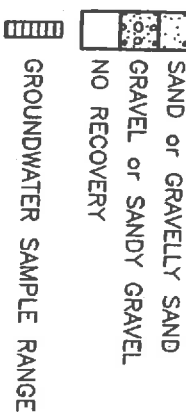
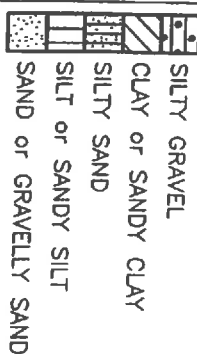


SOUTHWEST

B'



LEGEND



NOTES:

DEPTH	ug/L
B	<0.1
T	<0.05
E	<0.05
X	<0.05
Gasoline	<5.0
Diesel	<10.0

NOTE: STREET LEVEL ASSIGNED ARBITRARY ELEVATION OF ZERO.



ESLL2-14865-100

DATE: 05/09/00

DRWN: N.S.

FILE: 14865G005

CROSS SECTION B-B'
GROUNDWATER RESULTS

FIGURE 6

Table 1. Summary of Collected Soil Analytical Data

Beach Samples (Collected by Hand Auger)

Sample Location depth- ft Sample date	Storm Drain Area			Former Dock Area			
	HA-2 2.3 4/5/00	HA-1 1.8 4/5/00	HA-4 1.8 4/5/00	HA-11 1.3 4/5/00	HA-12 1.3 4/6/00	HA-13 1.3 4/6/00	HA-10 1.3 4/5/00
BTX Compounds							
Benzene	<0.05	<0.05	<0.05	<2.5	<0.05	<0.05	<0.05
Toluene	<0.05	<0.05	<0.05	<17.5	<0.05	<0.05	<0.05
Ethylbenzene	<0.05	<0.05	<0.05	<35.0	<0.341	<0.05	<0.05
Xylene	<0.1	<0.1	<0.1	<150	<0.21	<0.1	<0.1
Petroleum Hydrocarbons							
Gasoline-Range Hydrocarbons	<5.0	<5.0	<5.0	5,770	30.3	<5.0	<5.0
Diesel-Range Hydrocarbons	407	10.3	<10	1,590	113	<10	<10
Oil-Range Hydrocarbons	227	<25	<25	<275	33.5	<25	<25
Total Petroleum Hydrocarbons	634	10.3	ND	7,360	176.8	ND	ND
Interim TPH Policy Testing							
Hazard Index (Residential, HI)	nt	nt	nt	0.78	nt	nt	nt
Leaching Model (Well Estimate, mg/L)	nt	nt	nt	0.60	nt	nt	nt

Right-of-Way Samples (Collected by Geoprobe)

Sample Location Sample Name depth- ft Sample date	N-Avenue Shoreline Edge of Gravel			N-Avenue Along Dock Piping			N-Avenue Western Side		N-Avenue Southern	
	B4 B4-6 6 to 8 4/6/00	B1-6 6 to 8 4/6/00	B1-8 8 to 10 4/6/00	B3-2 2 to 4 4/6/00	B3-10 10 to 12 4/6/00	B2-4 4 to 6 4/6/00	B5-4 4 to 6 4/6/00	B5-8 8 to 10 4/6/00	B6-10 10 to 12 4/6/00	
BTX Compounds										
Benzene	<0.05	<0.05	<0.05	0.0902	<0.05	<1.0	<0.05	<0.1	<0.05	
Toluene	<0.05	<0.05	<0.05	0.0803	<0.05	<1.0	<0.05	<0.1	<0.05	
Ethylbenzene	<0.05	<0.05	<0.05	0.13	<0.05	<4.0	<0.05	<0.16	<0.05	
Xylene	<0.1	<0.1	<0.1	0.193	<0.1	<20.0	<0.15	<0.2	<0.1	
Petroleum Hydrocarbons										
Gasoline-Range Hydrocarbons	<5.0	<5.0	<5.0	45.9	<5.0	1,970	11.6	80.8	<5.0	
Diesel-Range Hydrocarbons	15.5	48	<10	26.5	<10	111	2,110	668	<10	
Oil-Range Hydrocarbons	38.7	29.5	<25	25.6	<25	<25	881	207	<25	
Total Petroleum Hydrocarbons	54.2	77.5	ND	98	ND	2,081	3,003	956	ND	
Interim TPH Policy Testing										
Hazard Index (Residential, HI)	nt	nt	nt	nt	nt	0.17	0.11	nt	nt	
Leaching Model (Well Estimate, mg/L)	nt	nt	nt	nt	nt	0.64	0.05	nt	nt	

Notes:

All concentrations are reported in mg/kg, except for Interim TPH Policy Testing Data
Approximate sampling locations are shown in Figure 1.

Copies of the analytical laboratory reports are included as attachments to this report.

1. Due to low sample recovery, a sample was not collected from boring B-3 at the 6-foot sample depth.

Table 2. Summary of Collected Groundwater Analytical Data

Sample Location Sample Name depth- ft Sample date	N-Avenue, Along Dock Piping		
	Shoreline Area B1 B1-8 8 to 12 4/6/00	Center of Right-of-Way B2 B2-7.5 7.5 to 11.5 4/6/00	Adjacent to Terminal B3 B3-6 6 to 10 4/6/00
BTEX Compounds (mg/L)			
Benzene	0.010	0.045	0.0675
Toluene	< 0.0005	< 0.0015	0.0046
Ethylbenzene	< 0.0005	< 0.0069	0.0339
Xylene	< 0.0024	< 0.0072	0.0055
Petroleum Hydrocarbons			
Gasoline Range Hydrocarbons	0.237	1.46	0.97
Diesel-Range Hydrocarbons	1.98	4.56	4.84
Oil-Range Hydrocarbons	< 0.75	< 1.51	< 0.75
<i>Total Petroleum Hydrocarbons</i>	2.217	6.02	5.81

Notes:

All concentrations are reported as mg/L.

Copies of analytical laboratory reports are attached as appendices to this report.

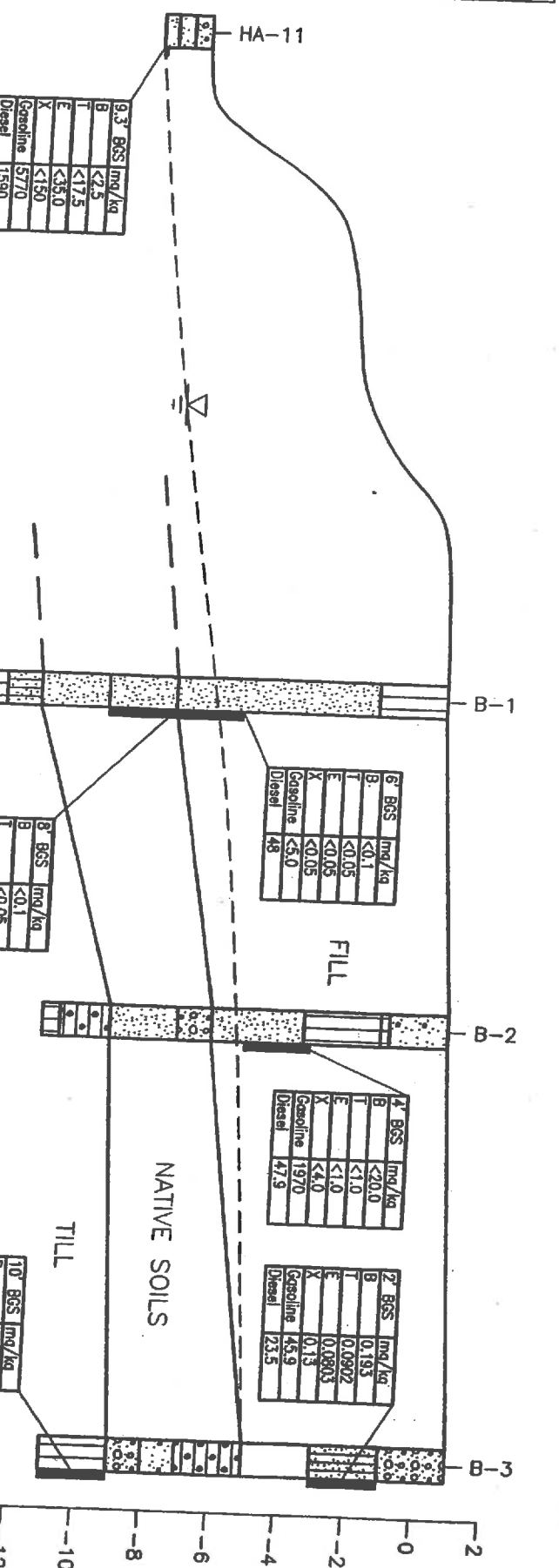
A

NORTHWEST

SOUTHEAST

A'

APPROXIMATE RELATIVE ELEVATION



DATE: 05/02/00

DRWN: N.S.

ESLL2-14865-100

FILE: 14865C002

CROSS SECTION A-A'
SOIL RESULTS

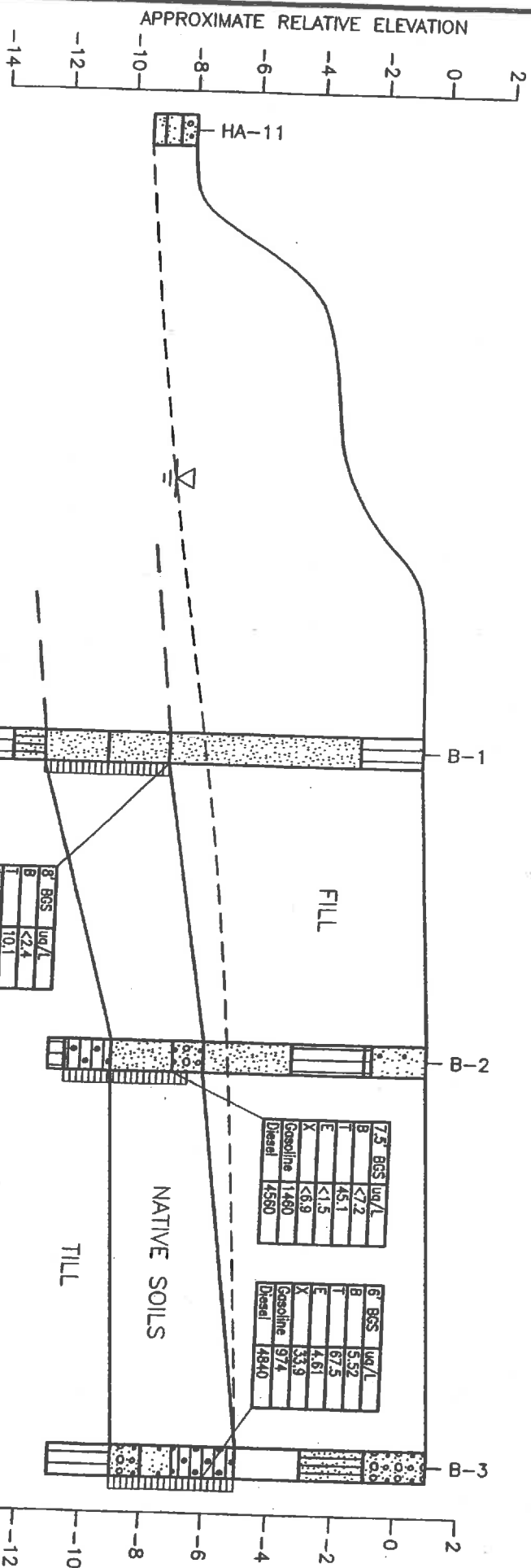
FIGURE 3

A

NORTHWEST

A'

SOUTHEAST



DEPTH	BGS	ug/L
B	8	<2.4
T	10.1	
E	<0.5	
X	<0.5	
Gasoline	237	
Diesel	1980	

DEPTH	7.5' BGS	ug/L
B	<7.2	
T	45.1	
E	<1.5	
X	<6.9	
Gasoline	1460	
Diesel	4560	

DEPTH	6' BGS	ug/L
B	5.52	
T	67.5	
E	4.61	
X	33.9	
Gasoline	974	
Diesel	14840	

LEGEND

- Silty Gravel
- Clay or Sandy Clay
- Silty Sand
- Sand or Silty Sand
- Sand or Gravelly Sand
- Groundwater Sample Range
- Sand or Gravelly Sand
- Gravel or Sandy Gravel
- No Recovery

NOTES:

DEPTH	ug/L
B	<0.1
T	<0.05
E	<0.05
X	<0.05
Gasoline	<5.0
Diesel	<10.0

NOTE: STREET LEVEL ASSIGNED ARBITRARY ELEVATION OF ZERO.



DATE: 05/09/00
 ESLL2-14885-100
 DRWN: N.S.
 FILE: 14885G004

CROSS SECTION A-A'
GROUNDWATER RESULTS

FIGURE 4

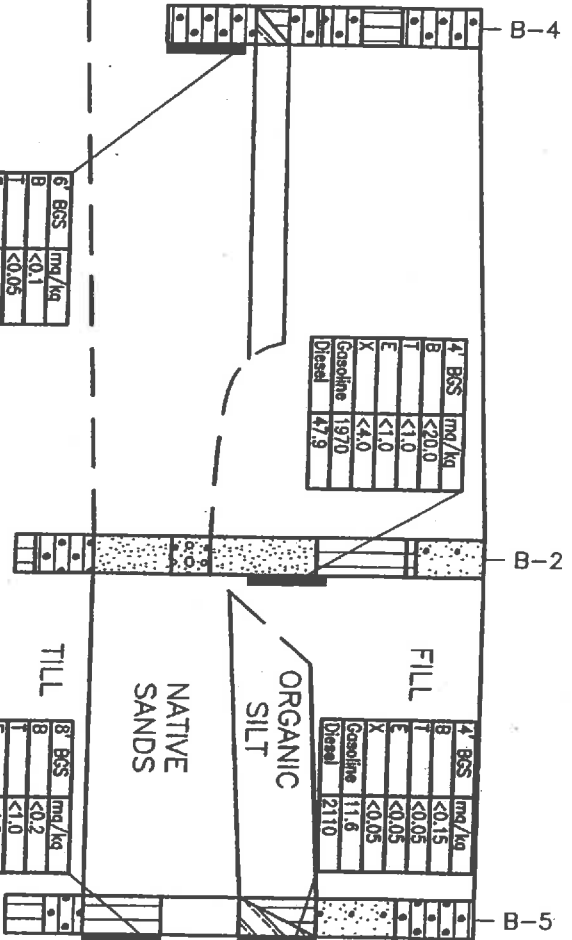
NORTHEAST

B

SOUTHWEST

B'

APPROXIMATE RELATIVE ELEVATION



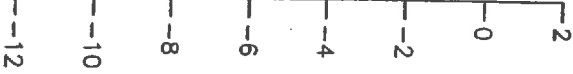
DEPTH	mg/kg
B	<0.1
T	<0.05
E	<0.05
X	<0.05
Gasoline	<5.0
Diesel	15.5

DEPTH	mg/kg
B	<20.0
T	<1.0
E	<1.0
X	<4.0
Gasoline	1970
Diesel	47.9

DEPTH	mg/kg
B	<0.15
T	<0.05
E	<0.05
X	<0.05
Gasoline	111.6
Diesel	2110

DEPTH	mg/kg
B	<0.2
T	<1.0
E	<1.0
X	<0.16
Gasoline	80.8
Diesel	668

APPROXIMATE HORIZONTAL SCALE IN FEET



LEGEND

- SILTY GRAVEL
- CLAY or SANDY CLAY
- SILTY SAND
- SILT or SANDY SILT
- SAND or GRAVELLY SAND
- SAND or GRAVELLY SAND
- GRAVEL or SANDY GRAVEL
- NO RECOVERY
- SOIL SAMPLE RANGE

NOTES:

DEPTH	mg/kg
B	<0.1
T	<0.05
E	<0.05
X	<0.05
Gasoline	<5.0
Diesel	<10.0

NOTE: STREET LEVEL ASSIGNED ARBITRARY ELEVATION OF ZERO.



ESLL2-14865-100

CROSS SECTION B-B'
SOIL RESULTS

DATE: 05/02/00

DRWN: N.S.

FILE: 148650003

FIGURE 5


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CROSS SECTION B-B' GROUNDWATER RESULTS

FIGURE 6



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BORING LOG

B-1

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PROJECT NO: *ESLL2-14885-100 Former Anacortes Terminal*

LOCATION: *Anacortes, Washington; Just W of Lines at N End of Property*

START DATE: *04/08/00* TIME: *08:10*

BORE HOLE ID: *1 inch*

COMPLETION DATE: *04/08/00* TIME: *09:10*

BORING DEPTH: *14.0 feet bgs*

WATER LEVEL DURING DRILLING: *10.0' bgs*

SURFACE ELEV.: *feet (MSL)*

DATE MEASURED: *04/08/00*

M. P. ELEVATION: *feet (MSL)*

CLIENT: *Equiva Services LLC*

DRILLING CO.: *Cascade Drilling*

DRILLER: *Kasey*

RIG TYPE: *Geoprobe*

METHOD: *Direct Push*

LOGGED BY: *C. Afferness*

DEPTH (in feet)	SAMPLE DATA						SOIL DESCRIPTION
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	
0	SS		25	0		ML	<u>SILT WITH GRAVEL</u> : Black and brown; moist; no odor.
5	SS		25	0		SP	<u>SAND</u> : Black and brown; fine- to medium-grained; moist to dry; no odor.
	SS		25	0			4.0'-6.0' - Mostly saturated; very slight odor.
	SS		30	7			6.0'-8.0' - Mostly saturated; strong diesel odor.
	SS		50	10			8.0'-10.0' - Gray and black; medium- to coarse-grained; trace gravel; moist; dense; slight odor.
10	SS		40	0			10.0'-12.0' - Fine- to medium-grained; saturated; no odor.
	SS		80	0		ML	<u>SANDY SILT</u> : Brown to tan; trace gravel; moist; no odor.
						ML	<u>SILT</u> : Brown; trace sand; moist to dry; no odor.
						CL	<u>CLAY</u> : Gray-brown; trace silt; moist; no odor.
							Total depth = 14.0 feet bgs.

REMARKS:

SS - Split Spoon
■ - Sample Interval



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B-2

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PROJECT NO: ESLL2-14865-100 Former Anacortes Terminal

CLIENT: Equiva Services LLC

LOCATION: Anacortes, Washington; Midway along Fuel Lines

DRILLING CO.: Cascade Drilling

START DATE: 04/06/00 TIME: 09:30 BORE HOLE ID: 1 inch

DRILLER: Kasey

COMPLETION DATE: 04/06/00 TIME: 10:00 BORING DEPTH: 12.0 feet bgs

RIG TYPE: Geoprobe

WATER LEVEL DURING DRILLING: 6.0' bgs SURFACE ELEV.: feet (NSL)

METHOD: Direct Push

DATE MEASURED: 04/06/00 M. P. ELEVATION: feet (NSL)

LOGGED BY: C. Alferness

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PTD (ppm)	U.S.C.S.	LITHOLOGY
0	SS			75	0	SM	
							<u>GRAVELLY SILTY SAND</u> : Brown to black, some iron mottling; dry to moist; no odor.
	SS			75	0	ML ML	
							<u>SILT</u> : Brown; dry; no odor.
							<u>SILT WITH TRACE CLAY</u> : Prevalent orange mottling; dry; no odor.
	SS			75	1	ML	
						SP	
5							<u>SILT</u> : Orange; trace sand; moist to saturated; no odor.
							4.0'-4.25' - 1 worm; strong odor.
							<u>SAND</u> : Gray to black (stained); moist to saturated; strong odor.
							6.0'-7.0' - Less black; saturated; odor.
						GP	
							<u>GRAVEL WITH SAND</u> : Brown; slight odor.
	SS			75	0	SP	
							<u>SAND</u> : Gray-brown; fine-grained; trace silt; slight odor.
10	SS			75	0	GM	
							<u>SILTY GRAVEL</u> : Gray; saturated; slight odor.
						ML	
							<u>SILT</u> : Brown; trace sand; moist to dry; stiff; no odor.
							Total depth = 12.0 feet bgs.

REMARKS: SS - Split Spoon
■ - Sample Interval



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B-3

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PROJECT NO: <i>ESLL2-14865-100 Former Anacortes Terminal</i>				CLIENT: <i>Equiva Services LLC</i>	
LOCATION: <i>Anacortes, Washington; Next to Lines near Terminal</i>				DRILLING CO.: <i>Cascade Drilling</i>	
START DATE: <i>04/06/00</i>		TIME: <i>10:15</i>		BORE HOLE ID: <i>1 inch</i>	
COMPLETION DATE: <i>04/06/00</i>		TIME: <i>11:57</i>		BORING DEPTH: <i>12.0 feet bgs</i>	
WATER LEVEL DURING DRILLING: <i>6.0' bgs</i>		SURFACE ELEV.: <i>feet (MSL)</i>		RIG TYPE: <i>Geoprobe</i>	
DATE MEASURED: <i>04/06/00</i>		M. P. ELEVATION: <i>feet (MSL)</i>		METHOD: <i>Direct Push</i>	
LOGGED BY: <i>C. Alferness</i>					

DEPTH (in feet)	SAMPLE DATA						SOIL DESCRIPTION
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	
0	SS			80	0	GP	GRAVEL AND SAND; Dry; loose; no odor.
	SS			20		ML	GRAVELLY SANDY SILT; Gray to black; sheen visible for bottom 2".
	SS			0		NR	NO RECOVERY
5	SS			10	12	GP	GRAVEL; Gray; with silt and sand; saturated; slight odor.
	SS			50	1	SP	GRAVELLY SAND; Gray; coarse-grained; trace silt; saturated; very slight to almost no odor.
						GP	GRAVEL; Saturated; no odor.
10	SS			20	0	ML	SILT; Brown; trace sand; dry; extremely hard; no odor.
							11.0'-12.0' - With trace gravel; very hard (till); no odor.
							Total depth = 12.0 feet bgs.

REMARKS: SS - Split Spoon
■ - Sample Interval



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B-4

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PROJECT NO: ESLL2-14865-100 Former Anacortes Terminal

CLIENT: Equiva Services LLC

LOCATION: Anacortes, Washington; NE Corner

DRILLING CO.: Cascade Drilling

START DATE: 04/06/00 TIME: 12:00

BORE HOLE ID: 1 inch

DRILLER: Kasey

COMPLETION DATE: 04/06/00 TIME: 12:30

BORING DEPTH: 8.0 feet bgs

RIG TYPE: Geoprobe

WATER LEVEL DURING DRILLING: 6.0' bgs

SURFACE ELEV.: feet (MSL)

METHOD: Direct Push

DATE MEASURED: 04/06/00

M. P. ELEVATION: feet (MSL)

LOGGED BY: C. Alferness

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
0	SS			70	0	GP	GRAVEL WITH SILT AND SAND; Brown; moist; no odor.
	SS			70	0	ML	SILT; Brown; dry; loose; no odor.
						GP	GRAVEL WITH SILT AND SAND; Orange; moist; loose; no odor.
5	SS			80	1	CL	SILTY CLAY WITH GRAVEL; Orange-brown; saturated; no odor.
						OL	ORGANIC SILT; Red-brown; some sand; soft; no odor.
	SS			90	1	SP	SAND; Gray; medium-grained; wet; slight odor. 6.0'-7.0' - Trace gravel; slight odor.
						SM	SILTY SAND WITH TRACE GRAVEL; Slight odor.
						GP	GRAVEL WITH SILT AND SAND; Slight odor.
10							Total depth = 8.0 feet bgs.

REMARKS: SS - Split Spoon
■ - Sample Interval



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B-5

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PROJECT NO: ESLL2-14865-100 Former Anacortes Terminal		CLIENT: Equiva Services LLC
LOCATION: Anacortes, Washington; 13' W of 12" SD & Across from Fuel Lines Start		DRILLING CO.: Cascade Drilling
START DATE: 04/06/00 TIME: 12:40	BORE HOLE ID: 1 inch	DRILLER: Kasey
COMPLETION DATE: 04/06/00 TIME: 13:15	BORING DEPTH: 12.0 feet bgs	RIG TYPE: Geoprobe
WATER LEVEL DURING DRILLING: 8.0' bgs	SURFACE ELEV.: feet (MSL)	METHOD: Direct Push
DATE MEASURED: 04/06/00	M. P. ELEVATION: feet (MSL)	LOGGED BY: C. Alferness

DEPTH (in feet)	SAMPLE DATA						SOIL DESCRIPTION
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	
0	SS			80	0	ML	GRAVELLY SILT; Brown; dry; no odor.
5	SS			10	0	SP	GRAVELLY SAND WITH SILT; Dry; no odor.
	SS			20	0	ML	SILT WITH INTERBEDDED ORGANIC LAYERS; Organic layers are wood chips and 1"-2" thick.
	SS					NR	5.8'-6.0' - Gray silt; with sheen; odor. NO RECOVERY
10	SS			25		ML	SILT WITH SAND; Brown; fine-grained sand; saturated; strong sheen and odor throughout.
						GP	GRAVEL WITH SAND AND SILT; Slight sheen; odor.
						ML	SILT; Gray; trace gravel; stiff.
15							Total depth = 12.0 feet bgs.

REMARKS: SS - Split Spoon
■ - Sample Interval



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B-6

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PROJECT NO: ESLL2-14865-100 Former Anacortes Terminal		CLIENT: Equiva Services LLC
LOCATION: Anacortes, Washington; Near 3rd & N off 18" SD by 5'		DRILLING CO.: Cascade Drilling
START DATE: 04/06/00 TIME: 13:15	BORE HOLE ID: 1 inch	DRILLER: Kasey
COMPLETION DATE: 04/06/00 TIME: 14:15	BORING DEPTH: 12.0 feet bgs	RIG TYPE: Geoprobe
WATER LEVEL DURING DRILLING: 10.0' bgs	SURFACE ELEV.: feet (MSL)	METHOD: Direct Push
DATE MEASURED: 04/06/00	M. P. ELEVATION: feet (MSL)	LOGGED BY: C. Alferness

DEPTH (in feet)	SAMPLE DATA						LITHOLOGY	SOIL DESCRIPTION
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PTD (ppm)	U.S.C.S.		
0	SS			25	0	GP		GRAVEL WITH SILT AND SAND; Dry; no odor.
	SS			30	0			
						SP		SAND; Brown; very fine-grained; trace silt; moist; no odor.
								3.75'-4.0' - Medium-grained; moist; loose; no odor.
	SS		15	0		GP		GRAVEL WITH SAND
5						ML		SILT WITH ORGANIC CHIP LAYERS; Orange-brown; soft; no odor.
	SS		5			GP		GRAVEL; No odor.
	SS		1			GP		GRAVEL WITH SILT AND SAND; Wet; no odor.
10	SS		85	0		SM		GRAVELLY SILTY SAND; Brown; saturated; no odor.
						ML		SILT; Brown; occasional small gravel; moist; stiff.
								Total depth = 12.0 feet bgs.

REMARKS: SS - Split Spoon
■ - Sample Interval



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HA-1

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PROJECT NO: **ESLL2-14885-100** Former Anacortes Terminal
LOCATION: **Anacortes, Washington; Adjacent to 12" SD**
START DATE: **04/05/00** TIME: **12:40** BORE HOLE ID: **6 inches**
COMPLETION DATE: **04/05/00** TIME: BORING DEPTH: **2.0 feet bgs**
WATER LEVEL DURING DRILLING: **1.4' bgs** SURFACE ELEV.: **feet (MSL)**
DATE MEASURED: **04/05/00** M. P. ELEVATION: **feet (MSL)**

CLIENT: **Equiva Services LLC**
DRILLING CO.: **ThermoRetec Consulting Corp.**
DRILLER: **C. Alferness**
RIG TYPE: **Not Applicable**
METHOD: **Hand Auger**
LOGGED BY: **C. Alferness**

DEPTH (in feet)	SAMPLE DATA						LITHOLOGY	SOIL DESCRIPTION
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.		
0	HA					GP		COBBLES AND SAND; Brown; coarse-grained sand; moist; no odor.
						SP		SAND; Gray; fine- to medium-grained; sheen diesel-like odor.
						∇		
6					95.			
Refusal. Total depth = 2.0 feet bgs.								

REMARKS: G - Grab
HA - Hand Auger
■ - Sample Interval
■ - Analytical Sample



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HA-2

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PROJECT NO: ESLL2-14885-100 Former Anacortes Terminal		CLIENT: Equiva Services LLC
LOCATION: Anacortes, Washington: 4' E of 18" SD & 1' S of SD End		DRILLING CO.: ThermoRetec Consulting Corp.
START DATE: 04/05/00	TIME: 13:40	BORE HOLE ID: 6 inches
COMPLETION DATE: 04/05/00	TIME:	BORING DEPTH: 2.3 feet bgs
WATER LEVEL DURING DRILLING: 2.0' bgs	SURFACE ELEV.: feet (MSL)	RIG TYPE: Not Applicable
DATE MEASURED: 04/05/00	M. P. ELEVATION: feet (MSL)	METHOD: Hand Auger
		LOGGED BY: C. Alferness

DEPTH (in feet)	SAMPLE DATA						LITHOLOGY	SOIL DESCRIPTION
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.		
0	HA					GP		COBBLES AND SAND: Brown; moist; loose; no odor.
						SP		GRAVELLY SAND: Brown; moist to saturated; loose; no odor.
6								Total depth = 2.3 feet bgs.

REMARKS: G - Grab
HA - Hand Auger
■ - Sample Interval
■ - Analytical Sample



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BORING LOG

HA-4

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PROJECT NO: ESLL2-14865-100 Former Anacortes Terminal

LOCATION: Anacortes, Washington; 6' N of 12" SD

START DATE: 04/05/00 TIME: 14:10

COMPLETION DATE: 04/05/00 TIME:

WATER LEVEL DURING DRILLING: 1.4' bgs

DATE MEASURED: 04/05/00

BORE HOLE ID: 6 inches

BORING DEPTH: 2.0 feet bgs

SURFACE ELEV.: feet (MSL)

M. P. ELEVATION: feet (MSL)

CLIENT: Equiva Services LLC

DRILLING CO.: ThermoRetec Consulting Corp.

DRILLER: C. Alferness

RIG TYPE: Not Applicable

METHOD: Hand Auger

LOGGED BY: C. Alferness

DEPTH (in feet)	SAMPLE DATA						SOIL DESCRIPTION
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	
	HA					GP	COBBLES
						SP	SAND; Brown; occasional cobbles; moist to saturated; loose; no sheen.
							1.4' - Slight odor.
							Total depth = 2.0 feet bgs.

REMARKS:

- G - Grab
- HA - Hand Auger
- - Sample Interval
- - Analytical Sample



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BORING LOG

HA-10

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PROJECT NO: ESLL2-14865-100 Former Anacortes Terminal		CLIENT: Equiva Services LLC
LOCATION: Anacortes, Washington; 92' N of 12" SD		DRILLING CO.: ThermoRetec Consulting Corp.
START DATE: 04/05/00 TIME: 15:00	BORE HOLE ID: 6 inches	DRILLER: C. Alferness
COMPLETION DATE: 04/05/00 TIME:	BORING DEPTH: 2.0 feet bgs	RIG TYPE: Not Applicable
WATER LEVEL DURING DRILLING: 1.3' bgs	SURFACE ELEV.: feet (MSL)	METHOD: Hand Auger
DATE MEASURED: 04/05/00	M. P. ELEVATION: feet (MSL)	LOGGED BY: C. Alferness

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/ft	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
0	HA					GP	COBBLES
						SP	SAND; Brown; with occasional cobble.
6					0	▽	1.3' - Slight odor.
Total depth = 2.0 feet bgs.							

REMARKS: G - Grab
HA - Hand Auger
■ - Sample Interval
■ - Analytical Sample



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BORING LOG HA-11

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PROJECT NO: **ESLL2-14865-100** Former Anacortes Terminal
LOCATION: **Anacortes, Washington: 44' W of 12" SD, 10' N of Grass**
START DATE: **04/06/00** TIME: **14:30** BORE HOLE ID: **6 inches**
COMPLETION DATE: **04/06/00** TIME: BORING DEPTH: **1.4 feet bgs**
WATER LEVEL DURING DRILLING: **1.3' bgs** SURFACE ELEV.: **feet (MSL)**
DATE MEASURED: **04/05/00** M. P. ELEVATION: **feet (MSL)**

CLIENT: **Equiva Services LLC**
DRILLING CO.: **ThermoRetec Consulting Corp**
DRILLER: **C. Alferness**
RIG TYPE: **Not Applicable**
METHOD: **Hand Auger**
LOGGED BY: **C. Alferness**

DEPTH (in feet)	SAMPLE DATA					SOIL DESCRIPTION	
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.	LITHOLOGY
6	HA					GP	COBBLES: No odor.
						SP	SAND: Brown with 50% black stained; 10% cobbles; strong petroleum odor.
							1.0'-1.4' - Gray; medium-grained; moist to saturated; no sheen. 1.3' - Strong petroleum odor. Total depth = 1.4 feet bgs.

REMARKS: G - Grab
HA - Hand Auger
■ - Sample Interval
■ - Analytical Sample

**ThermoRetec**

Smart Solutions. Positive Outcomes.

BORING LOG

HA-12

1011 S.W. Klickitat Way
Suite #207
Seattle, Washington 98134
(206) 624-9349
www.thermoretec.com

PROJECT NO: ESSL2-14865-100 Former Anacortes Terminal

LOCATION: Anacortes, Washington: 58' N of 12" SD, 10' N of Grass

CLIENT: Equiva Services LLC

START DATE: 04/06/00 TIME: 14:40

BORE HOLE ID: 6 inches

DRILLING CO.: ThermoRetec Consulting Co.

COMPLETION DATE: 04/06/00 TIME:

BORING DEPTH: 1.4 feet bgs

DRILLER: C. Alferness

WATER LEVEL DURING DRILLING: 1.3' bgs

SURFACE ELEV.: feet (MSL)

RIG TYPE: Not Applicable

DATE MEASURED: 04/06/00

M. P. ELEVATION: feet (MSL)

METHOD: Hand Auger

LOGGED BY: C. Alferness

DEPTH (in feet)	SAMPLE DATA						LITHOLOGY	SOIL DESCRIPTION
	TYPE	DEPTH	BLOWS/ft	% RECOVERY	PTD (ppm)	U.S.C.S.		
6	HA					GP		COBBLES; No odor.
						SP		SAND; Gray to black; occasional cobbles; stained; strong odor.
								1.3' - Saturated.
								Total depth = 1.4 feet bgs.

REMARKS:

G - Grab

HA - Hand Auger

- Sample Interval

- Analytical Sample



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BORING LOG

HA-13

1011 S.W. Klickitat Way
Suite #207
Seattle, Washington 98134
(206) 624-9349
www.thermoretec.com

PROJECT NO: ESLL2-14865-100 Former Anacortes Terminal

LOCATION: Anacortes, Washington; 72' N of 12" SD

START DATE: 04/06/00 TIME: 14:50

COMPLETION DATE: 04/06/00 TIME:

WATER LEVEL DURING DRILLING: 'bgs

DATE MEASURED:

BORE HOLE ID: 6 inches

BORING DEPTH: 1.4 feet bgs

SURFACE ELEV.: feet (MSL)

M. P. ELEVATION: feet (MSL)

CLIENT: Equiva Services LLC

DRILLING CO.: ThermoRetec Consulting Corp.

DRILLER: C. Alferness

RIG TYPE: Not Applicable

METHOD: Hand Auger

LOGGED BY: C. Alferness

DEPTH (in feet)	SAMPLE DATA						LITHOLOGY	SOIL DESCRIPTION
	TYPE	DEPTH	BLOWS/6"	% RECOVERY	PID (ppm)	U.S.C.S.		
0	HA					GP		COBBLES
						SP		SAND: Brown; occasional cobble; loose; no staining; slight petroleum odor.
6								Total depth = 1.4 feet bgs.

REMARKS:

G - Grab

HA - Hand Auger

■ - Sample Interval

■ Analytical Sample



ThermoRetec
Smart Solutions. Positive Outcomes.

May 26, 2000

Mr. Tony Palagyi
Project Engineer
Equiva Services, LLC
10602 NE 38th Place
Kirkland, Washington 98033

(206) 624-9349 Phone
(206) 624-2839 Fax
www.thermoretec.com

**Re: Results of Soil and Groundwater Sampling
Former Anacortes Terminal
Corner of 3rd Street and N-Avenue
Anacortes, Washington**

Dear Tony:

ThermoRetec Corporation (ThermoRetec) has completed the sampling of soil and groundwater at the former Anacortes Terminal. This letter report summarizes the data collected during that study. Testing was performed consistent with our scope of work dated March 29, 2000.

1. INTRODUCTION AND BACKGROUND

The objective of the current study was to characterize the type and extent of hydrocarbon contamination located within the N-street right-of-way adjacent to the former terminal. The location of the terminal is identified in Figure 1. The terminal is currently owned and operated by Reisner petroleum.

The right-of-way is being developed by the City of Anacortes into a public beach access and parking area. Testing recently performed by the City of Anacortes indicated the presence of elevated hydrocarbon concentrations in soils at the end of the right-of-way. That testing was preliminary and did not include testing for specific compounds (e.g., BTEX), evaluation of hydrocarbon characteristics, or testing of hydrocarbon toxicity under the Interim TPH Policy.

The current study included soil and groundwater sampling within the N-Avenue right-of-way. Soil sampling included geoprobe borings in the gravel portion of N-Avenue, and hand auger borings completed along the beach. Groundwater sampling was performed in three of the geoprobe borings. Specific sampling methods are described in Section 2 below. Results and conclusions are provided in Sections 3 and 4, respectively.

2. SAMPLING METHODS

Phase 2 sampling was completed on April 5 and 6, 2000. Prior to sampling, ThermoRetec reviewed aerial photographs, former facility maps, and data reported previously by the City

of Anacortes. A utility locate was performed to identify buried active utilities, and to determine the locations of the buried former dock lines. A street use permit was obtained from the City of Anacortes. Phase 2 sampling locations were then finalized and the sampling program initiated.

Geoprobe Sampling of Soil and Ground Water

Six geoprobe borings were placed in the N-Avenue right-of-way. The locations of these borings are shown on Figure 2.

Geoprobe Borings

Prior to drilling, utilities were marked by both the City and a private locator, Applied Professional Services (APS). APS was used to check for any private utility lines, and specifically to locate the buried former dock lines. Former facility maps indicated that these lines extended from the terminal to the dock. The approximate locations of the lines as identified by APS are noted in Figure 2. ThermoRetec could not verify the number, type or condition of the lines.

Geoprobe borings were completed on April 6th, 2000. The borings were completed using a geoprobe sampling rig operated by Cascade Drilling. All geoprobe borings were backfilled with bentonite chips upon completion of testing. Start cards were filed with the Department of Ecology for the borings.

In order to characterize the site geology and to screen for soil contamination, continuous samples were collected from each boring. The borings ranged in depth from 8 to 14 feet below ground surface. Samples collected from the split-spoon sampler were inspected by ThermoRetec's field geologist and screened for contamination as described below. Observations were recorded on drilling logs, included as Attachment C to this report.

A site survey was not completed. All horizontal and vertical measurements contained in this report are approximate, based on measurements collected by ThermoRetec's field geologist.

Soil Sample Collection and Field Screening

Soil samples collected from the geoprobe sampler were screened for the presence of chemical contamination using a PID. Field properties of the soil (color, texture, type and moisture content) were noted on the drilling logs. Any visual or olfactory observations of the field geologist potentially indicating the presence of hydrocarbon contamination were also recorded.

Based on the field screenings, the field geologist selected samples of soils for chemical analysis. At least one soil sample was collected from each boring. Where field screenings indicated the potential presence of hydrocarbon contamination, at least one sample was collected from the depth with the heaviest apparent contamination.

Analytical samples were packed in appropriate pre-cleaned, EPA-approved sample containers. Samples to be analyzed for volatile hydrocarbons (WTPH-g, EPA 8020, VPH) were packed in zero-headspace containers. Soil samples were packed on ice and submitted to North Creek Analytical laboratories in Bothell. Nine soil samples were analyzed WTPH-g, WTPH-d, and EPA 8020.

After review of the preliminary analytical data, ThermoRetec requested North Creek to perform Interim TPH Policy testing on two samples collected from the geoprobe borings. Based on the results of initial testing, one sample was analyzed for both VPH and EPH. The other sample did not contain a significant gasoline hydrocarbon fraction, and was analyzed only by the EPH method.

Groundwater Sample Collection

Groundwater samples were collected from three of the soil borings. Groundwater samples were collected from a temporary 0.010" slotted stainless-steel screen. The screen was placed in the geoprobe borings so that the top of the screen crossed the apparent water table. Samples were collected using a peristaltic pump. New pump tubing was used for each sampling location. No free-phase hydrocarbon products were encountered in any of the borings.

Samples were collected without filtration directly into EPA-approved, pre-cleaned sample containers. Appropriate sample preservatives were used, consistent with the analytical methods to be performed.

Water samples were packed on ice and submitted to North Creek Analytical along with the soil samples. Water samples were submitted for analysis by methods WTPH-g, WTPH-d and BTEX by EPA 8020.

Hand Auger Sampling of Shallow Soils

A hand auger was used to collect shallow soil samples from the base of the soil slope, at the northern end of the N-Avenue right-of-way. This area was not accessible to the geoprobe at the time of sampling.

Thirteen borings were placed using the hand auger on April 5th and April 6th. The borings were placed along the base of the slope, along the full width of the right-of-way. Hand auger locations are shown in Figure 2. Sampling locations reported by the City are also shown in this figure.

Each boring was completed to a depth of approximately 2 feet. Water was typically encountered at this depth. Soil samples were field-screened as described above for the geoprobe borings. Screening data were recorded in the project log book.

Samples of soils were collected from several of the hand auger borings for chemical analysis. These samples were packed in appropriate containers as described above, and submitted to North Creek Analytical for analysis of WTPH-g, WPTH-d and BTEX by EPA 8020.

After review of preliminary analytical data, North Creek was instructed to analyze one of the soil samples (HA-11) for VPH and EPH under the Interim TPH Policy.

3. RESULTS AND DISCUSSION

Figure 2 summarizes the main site features and the locations from which samples were collected. The base map was compiled from historic facility maps (dated 1956, obtained from Equiva), historical aerial photographs (dated 1969, 1975, 1981, 1988, 1992 and 1997; obtained from Walker & Associates), utility and sampling maps obtained from the City, and measurements made by ThermoRetec's field geologist using a 300-ft tape.

The area of right-of-way located below the grass-covered soil slope is collectively referred to in Figures 2, 3 and 4 as "beach". This general term is not intended to imply a delineation of upland versus aquatic lands or to define boundaries for permitting jurisdictions, but is used here to describe the general visual characteristics of the sampled areas.

Geologic cross sections are shown in Figures 3 and 4. Vertical measurements indicated on the cross sections are approximate, as the elevations of the borings were not surveyed. Analytical data collected as part of this study are shown in Tables 1 and 2.

Site Geologic Conditions

The soil encountered in the upper right-of-way included mostly gravel, gravelly sand and sand, with some lenses of silt and clay. Shallow soils, between 0 and 4-6 feet below grade, consisted of a mixture of sand, gravel and silt. This layer is interpreted as fill based on the sorting of the soils and the presence of crushed rock in these soils. Minimal anthropogenic debris (e.g., bricks) was noted in the collected soil samples from this layer.

Borings B-4, B-5 and B-6 all contained an organic silt layer between depths of approximately 4 and 6 feet below ground surface. This layer appeared to be native. Borings B-1, B-2 and B-3 were located along the buried former dock lines. In these three borings, the apparent fill soil extended to depths of 6 feet bgs, and the apparent native silt layer was not noted. This suggests that the silt layer may have been removed during installation of the fuel lines.

Soils beneath the fill and silt layers consisted of sands and gravelly sand to a depth of approximately 10 to 11 feet bgs in all locations. This sand layer was underlain by a stiff silt and then a clay layer between 11 and 14 feet bgs. This silt/clay layer likely acts as an aquitard, restricting downward flow of groundwater.

The apparent water table was located within the sandy soils beneath the fill soil and shallow organic silt layers. The apparent water table was approximately 8 feet bgs. Perched water was noted in some of the borings at shallower depths.

Testing of the static water elevations in each boring was not performed. However, based on the proximity of the site to Guemes channel, and the observations made during sampling, it is reasonable to expect that the groundwater gradient is to the northwest, toward Guemes channel.

Soil Hydrocarbon Concentrations – Hand Auger Borings

Elevated concentrations of hydrocarbons were noted in two areas at the base of the grass-covered soil slope.

Sample HA-2 was collected from the area east of the two storm drain lines. A slight hydrocarbon odor was noted in this sample. The sample contained 382 mg/kg of diesel-range hydrocarbons. Gasoline hydrocarbons were not detected. Because of the low concentrations of hydrocarbons in this sample, testing by the Interim TPH Policy was not performed.

Sample HA-11 was located just below the apparent end of the buried former dock lines. Based on former facility maps, aerial photographs and field observations (remains of dock pilings), this sample was located approximately beneath the former dock. Based on aerial photographs, the dock in this area was removed between 1969 and 1975.

Sample HA-11 contained gasoline-range hydrocarbons at a concentration of 5,770 mg/kg. Diesel-range hydrocarbons were detected at 1,590 mg/kg. BTEX compounds were not detected, although detection limits were slightly elevated for these compounds. The sample was tested for VPH and EPH under the Interim TPH Policy. That testing indicated a hazard index of 0.78 using a residential exposure scenario as defined under the Policy, and a predicted "well concentration" of 0.60 mg/L as defined under the Policy. To pass the Policy, the hazard index must be less than 1.0, the "well concentration" must be less than 1.0 mg/L and the sample must not contain any free-phase product.

Other hand auger samples collected and analyzed did not contain significant hydrocarbon concentrations. However, some samples collected from the upper row of hand auger locations contained slight hydrocarbon odors. Samples from the lower hand auger locations were generally free of odors, with the exception of station HA-9. That station was immediately below station HA-11, the sample with the highest detected hydrocarbon concentrations.

Soil Hydrocarbon Concentrations – Geoprobe Borings

Soil analytical data from the geoprobe borings are included in Table 2 and in Figure 4. Boring logs are included in Attachment C to this report.

Three of the soil borings were located along the buried former dock lines. These borings included B-3, B-2 and B-1. Soils from Boring B-3, located adjacent to the terminal, contained field observations of hydrocarbon contamination at shallow depths (2-4 ft). Soil from the next sampling interval could not be collected due to poor sample recovery (caused by a rock stuck in the geoprobe sampler).

Soils from boring B-2 contained elevated hydrocarbon concentrations. A sample collected from 4-6 feet bgs contained 1,970 mg/kg of gasoline-range hydrocarbons, and 48 mg/kg of diesel-range hydrocarbons. The type of hydrocarbon appeared generally similar to that detected at location HA-11 (see above). No BTEX compounds were noted in the B-2 sample. Interim TPH Policy testing was performed on this sample. This testing indicated a hazard index of 0.17 (residential scenario) and a leaching "well concentration" of 0.64 mg/L as defined in the Policy.

Boring B-1 was located along the dock lines, closest to the shoreline. Concentrations of hydrocarbons in this boring were lower than at B-2. Low concentrations of petroleum hydrocarbons (non-detect to 77.5 mg/kg) were noted in soils collected from this location.

The boring placed in the southern area of the N-Avenue right-of-way (B-6) had no indications of hydrocarbon impact during field screening. Petroleum hydrocarbons were below detection limits in a sample collected from this boring.

Boring B-4 was located immediately north of the terminal, between the terminal and hand auger sampling location HA-2. Slight hydrocarbon odors were observed during field screenings, and a sample collected from 6 feet below ground surface contained trace concentrations of petroleum hydrocarbons (54 mg/kg).

Boring B-5 was located along the western portion of the right-of-way, adjacent to the Trident Seafoods property. Ecology records indicate that four USTs have been closed in-place at that property, but no reports were available indicating the locations, uses or condition of those USTs. Elevated hydrocarbon concentrations were noted in soils from 4-foot to 10-foot depths in boring B-5. The shallow soils contained diesel-range and oil-range hydrocarbons at concentrations of 2,110 and 881 mg/kg, respectively. Trace concentrations of gasoline-range hydrocarbons (12 mg/kg) were also detected. Interim TPH Policy testing performed on this sample indicated a residential hazard index of 0.11, and a predicted "well concentration" of 0.05 mg/L as defined in the Policy.

Deeper soils collected from boring B-5 also contained elevated hydrocarbon concentrations, but at a lower concentration. A sample from the 8-foot to 10-foot depth contained diesel-range hydrocarbon concentrations of 668 mg/kg and oil-range hydrocarbons at 207 mg/kg. Gasoline-range hydrocarbons were lower, at a concentration of 81 mg/kg.

Groundwater Hydrocarbon Concentrations – Geoprobe Borings

The groundwater sampling data collected during the current study are shown in Table 2 and in Figure 4. These samples were collected from the three borings placed along the former dock lines (B-1, B-2 and B-3).

The groundwater samples from B-1, located closest to the shoreline, contained the lowest hydrocarbon concentrations. Diesel-range hydrocarbons were detected at 1.98 mg/L, and gasoline-range hydrocarbons were detected at 0.237 mg/L. Of the BTEX compounds, only benzene was detected, at a concentration of 0.010 mg/L.

Groundwater from borings B-2 and B-3 both contained similar concentrations of diesel-hydrocarbons, gasoline hydrocarbons and benzene. The other BTEX compounds (ethylbenzene, toluene, xylenes) were only detected in boring B-3, located adjacent to the terminal. Concentrations of each parameter are shown in Table 2.

4. CONCLUSIONS

The data collected from this study confirm the presence of petroleum hydrocarbons in soils and groundwater in the N-street right-of-way, adjacent to the Reisner petroleum terminal. The data presented in Section 3 describe the distribution of detected hydrocarbons at the site. The data collected in this study were evaluated consistent with the proposed use of the right-of-way as a public access area by the City of Anacortes. Conclusions relative to that use are described below.

The proposed development of the property will include construction activities (industrial worker exposure) followed by recreational use of the property. The upper portion of the property will be paved for parking uses. No substantial changes are proposed for the beach area.

We have conservatively evaluated human health exposure risks using industrial exposure assumptions for construction activities and using residential cleanup levels and exposure assumptions for later recreational uses. This interim use of residential cleanup levels is conducted as a screening measure, as final cleanup levels at recreational sites are subject to a case-by-case determination. Using these exposure assumptions, ThermoRetec provides the following conclusions:

- ♦ The detected hydrocarbon concentrations in the right-of-way measured during this study did not exceed human health cleanup levels applicable to industrial worker exposure scenarios. Therefore, development activities to be performed by the City in the right-of-way are not likely to require special construction techniques or to result in unacceptable human health exposures to site workers. However, as a precautionary measure, ThermoRetec recommends that air monitoring be performed during any excavation activities where impacted soils are likely to be encountered. Further, we recommend that any soils to be removed from the site during construction activities are chemically

characterized in a manner appropriate to the proposed reuse, treatment or disposal of those soils.

- ◆ As defined using MTCA Method B cleanup levels and the Interim TPH Policy, the detected hydrocarbon concentrations in right-of-way soils were below soil cleanup levels applicable to residential sites. These data indicate that the soils in the right-of-way and along the upper edge of the beach do not present a direct contact risk to recreational users of the completed beach access area. The potential for airborne exposures to hydrocarbon vapors was not specifically evaluated for the beach soils. Such evaluation may be appropriate for the area around sample HA-11 if no actions are taken to remove or contain these soils.
- ◆ No free-phase hydrocarbons were detected in groundwater. Hydrocarbon concentrations measured during this study were lower near the shoreline than in areas closer to the terminal. The development of the right-of-way for public access is not anticipated to exacerbate groundwater conditions, or to prevent future remediation actions from being implemented. The need for groundwater remedial actions will be dependent on final site cleanup levels and points of compliance and was not specifically evaluated as part of this study.

5. LIMITATIONS

This work was performed consistent with our scope of work dated March 29, 2000 and in a manner commensurate with accepted procedures and practices in the environmental industry. The conclusions presented in this report represent ThermoRetec's best professional judgement regarding environmental conditions at the site at this time. These conclusions are based on the compilation and review of the information described in sections 2 and 3 of this report and are subject to the limitations of that information. Our conclusions and recommendations are based on state and federal environmental regulations and policies as they exist at the time of this report.

Information regarding hydrocarbon type presented in this report is provided for descriptive purposes only. We have not performed specific hydrocarbon fingerprinting or dating studies, nor have we solicited the opinions of qualified professionals to make conclusions regarding petroleum types or dates of release.

It has been a pleasure working with you on this project. Please do not hesitate to contact me if you require further information.

Sincerely,
THERMORETEC CONSULTING CORPORATION



Mark Larsen
Project Manager

cc: Cara Alferness / ThermoRetec
Chris Houck / ThermoRetec
Janette Dulay / ThermoRetec
Project File: ESLL2-14865

Attachments:

Figures 1, 2, 3 and 4
Tables 1 and 2
Attachment A: Interim TPH Policy Spreadsheets
Attachment B: Soil Boring Logs
Attachment C: North Creek Analytical Laboratory Reports
Attachment D: Previous Testing Data Provided by City of Anacortes

Table 2. Summary of Collected Groundwater Analytical Data

Sample Location Sample Name depth- ft Sample date	N-Avenue, Along Dock Piping		
	Shoreline Area	Center of Right-of-Way	Adjacent to Terminal
	B1	B2	B3
	B1-8	B2-7.5	B3-6
	8 to 12	7.5 to 11.5	6 to 10
	4/6/00	4/6/00	4/6/00
BTEX Compounds (mg/L)			
Benzene	0.010	0.045	0.0675
Toluene	< 0.0005	< 0.0015	0.0046
Ethylbenzene	< 0.0005	< 0.0069	0.0339
Xylene	< 0.0024	< 0.0072	0.0055
Petroleum Hydrocarbons			
Gasoline Range Hydrocarbons	0.237	1.46	0.97
Diesel-Range Hydrocarbons	1.98	4.56	4.84
Oil-Range Hydrocarbons	< 0.75	< 1.51	< 0.75
<i>Total Petroleum Hydrocarbons</i>	2.217	6.02	5.81

Notes:

All concentrations are reported as mg/L.

Copies of analytical laboratory reports are attached as appendices to this report.

Walla Walla College Marine Station
15510 Rosario Beach Road
Anacortes, WA 98221
August 11, 2005

Ericka Pickett
Anacortes City Council

Dear Ms Pickett:

Thank you for allowing several of my students to carry out a research project on the N Avenue and Guemes Ferry beaches this summer. They did careful work and learned a lot. I have enclosed their final reports for your information. These students are at an advanced level, but are still learning and their study was fairly short, so I would consider their findings to be preliminary data. Here is a summary of their findings:

Soft sediment: Eight quadrats at the zero tide line studied on each beach by 3 students (Lindsey, Brittany, and Brooke). All large organisms sifted out of the sediment down to 10 cm depth and identified. In a preliminary dig they found a much lower diversity of species at N Avenue. However, in their more thorough study they found some individual differences in species but no overall statistical differences in the types or diversity of animals between the N Avenue beach and Guemes Ferry beach. They noted what appeared to be a small amount of oily substance seeping in some of their quadrats, but no heavy contamination. They were only able to dig down 10 cm because there is coarse gravel below this depth at the N Avenue Beach.

Boulders: Eight quadrats at the zero tide line studied on each beach by 2 students (Andre and Greg). All large organisms on, next to, or directly under the rocks were identified and counted. They found significant decreases in the numbers of several different species of algae and animals at the N Avenue beach. Barnacles in contact with the sediment next to the rocks at N Avenue were dead or discolored, while they were larger and live at Guemes Ferry. Algae at N Avenue was less robust and had an oily sheen. A dark oily deposit was evident under many of the rocks. Species richness (an important component of diversity) was significantly lower at N Avenue Beach, though diversity was only slightly lower.

In summary, I would say that these preliminary studies show no major “smoking gun” but suggest that further attention may be warranted. We were surprised to find a stronger difference between species living near the rocks than in the sand/mud, since we assumed any petroleum would be seeping up through the mud. If there is a present source of pollution at N Avenue, it is possible that it is affecting mainly a restricted region of the beach, more near the boulders toward the west end than near the sand and mud toward the east end.

Again, thank you for giving my students the opportunity to do this work, and we hope that their study will be helpful to you.

Sincerely,

A handwritten signature in cursive script that reads "David L. Cowles". The signature is fluid and elegant, with the first name "David" being the most prominent part.

David L. Cowles, Ph.D.
Professor of Biology

Permanent address: Department of Biology
Walla Walla College
College Place, WA 99324

2 enclosures

A Comparison of Similar Intertidal Regions from Two Neighboring Beach Locations: Is there a Difference in Species Richness and Diversity?

A research project completed in partial fulfillment of Biol 460 Marine Ecology
August 9, 2005
Dr. Cowles

Submitted By
Andre Castelbuono
And
Greg Ryals

A Comparison of Similar Intertidal Regions from Two Neighboring Beach Locations: Is there a Difference in Species Richness and Diversity?

Introduction

It is expected in marine habitats that species, in part, depend upon substrate and water activity to provide them with suitable habitat for living. We can then expect that similar rocky intertidal regions of neighboring beaches should have similar species richness and diversity. Inhabiting the rocky intertidal substrate, one can expect to find a wide variety of organisms, from primary producers to grazers to carnivores. Table 1 contains a list of some of the species common to the rocky intertidal regions of our test sites (Kozloff, 1993).

Pollution from petroleum compounds has long been a threat to organisms that inhabit intertidal regions. Petroleum is a collection of unrefined hydrocarbons, many of which have chemical structure of multiple benzene rings, while others are poly aliphatic hydrocarbons. These non-polar molecules are easily absorbed across plasma membranes and cell walls leading to cellular mutations and errors in DNA repair (Campbell and Reece, 2002). After oil spills into the water, 25% of it will evaporate in the first few days while the remainder emulsifies into the water (Buchanan and Horwitz, 1998). Microflora in the water are known to degrade many of the components of petroleum, but not all (Swannell et al, 1996).

Some organisms are able to freely move to areas which are not subject to the oily film commonly associated with crude oils, while others, such as *Balanus glandula*, commonly known as acorn barnacles, are sessile, and thus have no means by which to escape. Therefore, petroleum pollution may have stronger effects on sessile organisms

than motile ones, and this could lead to reductions in species richness and diversity in areas affected by such pollution.

The direct damage to the environment, as well as its toxic effect on organisms of the intertidal zones have been documented. In tragedies such as the running aground of the Exxon Valdez off the coast of Alaska in 1995 species richness and diversity have suffered as a result of pollution (Exxon Valdez Oil Spill Council, 2004). Anacortes, WA. was also the site of an oil spill in 1991. The *Exxon Los Angeles* burst a pump while off-loading and spilled around 210,000 gallons of crude oil into the water. About 4,200 gallons reached Fidalgo Bay, killing 35 birds, oiling another 36 and covering mud flats and beaches (Anacortes Americans, 2000).

It has been suspected that petroleum products have been seeping into the water from an unknown underground source at the N-avenue beach on the Guemes channel. If this is true, this pollution may have the effect of lowering the species richness and diversity at the experimental site. By performing a comparative analysis, or transect, of the N-avenue beach along with a neighboring beach of similar structure, we ^{should} will be able to see if there is a significant difference in the species richness and diversity of intertidal species in the affected beach as compared to the other nearby beach. In this study we ^d propose to compare species composition on rocky substrate at zero tide level at the affected beach to that of similar habitat on a neighboring beach. We hypothesize^d that the polluted beach ^{would} will have a lower species richness and diversity than the control beach.

Materials and Methods

Since it is only suspected that there is pollution at the N-avenue beach, and not yet documented, we investigated species diversity at both the N-avenue beach, (figure 1), and

the beach at the Guemes Ferry Landing (figure 2). These beaches were very similar. The substrate was a mix of rocky and sandy intertidal. The locations of these beaches were only a few blocks from each other. We analyzed each rocky intertidal region at zero tide height for species diversity and richness. We used the computer program "Tides and ^{live}Charts" to determine the time at which the tides would recede far enough to expose the zero tide line at both beaches (figures 1,4).

Upon arriving at the Guemes Ferry landing at around 9:30am Wed, August 3, 2005, we located a region of zero tide line that was composed of at least 80 % exposed rocky habitat and was parallel to the actual tidal line. Using a 1 square meter transect grid of homemade origin (figure 3), we counted and identified all species greater than 1 cm on top of, next to, or directly under the rocks, in eight individual, sequential quadrats, linear with respect to the tidal line. In order to remain consistent in our analysis, only rocks that could be lifted up without disturbing the mud were observed both on the surface, and the underside. Rocks that were deeply embedded so that they could not be removed without disturbing the muddy substrate were only analyzed on the top side for marine organisms present. We first estimated percent algae cover and percent rock cover. Then, for each successive quadrat, we identified each type of marine organism present, both alga, and animal. Topmost organisms present were most often the algae, and thus they were identified first, using Kozloff (1993). After identifying the number of algae in quadrat one, we proceeded to record the number of animal species present in quadrat one, using the same literature (Kozloff, 1993). We continued this process for all eight quadrats at the Guemes Ferry Landing. Animals that we were unable to identify, if they were seen

long enough to catch them, were brought back to our lab facility and keyed out with the help of Dr. Cowles using Kozloff (1996).

On the following day, August 4, beginning at 10:55 AM, eight quadrats were evaluated at the N-avenue beach using the same procedures used at the Guemes Ferry Landing beach. After data were collected for each quadrat, the data for both beaches were sorted and organized into tables using Excel spreadsheets. Averages were calculated. T-tests were performed using Graphpad Prism to find any significant differences in species numbers or diversity between the two beaches. Several of the species had unequal variance and so Mann Whitney tests were performed on them. This data was then represented graphically. Both Simpson's and Shannon's diversity were calculated using a program supplied by Dr. Cowles.

Results

Average species richness per quadrat differed significantly between the two beaches (P value < 0.001), with Guemes (richness – 15/quadrat) being higher than N-avenue (richness – 8.625/quadrat). Simpson's diversity of the Guemes beach was 2.07, which was surprisingly close to the 2.03 value at the N-avenue beach. Shannon's diversity was almost as close with values of 1.28 and 1.18 at Guemes and N-avenue respectively (tables 2,3).

Percent algae cover was recorded for each quadrat on both beaches (tables 2,3). When averaged, the percent cover for Guemes was 85%, while N-avenue was only 54%. Percent rock cover was also recorded for each quadrat with an average of 82% cover at Guemes and 83% cover at N-avenue.

Each algae and animal was counted and recorded in each quadrat on each beach. The Guemes Ferry Landing results are found in table 2, and table 3 lists the results from the N-avenue beach. Averages were calculated in order to compare values between the beaches. Among the species present, there were many differences in averages that seemed significant. T tests were then performed on these species. Four species of algae, and six species of animals were selected to determine the significance in the differences of their numbers between the two beaches (table 4, figures 8-17).

Among the algae tested, both *Ulva linza* and *Ulva intestinalis* were significantly more abundant at Guemes while *Fucus gardneri* and *Mastocarpus papillatus* were not. The animals that were tested showed even less significant differences. *Littorina* proved to be the only animal that showed a significant difference between the beaches and was higher at Guemes. *Pagurus hirsutiusculus*, *Lottia scotum*, *Nucella lamellosa*, *Balanus glandula*, and *Hemigrapsis nudus* had P values ranging from 0.0586 (*Nucella*) to .8467 (*Lottia*). All of these except *H. nudus* averaged higher at the Guemes Ferry beach.

Discussion

We believe that there are greater differences between the two beaches than the counts alone suggest. Both *Ulva linza* and *Ulva intestinalis* were found to be significantly higher at Guemes (table 4). Data for *U. linza*, (figure 8), and *U. intestinalis*, (figure 9), show that they were both present in much higher amounts at the Guemes Ferry landing. In addition, the visual appearance of both species was much worse at the N-avenue beach. The blades were slimy and sickly looking, occasionally with a filmy substance on them, while at the Guemes Ferry beach they looked very healthy. The blades were crisper and much less sticky without any filmy substance on them.

The data for *Fucus gardneri* and *Mastocarpus papillatus* showed no significant differences in the amount of each present between the two beaches (table 4). In contrast, *F. gardneri* was actually present in slightly higher quantities at the N-avenue beach though the difference was far from significant. The visual appearance of these species was also much worse at the N-avenue beach. *F. gardneri*, as a whole, at the ~~at the~~ Guemes ferry landing were noticeably larger and healthier than the *F. garnderi* at the N-avenue location. Thus, even though there were an average of 7 *F. gardneri* per quadrat at the N-avenue Beach, and 5 *F. gardneri* per quadrat at Guemes Ferry landing, we feel that there is a greater difference between the corresponding locations than the data alone suggests.

While only one animal species, *Littorina*, showed a significant difference in abundance, favoring the Guemes Ferry beach (figure 12), most of the *Littorina* that we found were on *U. linza*. There was much more *U. linza* at the Guemes beach and so it was not surprising to see such a greater abundance of *Littorina* there as well. The Mann Whitney test for *Hemigrapsis nudus* (figure 14) for both sites showed no significant difference; however, the greater population was found to be at the N-avenue beach. Although Mann Whitney showed that there was no significant difference in counts of *Balanus glandula*, (table 4), we found that there was an obvious difference in their visual appearance. Most of the *B. glandula* in the quadrats at the N-avenue beach were concentrated on tops of the larger rocks away from the sediment, as opposed to the barnacles in the quadrats at the Guemes Ferry Landing which were almost evenly distributed over the tops and sides of the larger and smaller rocks throughout the transect. The *B. glandula* at the Guemes Ferry Landing were larger and whiter in color, as opposed

to the N-avenue beach where the living *B. glandula* were smaller and covered in oily residue, which often resulted in darker appearing plates. At the Guemes Ferry Landing, the barnacles were also nearer to or on the sediment line, in contrast to the barnacles at the N-avenue beach which were either dead, or absent from rocks at or near the sediment line.

There was a ^{highly} significant difference in the species richness between the two beaches, and it was found to favor the Guemes Ferry Landing (figure 18). ^{table 7} At the Guemes beach there were a total of 29 species present in our quadrats. At the N-avenue beach there were only a total of 15 species present. Not only were there less species present, but most of the species present appeared in lower numbers as well. The P value recorded after performing a t-test comparing species richness on the two beaches was less than 0.0001. This was by far the lowest P value obtained and emphatically states that the species richness at the N-avenue beach was significantly lower than at the Guemes Ferry beach.

We discovered several interesting things while doing transects on the corresponding beaches. The general condition of the algae at the N-avenue beach could best be described as weak and unhealthy, possibly stained with an oily residue that was present on the majority of *U. linza* and *M. papillitus*. We were told that this beach used to be a refueling point for ships, and up above the beach there were visible storage tanks still present (figure 5), and that there were underground lines transversing from the tanks to the dilapidated pier still visible offshore. Many, if not most of the rocks overturned at the N-avenue site had noticeable oil residue on the underside (figures 6, 7).

In comparison, there were only a few examples of oil residue on the overturned rocks at the beach at the Guemes Ferry Landing.

The Guemes Ferry Landing beach had high numbers of many different species and appeared very diverse. N-avenue beach appeared on the surface to have a severe lack of diversity, but it turned out that it was actually an almost equal amount of diversity represented in a smaller amount of species. When we compared the Simpson's diversity and Shannon's diversity we found the diversity slightly higher at the Guemes Ferry landing (tables 2, 3). This went along with what we expected to find but the numbers were much closer than we anticipated. One likely reason for this is that both beaches, especially Guemes Ferry landing, were dominated by large numbers of barnacles, which reduces species evenness and thus depresses the diversity index. This comparison forced us to realize that while species richness is significantly affected by oil, diversity appears to remain roughly the same.

In summary, we found ~~that~~ the overall condition of the marine organisms at the N-avenue beach to be noticeably less healthy looking than that of the Guemes Ferry Landing. While diversity stayed around the same, species richness was very affected, ^{there did not reflect species richness} with *Ulva linza*, *Balanus glandula*, and *Littorina* taking the most obvious losses. We believe that the species present at the N-avenue beach are being impacted in a negative manner by an undetermined pollutant, and that something should be done to correct this condition before greater damage is done.

Literature Cited

Anacortes American, 2000. Our Century. <http://skagitpublishing.com/ourcentury/1990-1999.html> Accessed August 5, 2005.

Buchanan, M. and C. Horwitz. 1998. Pollution and Society.
<http://www.umich.edu/~gs265/society/pollution.htm> Accessed August 5, 2005.

Campbell, Neil A., Jane B. Reece. 2002. Biology 6th ed. Pearson Education, Inc. San Francisco, CA.

Exxon Valdez Oil Spill Council, 2004. <http://www.evostc.state.ak.us/facts/index.html>
Accessed August 5, 2005. (This website is maintained not by a single person, but by a committee and this is why we were able to cite a specific name)

Kozloff, Eugene N., 1996. Marine Invertebrates of the Pacific Northwest. University of Washington Press, Seattle and London. 539 pp.

Kozloff, Eugene N., 1993. SEASHORE LIFE of the Northern Pacific Coast. University of Washington Press, Seattle and London. 376 pp.

Swannell, R.P., K. Lee, and M. McDonagh. 1996. Field Evaluations of Marine Oil Spill Bioremediation. Microbiology Review. V. 60(2).

Tables and Figures

Table 1 – Complete list of species observed on both beaches. Identified using books, keys, and Dr. Cowles. This list is referred to in tables 2 and 3.

Species list	
<u>Algae</u>	
A	<i>Ulva linza</i>
B	<i>Prionitis lanceolata</i>
C	<i>Mastocarpus papillatus</i>
D	<i>Ulva intestinalis</i>
N	<i>Fucus gardneri</i>
P	<i>Odonthalia floccosa</i>
V	<i>Ralfsia sp.</i>
W	<i>Porphyra sp.</i>
Y	<i>Zostera sp.</i>
CC	<i>Cladophora columbiana</i>
<u>Animals</u>	
E	Unidentified red-striped Nereid
F	White-Cap limpet - <i>Acmaea mitra</i>
G	Orange tubeworm - <i>Thelepus crispus</i>
H	Hermit crab - <i>Pagurus hirsutiusculus</i>
I	<i>Balanus glandula</i>
J	Tall limpet - <i>Lottia persona</i>
K	<i>Littorina scatolata</i>
L	Green isopod - <i>Idotea wosnessemkii</i>
M	Flat limpet - <i>Lottia scutum</i>
O	<i>Hemigrapsis oregonensis</i>
Q	<i>Nucella lamellosa</i>
R	Unidentified black Chiton
S	Red crab - <i>Oregonia gracilis</i>
T	Bright color snail - <i>Calliostoma annulatum</i>
U	<i>Hemigrapsis nudus</i>
X	<i>Leptasterias hexactis</i>
Z	<i>Tellina modesta</i>
AA	High Cockscomb fish – <i>Anapilarchus purpureus</i>
BB	Mossy chiton - <i>Mopalia muscosa</i>

Table 2 – Results recorded from the Guemes Ferry Landing beach. Letters of algae and animals refer to species listed in table 1. Numbers listed vertically below quadrats 1-8 represent the number of species found in each quadrat.

Quadrat	1	2	3	4	5	6	7	8	Avg.	Total
% Algae Cover	80	90	80	90	85	75	80	90	85	
% Rock Cover	80	85	90	80	80	80	80	80	81.9	
<u>Algae</u>										
A	88	60	82	72	62	54	45	42	63.125	505
B	10	14	0	0	0	0	0	0	3	24
C	2	3	17	14	35	11	20	3	13.125	105
D	7	4	0	6	0	0	7	0	3	24
N	0	7	4	3	12	7	3	5	5.125	41
P	0	0	6	1	0	0	2	11	2.5	20
V	0	0	0	1	0	0	0	0	0.125	1
W	0	0	0	2	1	0	0	0	0.375	3
Y	0	0	0	0	0	21	0	12	4.125	33
CC	0	0	0	0	0	0	1	1	0.25	2
<u>Animals</u>										
E	2	2	1	1	1	3	0	1	1.375	11
F	1	0	0	0	0	0	0	0	0.125	1
G	2	0	0	0	0	3	3	1	1.125	9
H	7	8	31	5	2	7	3	6	8.625	69
I	255	1050	260	237	195	215	169	153	316.75	2534
J	2	0	0	0	0	0	0	0	0.25	2
K	18	19	25	40	22	29	47	25	28.125	225
L	1	1	0	1	0	0	1	0	0.5	4
M	2	18	9	11	14	4	18	9	10.625	85
O	0	3	1	1	2	4	2	0	1.625	13
Q	2	2	4	2	3	3	4	0	2.5	20
R	0	0	1	4	0	1	0	0	0.75	6
S	0	0	2	0	1	0	1	0	0.5	4
T	0	0	2	0	0	1	0	0	0.375	3
U	0	0	1	3	0	1	1	1	0.875	7
X	0	0	0	1	0	0	0	0	0.125	1
Z	0	0	0	0	0	1	0	0	0.125	1
AA	0	0	0	0	0	2	0	0	0.25	2
BB	0	0	0	0	0	2	1	0	0.375	3
Species Richness	14	13	15	18	12	18	17	13	15	
Simpsons Diversity										2.07
Shannons Diversity										1.28

Table 3 – Results recorded from N-avenue beach. Letters of algae and animals refer to species listed in table 1. Numbers listed vertically below quadrats 1-8 represent the number of species found in each quadrat

Quadrat	1	2	3	4	5	6	7	8	Avg.	Total
% Algae Cover	40	60	60	55	60	70	50	35	53.75	
% Rock Cover	85	80	80	85	85	80	80	90	83.125	
<u>Algae</u>										
A	55	42	31	55	41	26	25	16	36.375	291
B	0	0	0	0	0	10	0	0	1.25	10
C	18	14	16	10	7	5	9	5	10.5	84
D	0	2	0	0	0	0	0	0	0.25	2
N	3	2	14	0	6	30	3	1	7.375	59
P	0	0	0	0	0	0	0	0	0	0
V	0	0	0	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0	0	0	0
Y	0	0	0	0	0	0	0	0	0	0
CC	0	0	0	0	0	0	0	0	0	0
<u>Animals</u>										
E	0	0	0	0	0	0	0	0	0	0
F	0	0	0	0	0	0	0	0	0	0
G	0	0	0	0	0	0	0	0	0	0
H	0	1	0	2	1	8	3	7	2.75	22
I	202	198	244	148	148	155	90	232	177.125	1417
J	0	0	0	0	0	0	0	0	0	0
K	5	14	14	4	13	6	8	2	8.25	66
L	0	1	0	0	0	0	0	0	0.125	1
M	7	8	6	15	15	8	7	15	10.125	81
O	0	0	1	2	2	0	0	2	0.875	7
Q	0	0	0	5	0	2	0	0	0.875	7
R	0	0	0	0	0	0	0	0	0	0
S	1	0	0	0	0	0	0	0	0.125	1
T	0	0	0	0	0	0	0	0	0	0
U	0	2	1	2	1	4	0	13	2.875	23
X	0	0	0	0	0	0	0	0	0	0
Z	0	0	0	0	0	0	0	0	0	0
AA	0	0	0	0	0	0	0	0	0	0
BB	0	0	0	0	0	1	0	0	0.125	1
Species Richness	7	10	8	9	9	10	7	9	8.625	
Simpsons Diversity	2.03									
Shannons Diversity	1.18									

Table 4 – This table lists the P values for the species that underwent a t test comparison and the two species that required the Mann Whitney test.

Species	Average at Guemes	Average at N-avenue	P values (* means that a Mann Whitney value was taken)
<i>Ulva intestinalis</i>	3	0.25	0.0388
<i>Fucus gardneri</i>	5.125	7.375	0.4298
<i>Ulva linza</i>	63.125	36.375	0.005
<i>Mastocarpus papillatus</i>	13.125	10.5	0.7034
<i>Nucella lamellosa</i>	2.5	0.875	0.0586
<i>Hemigrapsis nudus</i>	0.875	2.875	.2786*
<i>Lottia scutum</i>	10.625	10.125	0.8467
<i>Pagurus hirsutiusculus</i>	8.625	2.75	0.1114
<i>Littorina</i>	28.125	8.25	0.0002
<i>Balanus glandula</i>	316.75	177.125	.1049*
Species Richness	15	8.625	0.0001

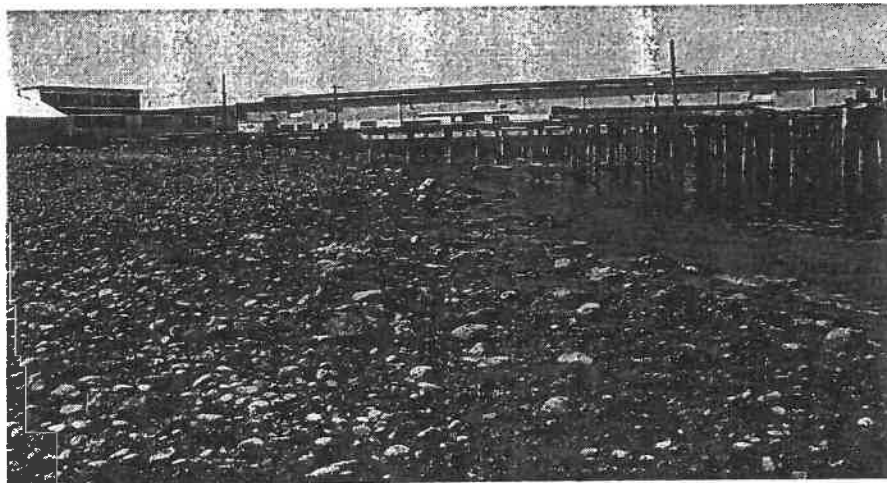


Figure 1. – This is the N-avenue beach zero tide line. At this point in the day the tide was about 6 inches below the zero tide mark

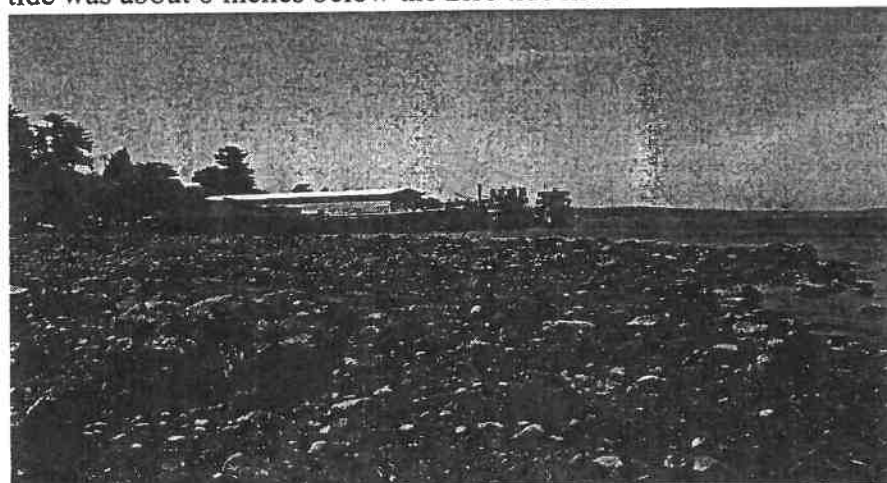


Figure 2. – This is a picture of the Guemes Ferry Landing beach at low tide on August 4, 2005.

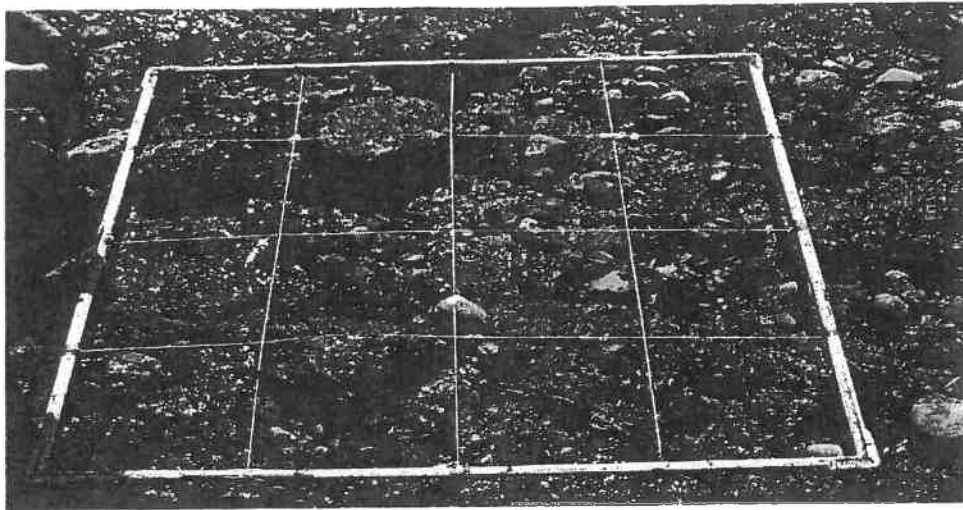


Figure 3 – Square meter quadrat at the N-avenue beach.

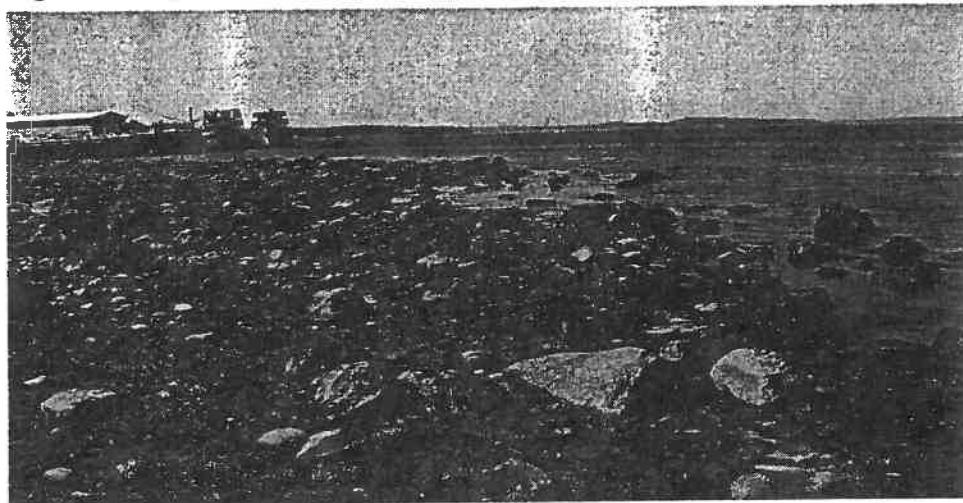


Figure 4 – Zero tide line at the Guemes Ferry Landing beach. The water line in this picture is at the zero tide line.

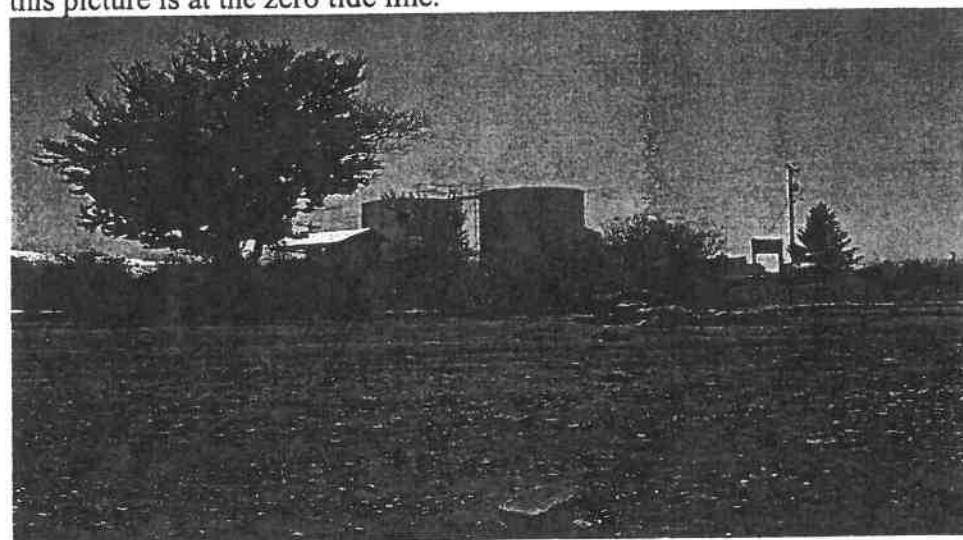


Figure 5 – Visible oil storage tanks directly behind N-avenue beach.

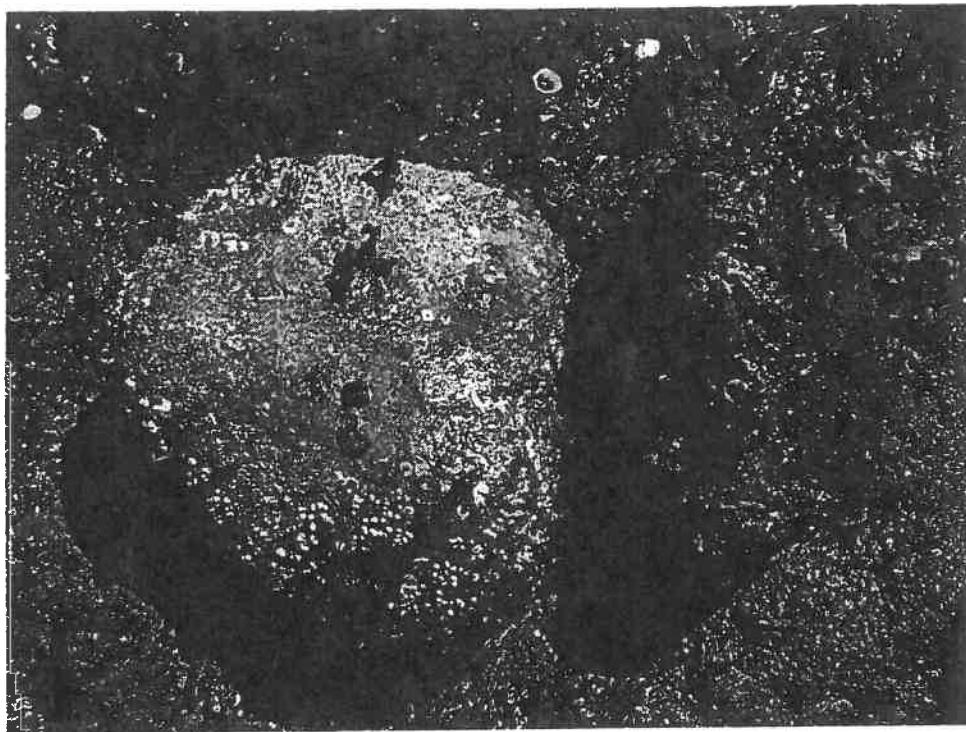


Figure 6 – The underside of two rocks at the N-avenue beach. The one on the right is covered in oil and appears almost completely black. Almost nothing was alive underneath it.



Figure 7 – Another rock from the N-avenue beach. This rock was half covered with oil underneath. A striking difference can be seen between the colors.

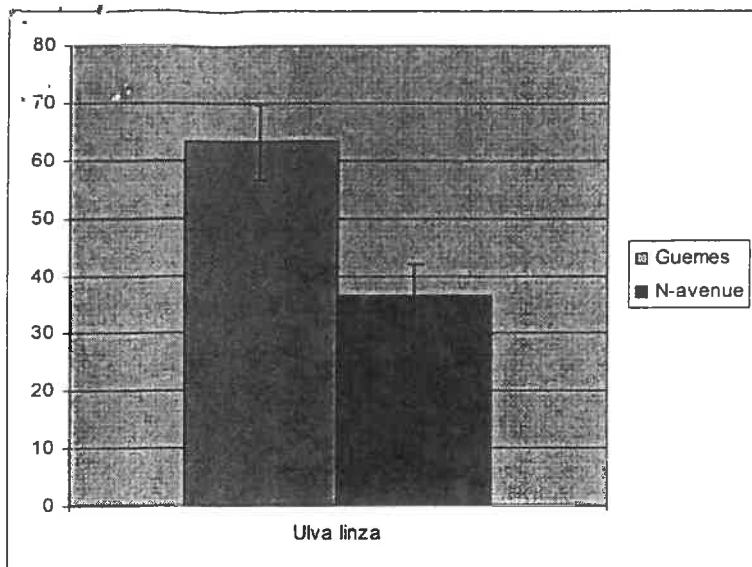


Figure 8

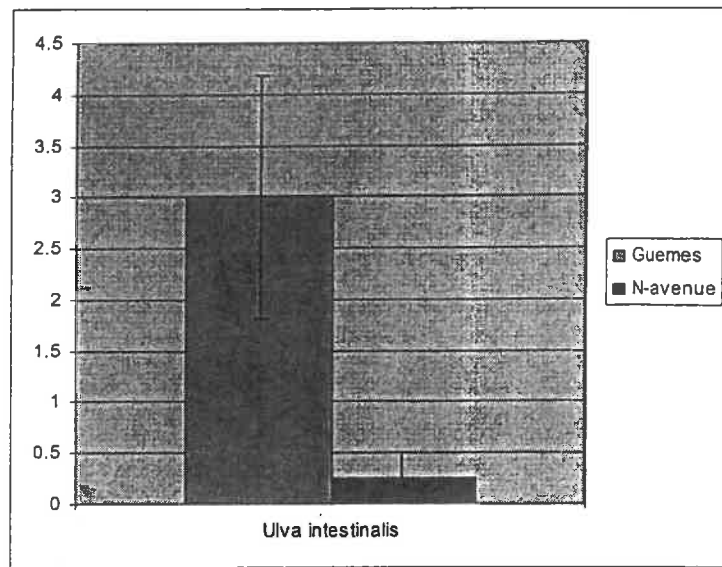


Figure 9

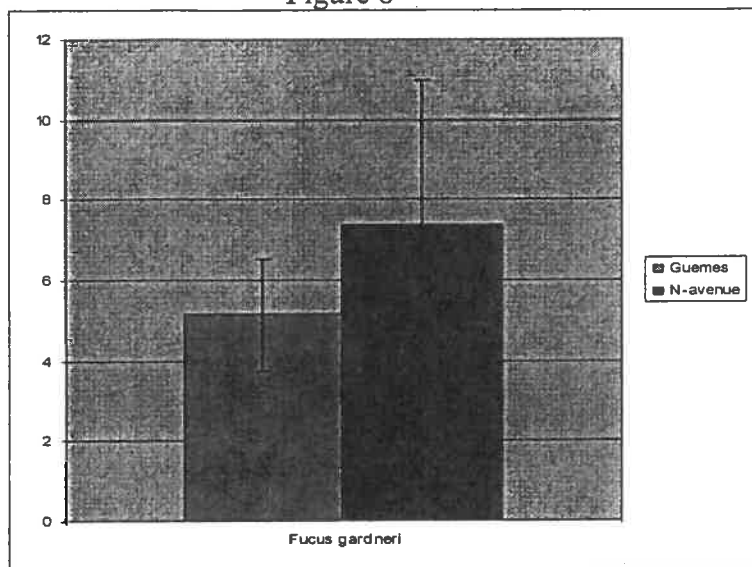


Figure 10

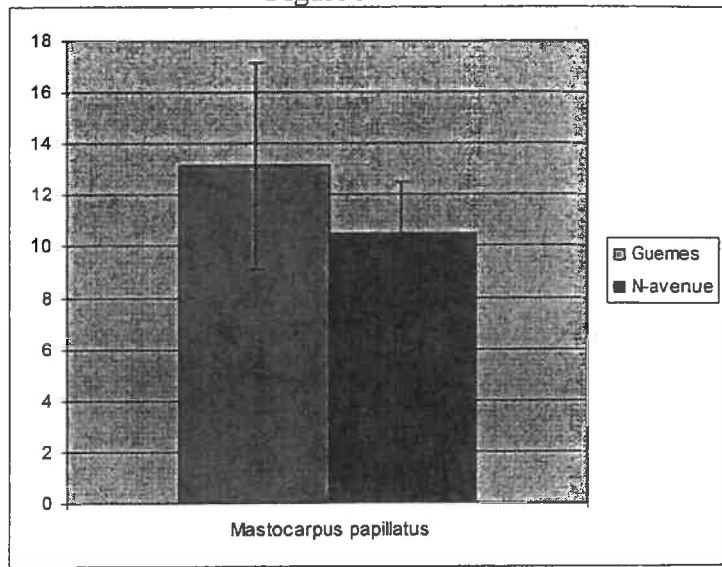


Figure 11

Figures 8-11 – These graphs show the average amounts of species of algae from the two beaches. The y axis shows the average number of species per quadrat at each beach. The error bars represent the standard deviation.

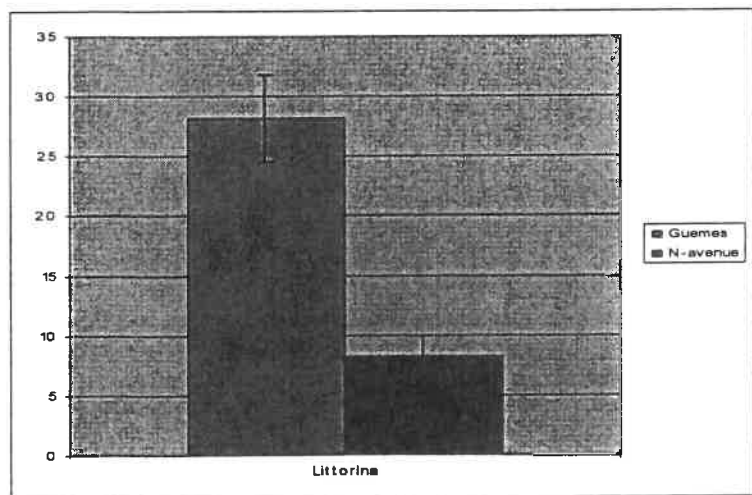


Figure 12

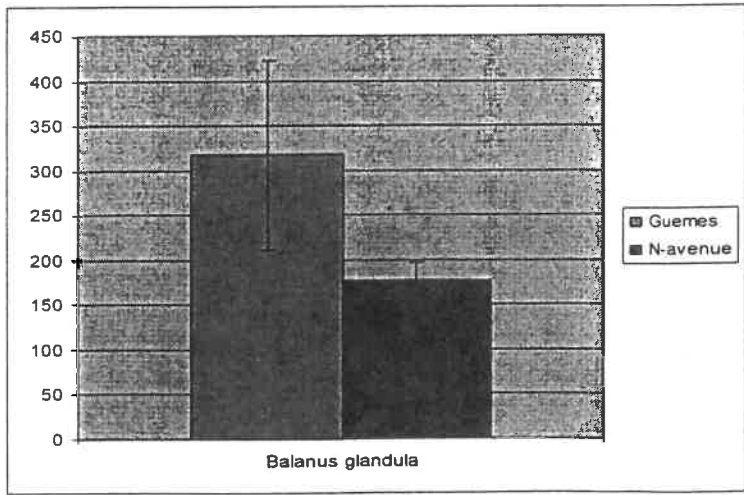


Figure 13

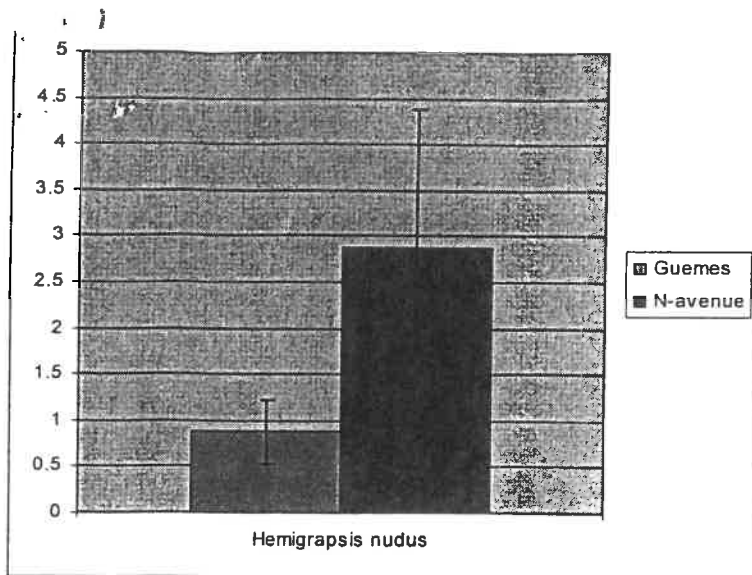


Figure 14

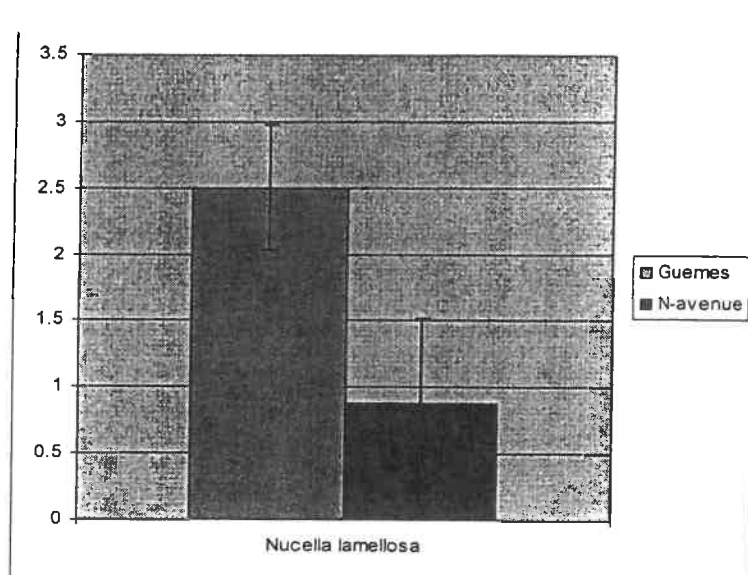


Figure 15

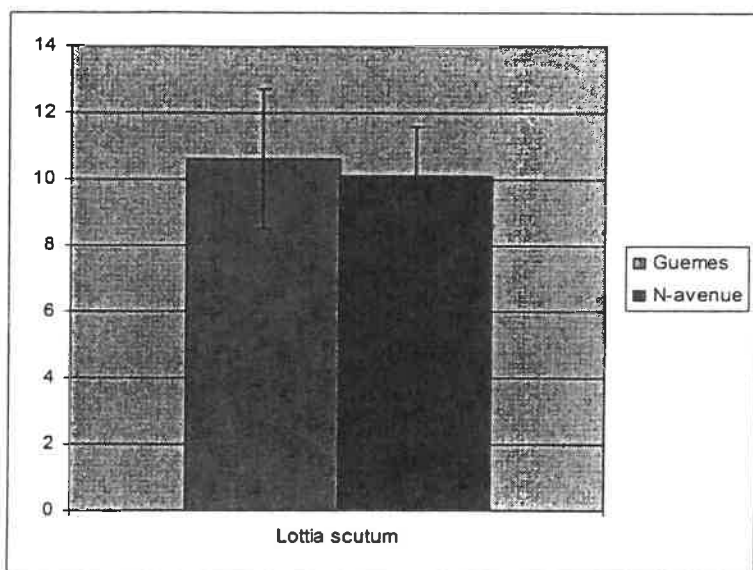


Figure 16

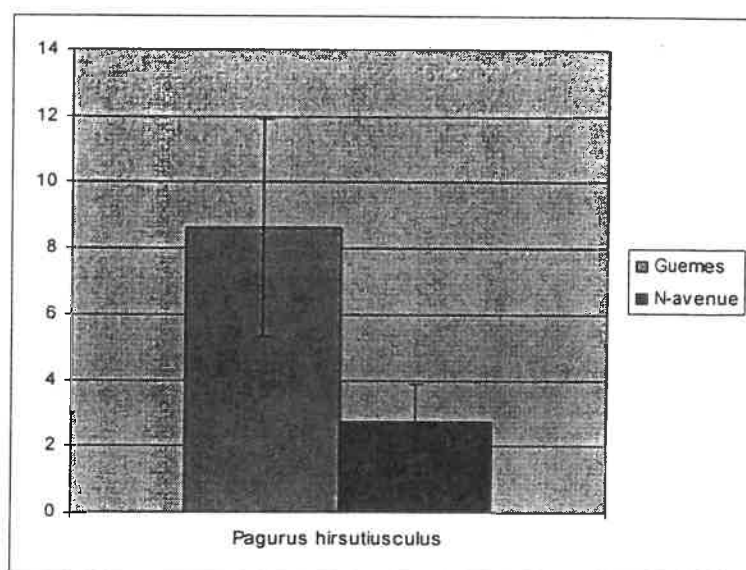


Figure 17

Figures 12-17 – These graphs show the average amounts of species of animals from the two beaches. The y axis shows the average number of species per quadrat at each beach. The error bars represent the standard deviation

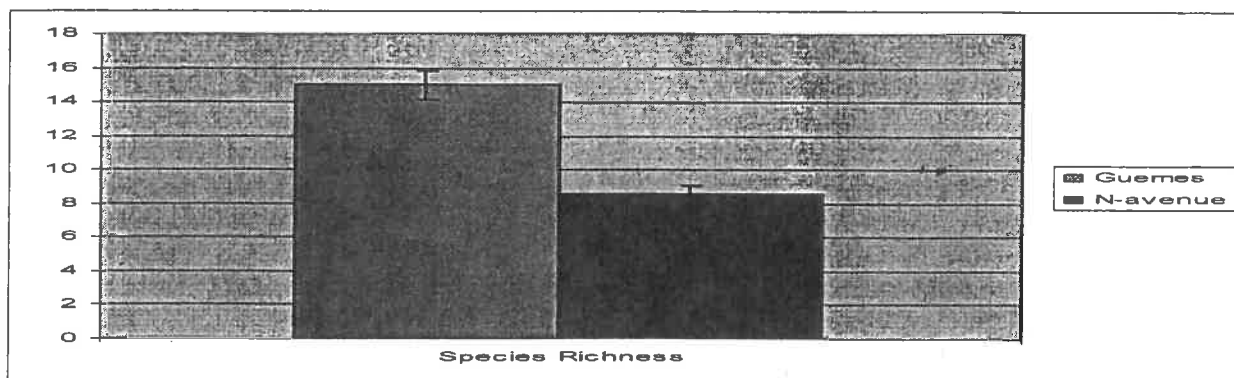


Figure 18 – This graph shows the relationship of species richness between the two beaches. The y axis shows the average species richness for each quadrat. The error bars represent the standard deviation

Comparison of Species Diversity of Suspected Polluted Beach with Control Beach

Lindsey Eggers

Brittany Kopp

Brooke Reiswig

In partial fulfillment of the requirements of

BIOL 460 Marine Ecology

August 9, 2005

Introduction:

Pollution is a major concern for many marine communities, and most of this pollution comes from human sources. We researched two beaches located on Guemes Channel, near Anacortes, Washington: the Guemes Ferry Beach, and the N Avenue Beach. The Guemes Channel has been the location of extensive marine industrial work for many years. In 1996 the area suffered from an eighty-two gallon oil spill in the channel (Langley, 1996). While this is a fairly small spill, it may have affected the marine species inhabiting the local beaches. It is also known that certain chemicals such as trichlorobenzene and hexochlorobutadiene are present in the sediments of the channel (Koch, 2004). Both beaches have been affected by these factors; however, we have recently become aware that the N Avenue Beach is suspected of having an additional pollution problem. The suspected cause of this pollution is an underground petroleum source, which could be seeping up through the sediment. This project did not look specifically at the possible pollutant, but was checking for any effects it may be having upon the organisms inhabiting this beach. Little research has been done on the organisms at N Avenue Beach and it is not known if the petroleum is adversely affecting it.

In research done by a group of scientists in Brazil (Peso-Aguiar et al, 2000), linear correlation indices were calculated to establish comparisons between ecological parameters of the studied communities and concentrations of heavy metals, hydrocarbons, petroleum pollution indicators and sediment mud percentages. They found that diversity indices indicated significant stress-related spatial gradients tied to petroleum. The refinery sample station showed notable differences in its biodiversity figures compared to the other stations. Other research shows that the effects of pollution by organic matter, oil or industrial waste on marine communities are remarkably similar. Diversity values fall, biomass and numbers

of organisms initially rise and then fall as the pollution load is increased (Gray, 1979).

Based on this information, we wish to test the diversity differences between the supposed affected beach and an average urban beach.

Materials and Methods:

Initially we needed to select an appropriate control beach to use in this experiment. We chose a control beach approximately $\frac{1}{4}$ mile west of N Avenue Beach (the polluted beach) on Guemes Channel. It was important to select a beach close to our polluted beach due to the time constraints of the tide and transportation between beaches. It was also imperative that we chose a beach with similar physical characteristics. The polluted beach had sandy/muddy areas, rocks and pilings. These features provide unique habitats for various species to live. Our control beach was carefully chosen so that it too possessed these same characteristics. In this way we were able to eliminate as many variables as possible.

In this experiment we planned to focus on the organisms present in the top layers of soft sediments. Any organisms on the surface and below a certain level were to be ignored. To gather these organisms, we planned to excavate ten 1-meter square quadrats of soft sediments 20 centimeters deep at the zero tide level. The sediments would then be strained using a sieve device we constructed. The organisms present in the collected sediments would then be extracted and trapped in one of two screens. The numbers of each species found would be recorded and any unknown species taken back to the lab for identification. The data would be organized into groups of organisms based upon feeding styles (predator, filter, or sediment feeders). Later this data would be analyzed to determine species richness and differences in the numbers of feeder types. We hypothesized that we would

see a decrease in richness and a decrease in the number of sediment feeders on the polluted beach.

We constructed several items that were necessary for properly measuring the quadrats, sifting the sediment, and collecting organisms. For sifting the sediment and collecting organisms we designed and built a sieve apparatus out of buckets and PVC pipe (Figure 1). On the top level was a large five-gallon bucket whose bottom was replaced with a $\frac{1}{4}$ inch mesh screen. Directly beneath the large bucket was a smaller bucket whose bottom was replaced with a 1 mm sieve. The large bucket was fitted to the top of the smaller bucket and caulk was used to fill in the crack and create a crude seal. Sediment was shoveled into the large bucket, and seawater was poured through the device to wash away the sediments. Organisms would be collected from the screen and the sieve. Any organisms that went through the 1 mm sieve (i.e. were smaller than 1 mm) were not collected.

To obtain a consistent measurement of the quadrats, we constructed a frame 1-meter square out of one inch PVC pipe (Figure 2). It had four legs that were 20 centimeters long, with markings every centimeter to ensure that our depth was consistent. The frame was pushed into the sediment up to the chosen depth on each leg, and this provided our digging reference.

Prior to beginning the actual organism counts, we conducted a preliminary survey to determine which species were present at each beach. The low tide was -1.7 feet, and we arrived when the tide height was zero. In this way we were able to determine where digging should start and mark the location. We saw a marked difference in the number and variety of species on each beach. The polluted beach had much fewer organisms than the control beach. (Tables 1, 2)

Following our preliminary survey, we photographed many of the species for rapid identification once the counts began. These photos were printed in color and placed in our data book for later reference.

One week later we began the official species count. This was completed on two consecutive days during two low tides. We began with the control site, Guemes Ferry Beach, since we expected to find more organisms in that location. On July 31 low tide was -0.6 feet at 8:15 a.m., and we arrived at 6 a.m. to begin digging and sifting quadrats. Our preliminary visits to the beaches had indicated that the polluted beach (the N Avenue beach) had very shallow sediment above a layer of gravel, so we went first to that beach to determine how deep the soft sediments were. We found it to be approximately 10 centimeters deep. We then proceeded to dig at this depth at the control beach. One person was in charge of digging the quadrats while the others sifted sediment and recorded the organisms found. The digging went faster than the sifting, so sediment from each quadrat was placed in a separate pile on large tarps. The number of quadrats we originally proposed to dig and sift was 10, but we were able to complete only eight before the tide covered the zero tide mark. While sifting the sediment from the first quadrat we found that the 1 mm sieve would quickly fill up with rocks and gravel, preventing silt from running through, clogging the device. Since even the smallest organisms were getting caught in the first screen and not making it to the sieve, we decided to eliminate the bucket with the small sieve. As a safety factor we added a second screen of ¼ inch mesh at an angle on top of the first one in the large bucket to decrease the size of the holes. This modification increased the speed with which we could sift sediment and yet continue to collect organisms efficiently. When organisms were found in the screen we recorded them in our data book. If we did not know the identity, we wrote a brief description of it and placed it

in a collection bucket to be brought back to the station for identification.

The following day we repeated the same procedure at the polluted beach. As stated previously, this beach had very shallow soft sediments above a layer of gravel, making it more difficult to both dig and sift the sediment. In addition to the gravel, we encountered large quantities of eelgrass growing in our quadrats; two of the quadrats were entirely eelgrass with mud in the roots. Since eelgrass is very beneficial to the ecosystem, we were careful to leave the roots intact and return the plants to their previous location. We were unable to finish sifting the sediments on this beach before the tide came back in, so we pulled the tarps above the high tide line and returned several hours later to finish sifting the remaining quadrats.

The unknown species that we collected were returned to the station and stored in saltwater tanks. Each unknown organism was identified as specifically as possible. The organisms were examined under a dissecting scope and keyed out using Kozloff (1996). Many of the organisms were positively identified to species, but with some we were only able to identify their class.

Data analysis was conducted using GraphPad Prism. We performed two-tailed T-tests assuming unequal variances to determine if any significant statistical differences existed in the numbers of species gathered from both beaches. We compared species richness, types of feeders, and the numbers of species that appeared to show significant differences.

Results:

We recorded the number of each species we found at each beach (Tables 3, 4). These species were divided according to feeding types: predator, filter, and sediment feeders.

We compared the percentages that each species made up of the total fauna on both beaches. The percentages are found by using the total number of organisms found on each beach. We conducted two-tailed T-tests comparing five of these organisms which appeared to be in significantly different numbers on the two beaches. These five organisms were *Macoma nasuta* (bent-nosed clam), *Amphioplus macrospis* (brittle star), *Onuphis iridescent* (worm), a red-striped polychaete, and *Cancer productus* (red rock crab). We found that there was no statistical difference in any of these species between beaches.

Another comparison made was between the numbers of individuals of several different types of feeders present on each beach. We found sediment feeders, filter feeders, predators and scavengers on both the polluted and control beaches (Table 3,4). Only two species of scavengers were identified, so these were left out of the statistical tests. Upon conducting a two-tailed T-test, we found that there was no significant difference in types of feeders on each beach. (Figure 4, Tables 3, 4)

Species richness was another important comparison we made. Once again using a two-tailed T-test, we compared the numbers of species present on each beach. There was a higher number of species found on the control beach, but it wasn't a significant statistical difference. (Table 6, Figure 5)

Discussion:

Since the presence of pollution on a beach causes species diversity values to fall, and biomass and numbers of organisms initially rise and then fall as the pollution load is increased (Gray, 1979), we expected the numbers of organisms on the polluted beach to be significantly lower than those of the control beach.

We analyzed our data using two-tailed T-tests that assumed unequal variance. For data with significantly different variances, we conducted a nonparametric two-tailed T-test to determine significance. Unfortunately, none of our data was found to be significant. It appears that any pollution found on the N Avenue beach is not having a noticeable effect on the diversity or richness of the organisms living there.

Our hypothesis that the polluted beach would contain more filter feeding organisms and fewer sediment feeders on account of the supposed pollution in the sediment was incorrect. In fact, it turned out to be the opposite; the control beach had more filter feeders, while the polluted beach had more sediment feeders (Figure 4), ^{ugh} those these differences, also, were not significant. We also expected there to be a greater species diversity and richness on the control beach, but although the numbers of organisms were higher, the analysis showed no significant statistical difference (Figure 3). In addition to comparing the organism richness and diversity of the two beaches, we did an additional analyses[!] to account for disproportionate numbers skewing our averages. We noticed that quadrat #5 from the polluted beach had a disproportionate number of organisms compared to every other quadrat on that beach. We believe this was due to eelgrass growing extensively on that quadrat. To determine if this quadrat was significantly skewing our data we performed all the same tests, eliminating quadrat 5 from the comparisons. To our surprise, these tests showed that there was still no significant difference between the beaches.

While digging, we noted some small amounts of oil seeping up through the sediments. Another group working on the same beach noted fairly substantial quantities of oil coating some of the rocks at one end of the beach. Perhaps the petroleum source is located at one end of the beach and has not yet extensively reached the area where we were working. It may not have reached a point where it is markedly adversely affecting the organisms that live in the sediment in the middle of the beach. Also as stated previously, the presence of pollution on a beach causes species diversity values to fall, and biomass and numbers of organisms initially rise and then fall as the pollution load is increased (Gray, 1979). Perhaps our survey was conducted during the rising of the number of organisms just prior to the decline under the heavier pollution load.

Another possibility for the apparent stability of sediment organisms on the polluted beach is the presence of eelgrass. A source we spoke to at the beach informed us that the eelgrass was planted on this beach recently, specifically to combat the pollution problems. The main limiting factor affecting biodegradation of many organic contaminants is the availability of oxygen, which is needed by the naturally occurring bacteria that biodegrade the contaminants. Eelgrass helps solve this availability problem by increasing the amount of oxygen available to the bacteria. The sediment of the polluted beach was anoxic within a few millimeters of the surface, which does not allow for much bacteria to inhabit the area. Eelgrass can increase the oxygenated zone six inches deeper than it was before, allowing bioremediation to take place quicker and deeper. (Huesemann, 2003) Tests at the Pacific Northwest National Laboratory's Marine Sciences Laboratory in Sequim, Washington showed that within five months about 60 percent of polycyclic aromatic hydrocarbons (PAHs) were removed in sediments planted with eelgrass, while during the same period only 24 percent of the PAHs were removed in unplanted sediments (Huesemann, 2003).

Moreover, eelgrass meadows also prevent erosion while providing homes for a wide variety of intertidal species including: sea anemones, marine worms, snails, limpets, crabs, birds, and fish (Schlender, 2005).

We would do several things differently if we were able to do the experiment again. First, we would not use the 1 mm sieve, instead setting up a sifting device that utilized two different size screens in the same manner as before, but with the smaller one sized in between the $\frac{1}{4}$ mesh and the 1 mm sieve. In addition, we would design a more efficient method for recording and collecting organisms. A separate container for each quadrat's unknown organisms would be helpful in keeping everything organized. One person's sole job would be to describe and record unidentified organisms, thereby eliminating any confusion that results from multiple recording systems. This system would include a thorough description of each unknown species, including photographing each one instead of rough descriptions to be matched later.

We believe that the N Avenue Beach is in danger of experiencing considerable impact from the presence of petroleum. Although we were not able to find significant differences between this beach and our control beach, there is still reason for concern. The numbers of organisms and species on this beach are lower than the control beach in spite of the presence of eelgrass and we did notice small amounts of oil present in each quadrat. Further research and analysis are needed to determine if there is a significant pollution problem on this beach.

Tables and Figures:

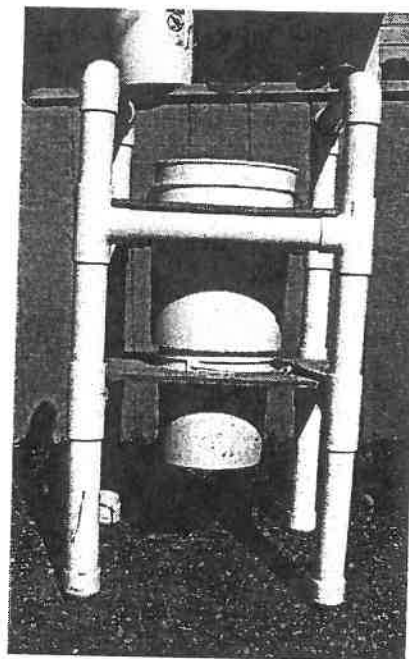
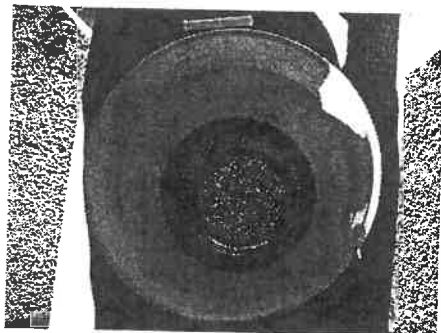


Figure 1: Sifting device. Top bucket contains $\frac{1}{4}$ screen, bottom contains 1 mm sieve.

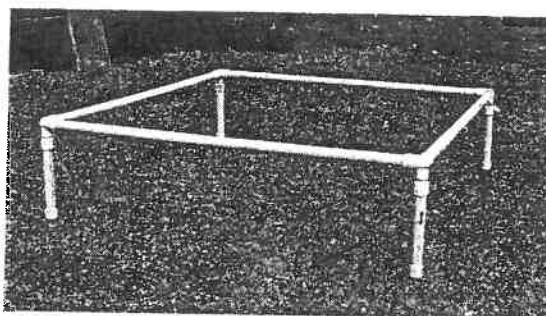


Figure 2: PVC frame for measuring size and depth of quadrats. Legs marked in 1 cm increments for measuring depth.

Control Beach	
Species	Number
<i>Clinocardium nutallii</i>	0
<i>Macoma nasuta</i>	6
<i>Amphioplus macrospis</i> (Brittle Star)	1
<i>Nephtys</i> sp. (Sandworm)	3
<i>Callistoma ligatum</i> (Blue top shell)	1
<i>Nereis brandti</i>	1
<i>Cancer productus</i> (Red rock crab)	1
Total Number of Species	6

Table 1: Initial survey from control beach.

Polluted Beach	
Species	Number
<i>Clinocardium nutallii</i>	1
<i>Macoma nasuta</i>	1
<i>Amphioplus macrospis</i> (Brittle Star)	0
<i>Nephtys</i> sp. (Sandworm)	1
<i>Callistoma ligatum</i> (Blue top shell)	0
<i>Nereis brandti</i>	0
<i>Cancer productus</i> (Red rock crab)	0
Total Number of Species	3

Table 2: Initial survey from polluted beach.

Control Beach											
Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5	Quadrat 6	Quadrat 7	Quadrat 8	Totals	Percentage	Feeder Type
<i>Glycera capitata</i>		1							1	0.27	?
Heart Cockle									0	0.00	F
<i>Amphioplus macraspis</i>	2	1	1	1	7	2	3	7	24	6.54	F
<i>Upogebia pugettensis</i>					1				1	0.27	F
Purple Shore Crab									0	0.00	F
Unknown Shrimp					1				1	0.27	F
<i>Onuphis iridescens</i>									0	0.00	F
Acorn Worm									0	0.00	F
Pile Worm									0	0.00	P
<i>Anthopleura artemisia</i>							1		1	0.27	P
<i>Nephtys</i> sp.	6	3	3	2	7	5	3	3	32	8.72	P
Red-stripe Polychaete	4	3	2	1			1		11	3.00	P
Red Rock Crab	1		2	1		1	1		6	1.63	P
<i>Hemipodus borealis</i>		1	2	2	3	1	2	4	15	4.09	P
<i>Solen sicarius</i>							1		1	0.27	P
Bent-nosed Clam	12	2	34	47	37	26	55	47	260	70.84	S
Peanut Worm	1		1		1		1		4	1.09	S
Polychaete worm (yellow/white)	1								1	0.27	S
Polychaete worm (red)	1								1	0.27	S
Unknown Amphipod				1		2			3	0.82	S
<i>Golfingia pugettensis</i>						1			1	0.27	S
<i>Amphiodia urtica</i>				1	1	1			3	0.82	Sc
<i>Paranemertes sanjuanensis</i>							1		1	0.27	Sc
Total Organisms Per Quadrant	28	11	45	56	58	39	69	61	367	100.00	
Total Species Per Quadrant	8	6	7	8	8	8	10	4	21		
Sediment Feeders	2	1	1	1	9	2	3	7	26	73.57	
Filter Feeders	15	2	35	48	38	29	56	47	270	7.08	
Predators	11	7	9	6	10	7	9	7	66	17.98	

Table 3: Species found in each of the quadrats at the control beach. Feeder types: F = filter feeder, P = predator, S = sediment feeder, and Sc = scavenger.

Polluted Beach											
Species	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5	Quadrat 6	Quadrat 7	Quadrat 8	Totals	Percentage	Feeder Type
<i>Glycera capitata</i> (large worm)									0	0.00	?
Heart Cackle				1	1		2		4	1.22	F
<i>Amphioplus macrospis</i> (Brittle Star)		5	1	2	29	1		3	41	12.50	F
<i>Upogeba pugetta</i> (Blue Mud Shrimp)									0	0.00	F
Purple Shore Crab							1		1	0.30	F
Unknown Shrimp									0	0.00	F
<i>Onuphis iridescens</i> (worm)								2	2	0.61	F
Acorn Worm	1								1	0.30	F
Pile Worm					2	7	2		11	3.35	P
<i>Anthopleura artemisia</i> (anemone)									0	0.00	P
<i>Nephtys</i> sp. (Sandworm)	4	5		8	20	4	8	8	57	17.38	P
Red-stripe Polychaete		1		2	13				16	4.88	P
Red Rock Crab	1	1	3		8		1	4	18	5.49	P
<i>Hemipodus borealis</i> (Red Setae Worm)		1		5	19	1	4	2	32	9.76	P
<i>Solen sicarius</i>									0	0.00	P
l-nosed Clam	36	15	6	11	46	3	8	15	140	42.68	S
Peanut Worm					3			1	4	1.22	S
Oligochaete worm (yellow/white)									0	0.00	S
Oligochaete worm (red)									0	0.00	S
Unknown Amphipod									0	0.00	S
<i>Golfingia pugettensis</i> (nemertean worm)											S
<i>Amphipholis pugetana</i> (Brittle star)									0	0.00	Sc
<i>Paranemertes sanjuanensis</i> (Nemertean worm)				1					1	0.30	Sc
Total Organisms Per Quadrant	42	28	10	30	141	16	26	35	328	100.00	
Total Species Per Quadrant	4	6	3	7	9	5	7	7	14		
Sediment Feeders	1	5	1	3	30	1	3	5	49	43.90	
Filter Feeders	36	15	6	11	49	3	8	16	144	14.94	
Predators	5	8	3	15	62	12	15	14	134	40.85	

Table 4: Species found in each of the quadrats at the polluted beach. Feeder types: F = filter feeder, P = predator, S = sediment feeder, and Sc = scavenger.

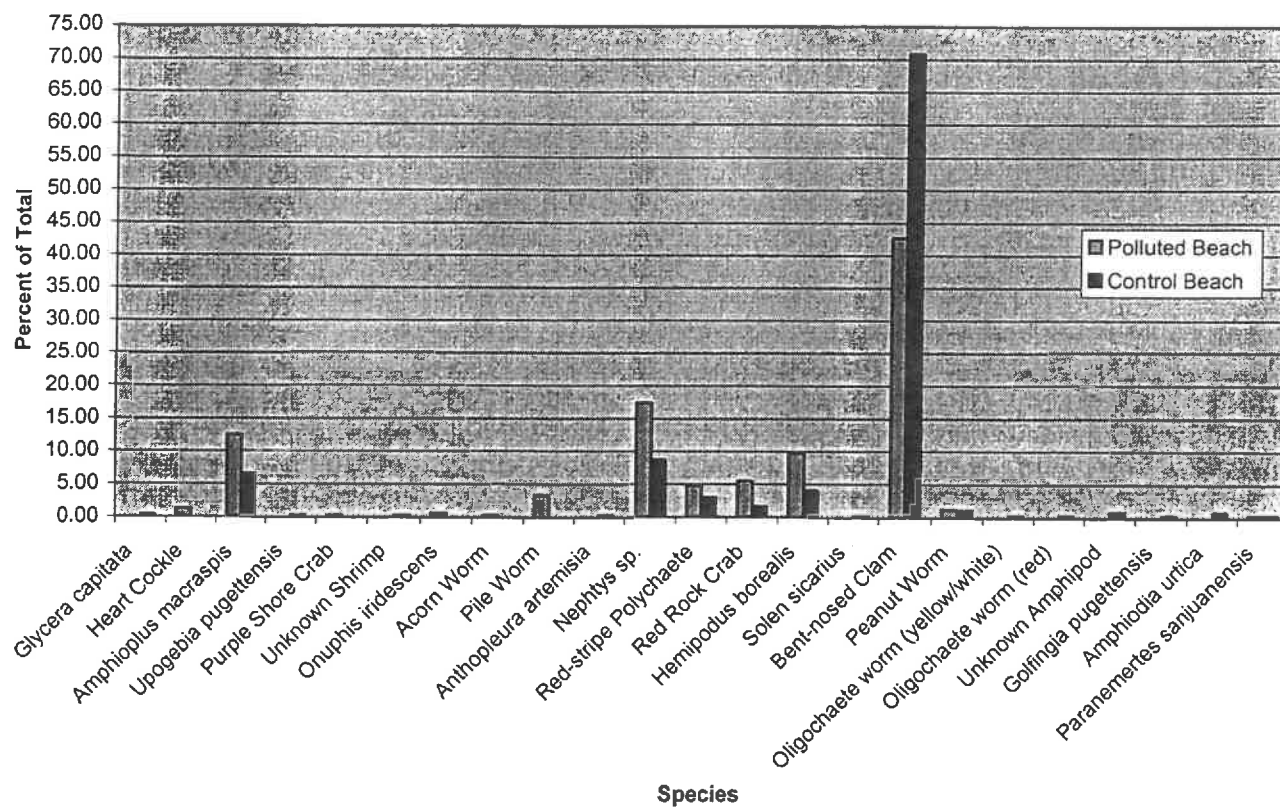


Figure 3: Comparison of percentages of species on each beach.

Individuals by species		
Species	Polluted Beach	Control Beach
Heart Cockle	1.22	0.00
Bent-nosed Clam	34.15	69.57
Amphioplus macraspis	12.50	6.52
Pile Worm	3.35	0.00
Upogebia pugettensis	0.00	0.27
Anthopleura artemisia	0.00	0.27
Nephtys sp.	17.38	8.70
Peanut Worm	1.22	1.09
Red-stripe Polychaete	4.88	2.72
Red Rock Crab	5.49	1.63
Purple Shore Crab	0.30	0.00
Hemipodus borealis	8.54	1.09
Tube Worm	8.84	4.08
Oligochaete worm (yellow/white)	0.61	0.00
Oligochaete worm (red)	0.00	0.27
Thelepus? Unknown polychaete	0.00	0.27
Glycera capitata	0.00	0.27
Parchment tubeworm	0.00	0.27
Unknown Shrimp	0.00	0.27
Amphiodia urtica	0.00	0.27
Unknown Amphipod	0.00	0.82
Paranemertes sanjuanensis	0.00	0.82
Solen sicarius	0.30	0.27
Onuphis iridescent	0.00	0.27
Red-striped Nereid	0.61	0.00
Acorn Worm	0.30	0.00
Golfingia pugettensis	0.30	0.00

Table 5: Percentages of organisms of each species found on each beach. The total number of organisms for the control and polluted beaches are 367 and 328, respectively.

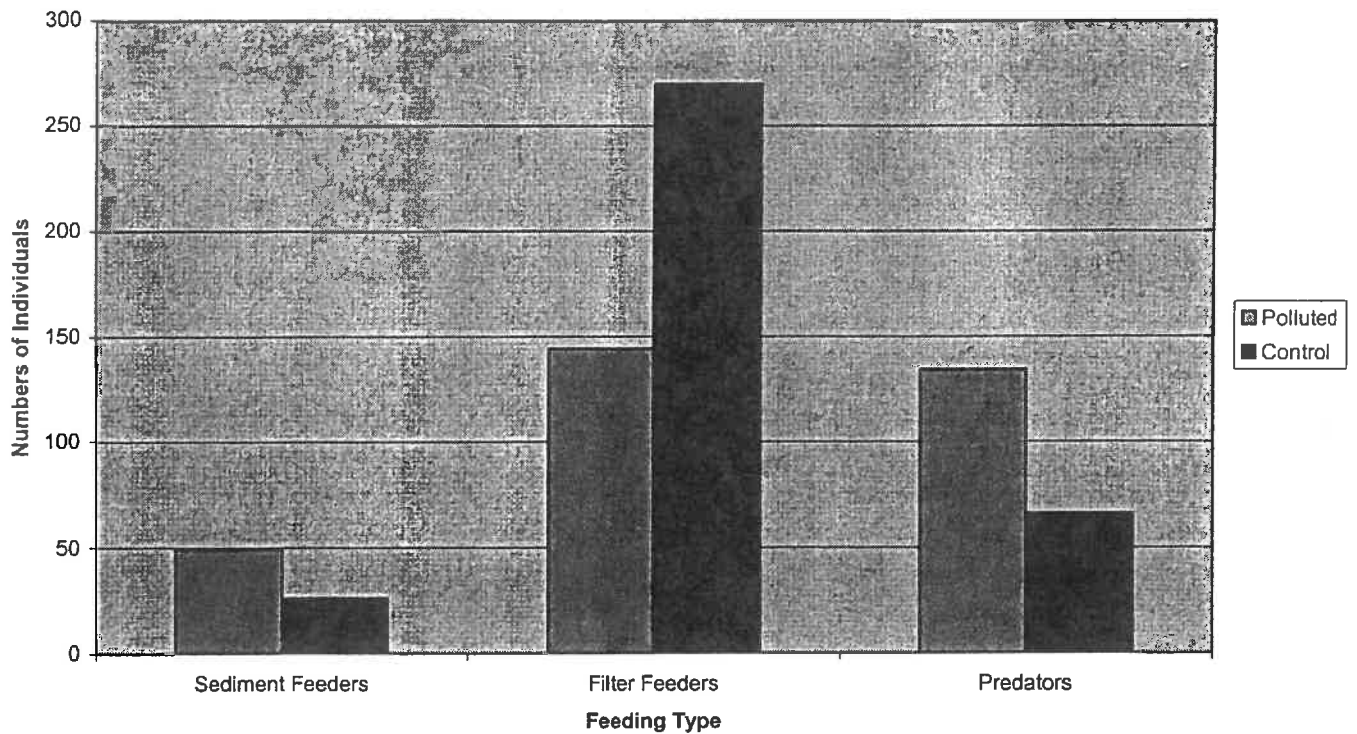


Figure 4: Comparison of organism feeding types at each beach.

Species Richness									
	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5	Quadrat 6	Quadrat 7	Quadrat 8	Total
Control	8	6	7	8	8	8	10	4	21
Polluted	4	6	3	7	9	5	7	7	14

Table 6: Numbers of species found in each quadrat at both beaches with the total number of species found.

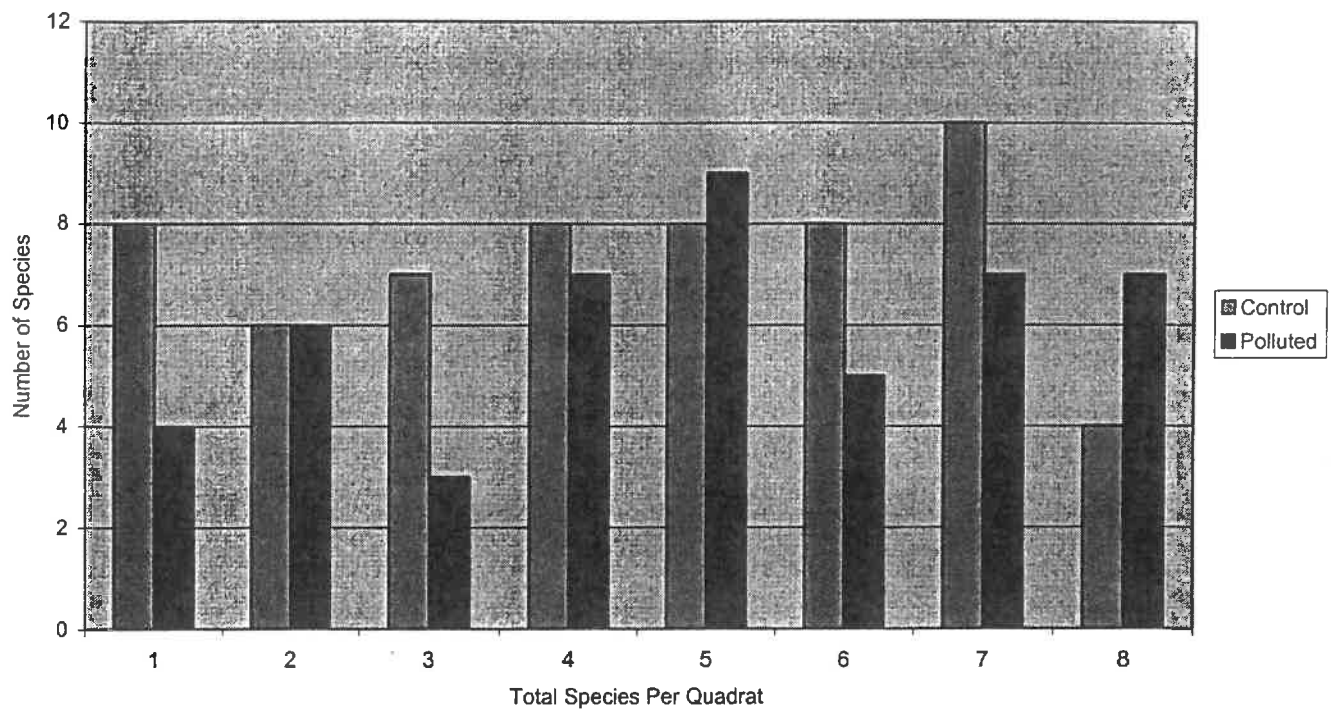


Figure 5: Comparison of species richness on each beach. No significant statistical difference was found.

Literature Cited:

1. Cai, L., Ma, L., Gao, Y., Zheng T., Lin, P (2002). Analysis on Assessing Criterion for Polluted Situation Using *Species Diversity* Index of Marine Macrofauna. *Journal of Xiamen University (Natural Science)*. 41 (5): 641-646.
2. Gray, J.S. (1979). Pollution-induced changes in populations. *Philos Trans R Soc Lond B Biol Sci*. 286(1015): 545-61.
3. Huesemann, M. Photosynthesis Shines as Remediation Tool. *Breakthroughs*. Summer 2003. http://www.pnl.gov/breakthroughs/summer03/special_report3.stm
4. Koch, K. (2004). Candidate 2004 Water Quality Assessment- Category 5 Sediment Listings. Retrieved July 2005 from http://www.ecy.wa.gov/programs/wq/303d/2002/2004_documents/sed-060105-cat5.pdf
5. Kozloff, E.N. (1993). Seashore Life of the Northern Pacific Coast An Illustrated Guide to Northern California, Oregon, Washington and British Columbia. University of Washington Press. (Original work published 1973)
6. Kozloff, E.N. 1996. Marine Invertebrates of the Pacific Northwest. University of Washington Press.
7. Langley, R. 1996. Beach Cleanup Underway on Guemes Island. *Washington State Department of Ecology: Ecology News*. <http://www.ecy.wa.gov/news/1996news/96-021.html>.
8. Peso-Aguiar, MC; Smith, DH; Assis, RCF; Santa-Isabel, LM; Peixinho, S; Gouveia, EP; Almeida, TCA; Andrade, WS; Carqueija, CRG; Kelmo, F; Carrozzo, G; Rodrigues, CV; Carvalho, GC; Jesus, ACS (2000). Effects of petroleum and its derivatives in benthic communities at Baia de Todos os Santos/Todos os Santos Bay, Bahia, Brazil. *Aquatic Ecosystem Health & Management*. 3 (4): 459-470.

**STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY**

In the Matter of Remedial Action by:

Port of Anacortes

AGREED ORDER

No. DE 11346

RECEIVED

FEB 11 2016

TO: Port of Anacortes
100 Commercial Avenue
Anacortes, WA 98221

**Department of Ecology
Toxics Cleanup Program**

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EXHIBIT B	Scope of Work and Schedule
EXHIBIT C	Focused Site Investigation Results

I. INTRODUCTION

The mutual objective of the State of Washington, Department of Ecology (Ecology) and the Port of Anacortes (the Port) under this Agreed Order (Order) is to enable a remedial action to be selected for a facility where there has been a release or threatened release of hazardous substances. This Order requires the Port to conduct a Remedial Investigation/Feasibility Study (RI/FS) and develop a draft final Cleanup Action Plan (DCAP), addressing both upland and potential in-water contamination for the Quiet Cove Site. Ecology believes the actions required by this Order are in the public interest.

II. JURISDICTION

This Agreed Order is issued pursuant to the Model Toxics Control Act (MTCA), RCW 70.105D.050(1).

III. PARTIES BOUND

This Agreed Order shall apply to and be binding upon the Parties to this Order, their successors and assigns. The undersigned representative of each Party hereby certifies that he or she is fully authorized to enter into this Order and to execute and legally bind such Party to comply with this Order. The Port agrees to undertake all actions required by the terms and conditions of this Order. No change in ownership or corporate status shall alter the Port's responsibility under this Order. The Port shall provide a copy of this Order to all agents, contractors, and subcontractors retained to perform work required by this Order, and shall ensure that all work undertaken by such agents, contractors, and subcontractors complies with this Order.

IV. DEFINITIONS

Unless otherwise specified herein, the definitions set forth in Chapter 70.105D RCW and Chapter 173-340 WAC shall control the meanings of the terms in this Order.

A. Site: The Site is referred to as Quiet Cove and is generally located at 202 O Avenue, Anacortes. The Site is defined by the extent of contamination caused by the release of hazardous substances at the Site. Based upon factors currently known to Ecology, the Site is generally

described in the Site Diagram (Exhibit A). The Site constitutes a facility under RCW 70.105D.020(8).

B. Parties: Refers to the State of Washington, Department of Ecology and the Port of Anacortes.

C. Potentially Liable Person (PLP): Refers to the Port of Anacortes.

D. Agreed Order or Order: Refers to this Order and each of the exhibits to this Order. All exhibits are integral and enforceable parts of this Order. The terms “Agreed Order” or “Order” shall include all exhibits to this Order.

E. In-Water Area: Refers to the intertidal (areas exposed to air at low tide) and subtidal (areas always covered by water) areas associated with adjacent marine waters that may be included as part of the Site. The Remedial Investigation will determine if the Site contains an In-Water Area component.

F. Upland Area: Refers to areas of the Site that fall outside of the In-Water Area, as generally depicted in Exhibit A, Figure 2.

V. FINDINGS OF FACT

Ecology makes the following findings of fact, without any express or implied admissions of such facts by the Port:

A. The site is generally located between 2nd and 3rd Street west of O Avenue, at 202 O Avenue, Anacortes, Washington, 98221. The primary parcels include P55354, P55358, and P55359 and totals approximately 0.82 acres. The Site may extend across 2nd Street toward Curtis Wharf International Shipping Terminal and into the Guemes Channel to the Northwest. The Site is listed on the Department of Ecology’s Confirmed and Suspected Contaminated Sites List as Quiet Cove. The Facility Site ID No. is 20859 and the Cleanup Site ID is 12482.

B. The Site was historically used by Standard Oil Company as a terminal facility for bulk fuel and for bulk fuel storage as early as 1909, and included five steel oil tanks, filling shed, oil warehouse, oil staging area, associated piping, and an auto shed. All of these historical

structures were removed at some point, but no documentation has yet been discovered regarding when the removal occurred.

C. Current use of the Site includes use of existing buildings and pavement for storage.

D. The Port purchased the Upland Area of the Site in July 2013. The Port performed a Focused Site Investigation in 2014 as part of an Integrated Planning Grant to determine the presence of contamination. There is no evidence of a phase one environmental investigation at this Site. Thirty-five (35) soil samples were collected at depths ranging from 0-10 feet, with exceedances of MTCA Method A cleanup levels for unrestricted land use recorded for BTEX, TPH_{Gx}, TPH_{Dx}, and TPH_{Ox}. Three (3) soil samples were also collected at depths ranging from 2-6 feet, with exceedances of the MTCA Method A cleanup levels for unrestricted land use found for cPAHs, naphthalenes, and cadmium. Five (5) monitoring wells were placed around the Site to determine the nature and extent of groundwater contamination. The following groundwater exceedances of MTCA Method A cleanup levels for surface water were documented: TPH_{Dx}, TPH_{Ox}, and arsenic. Attached as Exhibit C is the Focused Site Investigation Results.

E. The following is a list of the environmental documents produced as part of the Focused Site Investigation:

- *Focused Site Investigation Plan*. Prepared by GeoEngineers, February 2014.
- *Quiet Cove Property – Preliminary Findings from Soil Investigation Memorandum*. Prepared by GeoEngineers, May 2014.
- *Quiet Cove and Curtis Wharf Cleanup and Redevelopment Strategy*. Prepared by Maul Foster & Alongi, Inc., GeoEngineers, and BST Associates, March 2015.

VI. ECOLOGY DETERMINATIONS

Ecology makes the following determinations, without any express or implied admissions of such determinations (and underlying facts) by the Port.

A. The Port is an “owner or operator” as defined in RCW 70.105D.020(22) of a “facility” as defined in RCW 70.105D.020(8).

B. Based upon all factors known to Ecology, a “release” or “threatened release” of “hazardous substance(s)” as defined in RCW 70.105D.020(32) and (13), respectively, has occurred at the Site.

C. Based upon credible evidence, Ecology issued a PLP status letter to the Port dated October 23, 2014, pursuant to RCW 70.105D.040, .020(26), and WAC 173-340-500. By letter dated October 27, 2014, the Port voluntarily waived its rights to notice and comment and accepted Ecology’s determination that the Port is a PLP under RCW 70.105D.040. On October 30, 2014 Ecology issued a final determination letter to the Port that it is a PLP under RCW 70.105D.040.

D. Pursuant to RCW 70.105D.030(1) and .050(1), Ecology may require PLPs to investigate or conduct other remedial actions with respect to any release or threatened release of hazardous substances, whenever it believes such action to be in the public interest. Based on the foregoing facts, Ecology believes the remedial actions required by this Order are in the public interest.

E. Under WAC 173-340-430, an interim action is a remedial action that is technically necessary to reduce a threat to human health or the environment by eliminating or substantially reducing one or more pathways for exposure to a hazardous substance, that corrects a problem that may become substantially worse or cost substantially more to address if the remedial action is delayed, or that is needed to provide for completion of a site hazard assessment, remedial investigation/feasibility study, or design of a cleanup action plan. Either Party may propose an interim action under this Order. If the Parties are in agreement concerning the interim action, the Parties will follow the process in Section VII.H. If the Parties are not in agreement, Ecology reserves its authority to require interim action(s) under a separate order or other enforcement action under Chapter 70.105D RCW, or to undertake the interim action itself.

VII. WORK TO BE PERFORMED

Based on the Findings of Fact and Ecology Determinations, it is hereby ordered that the Port take the following remedial actions at the Site and that these actions be conducted in accordance with Chapter 173-340 WAC unless otherwise specifically provided for herein:

A. The Port shall conduct the remedial actions as fully described in Exhibit B, "Scope of Work and Schedule". Generally, the Port shall perform a Remedial Investigation and Feasibility Study (RI/FS), including the development of an RI/FS Work Plan and Report, and develop a draft Cleanup Action Plan (DCAP) for the Site

B. The performance of the RI/FS shall include, but not be limited to, the following tasks:

1. Develop an RI/FS work plan that includes a scope of work to delineate and quantify (i.e. identify levels of contamination) the potential contaminants in all media (i.e. soil, groundwater, surface water, and adjacent marine sediments). The work plan shall also address the proper handling of all wastes generated from the Site during the RI/FS (e.g. soil cuttings, groundwater development and purge water, excess sediment sample material, free-product, etc.). The RI/FS work plan shall address both the Upland Area and potential In-Water Area of the Site and summarize the past investigations.
2. Perform an RI/FS study pursuant to WAC 173-340-350 and 173-204-550. The Port shall provide Ecology with the results of the field investigation in the form of a Data Report Technical Memorandum so that a determination can be made with regard to whether additional investigation is required to fully define the nature and extent of contamination.
3. Prepare an RI/FS report pursuant to WAC 173-340-350 and 173-204-550.

C. Develop a DCAP for the Site pursuant to WAC 173-340-350 through -380 and WAC 173-204-550 through -575.

D. The Port shall perform the remedial actions required by this Order according to the schedule set forth in Exhibit B.

E. The Port shall submit to Ecology a progress report the first week of each month addressing the progress of RI/FS work during periods of field activity. Field activity includes any work conducted at the site (i.e. any on-site activities such as sampling, construction-related

activities, site visits, etc.). After the field activity work is complete, the Port shall submit to Ecology a quarterly progress report due the first week of the first month per quarter. All progress reports shall include work completed to date, problems encountered and how they were resolved, any supporting documentation, and work scheduled for the subsequent time period. Electronic submittals of progress reports are acceptable.

F. A sampling and analysis plan shall be submitted to Ecology, which includes QA/QC procedures, for Ecology's review and approval, and a health and safety plan, for Ecology's review and comment, are also required, as specified in Exhibit B, per WAC 173-340-350(7)(c)(iv).

G. All plans or other deliverables submitted by the Port for Ecology's review and approval under the Scope of Work and Schedule (Exhibit B) shall, upon Ecology's approval, become integral and enforceable parts of this Order.

H. If the Parties agree on an interim action under Section VI.E, the Port shall prepare and submit to Ecology an Interim Action Work Plan, including a scope of work and schedule, by the date determined by Ecology. Ecology will provide public notice and opportunity to comment on the Interim Action Work Plan in accordance with WAC 173-340-600(16). The Port shall not conduct the interim action until Ecology approves the Interim Action Work Plan. Upon approval by Ecology, the Interim Action Work Plan becomes an integral and enforceable part of this Order, and the Port is required to conduct the interim action in accordance with the approved Interim Action Work Plan.

I. If Ecology determines that the Port has failed to make sufficient progress or failed to implement the remedial action, in whole or in part, Ecology may, after notice to the Port, perform any or all portions of the remedial action or at Ecology's discretion allow the Port opportunity to correct. The Port shall reimburse Ecology for the costs of doing such work in accordance with Section VIII.A (Remedial Action Costs). Ecology reserves the right to enforce requirements of this Order under Section X (Enforcement).

J. Except where necessary to abate an emergency situation, the Port shall not perform any remedial actions at the Site outside those remedial actions required by this Order, unless Ecology concurs, in writing, with such additional remedial actions.

VIII. TERMS AND CONDITIONS

A. Remedial Action Costs

The Port shall pay to Ecology costs incurred by Ecology pursuant to this Order and consistent with WAC 173-340-550(2). These costs shall include work performed by Ecology or its contractors for, or on, the Site under Chapter 70.105D RCW, including remedial actions and Order preparation, negotiation, oversight, and administration. These costs shall include work performed both prior to and subsequent to the issuance of this Order. Ecology's costs shall include costs of direct activities and support costs of direct activities as defined in WAC 173-340-550(2). Ecology has accumulated \$2300.60 in remedial action costs related to this Site as of March 31, 2015. Payment for this amount shall be submitted within thirty (30) days of the effective date of this Order. For all costs incurred subsequent to March 31, 2015, the Port shall pay the required amount within thirty (30) days of receiving from Ecology an itemized statement of costs that includes a summary of costs incurred, an identification of involved staff, and the amount of time spent by involved staff members on the project. A general statement of work performed will be provided upon request. Itemized statements shall be prepared quarterly. Pursuant to WAC 173-340-550(4), failure to pay Ecology's costs within ninety (90) days of receipt of the itemized statement of costs will result in interest charges at the rate of twelve percent (12%) per annum, compounded monthly.

In addition to other available relief, pursuant to RCW 19.16.500, Ecology may utilize a collection agency and/or, pursuant to RCW 70.105D.055, file a lien against real property subject to the remedial actions to recover unreimbursed remedial action costs.

B. Designated Project Coordinators

The project coordinator for Ecology is:

Arianne Fernandez

Lands Cleanup Unit/HQ – Toxics Cleanup Program
P.O. Box 47600, Olympia, Washington 98504-7600
(360) 407-7209
afer461@ecy.wa.gov

The project coordinator for the Port is:

Becky Darden
Port of Anacortes
100 Commercial Avenue
Anacortes, Washington 98221-1560
(360) 299-1831 Direct Line
(360) 293-3134 Main Office
Becky@portofanacortes.com

Each project coordinator shall be responsible for overseeing the implementation of this Order. Ecology's project coordinator will be Ecology's designated representative for the Site. To the maximum extent possible, communications between Ecology and the Port, and all documents, including reports, approvals, and other correspondence concerning the activities performed pursuant to the terms and conditions of this Order shall be directed through the project coordinators. The project coordinators may designate, in writing, working level staff contacts for all or portions of the implementation of the work to be performed required by this Order.

Any Party may change its respective project coordinator. Written notification shall be given to the other Party at least ten (10) calendar days prior to the change.

C. Performance

All geologic and hydrogeologic work performed pursuant to this Order shall be under the supervision and direction of a geologist or hydrogeologist licensed by the State of Washington or under the direct supervision of an engineer registered by the State of Washington, except as otherwise provided for by Chapters 18.43 and 18.220 RCW.

All engineering work performed pursuant to this Order shall be under the direct supervision of a professional engineer registered by the State of Washington, except as otherwise provided for by RCW 18.43.130.

All construction work performed pursuant to this Order shall be under the direct supervision of a professional engineer or a qualified technician under the direct supervision of a

professional engineer. The professional engineer must be registered by the State of Washington, except as otherwise provided for by RCW 18.43.130.

Any documents submitted containing geologic, hydrologic, or engineering work shall be under the seal of an appropriately licensed professional as required by Chapters 18.43 and 18.220 RCW.

The Port shall notify Ecology in writing of the identity of any engineer(s) and geologist(s), contractor(s) and subcontractor(s), and others to be used in carrying out the terms of this Order, in advance of their involvement at the Site.

D. Access

Ecology or any Ecology authorized representative shall have access to enter and freely move about all property at the Site that the Port either owns, controls, or has access rights to at all reasonable times for the purposes of, *inter alia*: inspecting records, operation logs, and contracts related to the work being performed pursuant to this Order; reviewing the Port's progress in carrying out the terms of this Order; conducting such tests or collecting such samples as Ecology may deem necessary; using a camera, sound recording, or other documentary type equipment to record work done pursuant to this Order; and verifying the data submitted to Ecology by the Port. The Port shall make all reasonable efforts to secure access rights for those properties within the Site not owned or controlled by the Port where remedial activities or investigations will be performed pursuant to this Order. Ecology or any Ecology authorized representative shall give reasonable notice before entering any Site property owned or controlled by the Port unless an emergency prevents such notice. All persons who access the Site pursuant to this section shall comply with any applicable health and safety plan(s). Ecology employees and their representatives shall not be required to sign any liability release or waiver as a condition of Site property access.

E. Sampling, Data Submittal, and Availability

With respect to the implementation of this Order, the Port shall make the results of all sampling, laboratory reports, and/or test results generated by it or on its behalf available to Ecology. Pursuant to WAC 173-340-840(5), all sampling data shall be submitted to Ecology in

both printed and electronic formats in accordance with Section VII (Work to be Performed), Ecology's Toxics Cleanup Program Policy 840 (Data Submittal Requirements), and/or any subsequent procedures specified by Ecology for data submittal.

If requested by Ecology, the Port shall allow Ecology and/or its authorized representative to take split or duplicate samples of any samples collected by the Port pursuant to implementation of this Order. The Port shall notify Ecology seven (7) days in advance of any sample collection or work activity at the Site. Ecology shall, upon request, allow the Port and/or its authorized representative to take split or duplicate samples of any samples collected by Ecology pursuant to the implementation of this Order, provided that doing so does not interfere with Ecology's sampling. Without limitation on Ecology's rights under Section VIII.D (Access), Ecology shall notify the Port prior to any sample collection activity unless an emergency prevents such notice.

In accordance with WAC 173-340-830(2)(a), all hazardous substance analyses shall be conducted by a laboratory accredited under Chapter 173-50 RCW for the specific analyses to be conducted, unless otherwise approved by Ecology.

F. Public Participation

A Public Participation Plan is required for this Site. Ecology shall review any existing Public Participation Plan to determine its continued appropriateness and whether it requires amendment, or if no plan exists, Ecology shall develop a Public Participation Plan alone or in conjunction with the Port.

Ecology shall maintain the responsibility for public participation at the Site. However, the Port shall cooperate with Ecology, and shall:

1. If agreed to by Ecology, develop appropriate mailing lists and prepare drafts of public notices and fact sheets at important stages of the remedial action, such as the submission of work plans, remedial investigation/feasibility study reports, cleanup action plans, and engineering design reports. As appropriate, Ecology will edit, finalize, and distribute such fact sheets and prepare and distribute public notices of Ecology's presentations and meetings.

2. Notify Ecology's project coordinator prior to the preparation of all press releases and fact sheets, and before major meetings with the interested public and local governments. Likewise, Ecology shall notify the Port prior to the issuance of all press releases and fact sheets, and before major meetings with the interested public and local governments. For all press releases, fact sheets, meetings, and other outreach efforts by the Port that do not receive prior Ecology approval, the Port shall clearly indicate to its audience that the press release, fact sheet, meeting, or other outreach effort was not sponsored or endorsed by Ecology.

3. When requested by Ecology, participate in public presentations on the progress of the remedial action at the Site. Participation may be through attendance at public meetings to assist in answering questions or as a presenter.

4. When requested by Ecology, arrange and/or continue information repositories to be located at the following locations:

- a. Anacortes Public Library
1220 10th St.
Anacortes, WA 98221
- b. Ecology's Headquarters Office
300 Desmond Drive
Lacey, WA 98503

At a minimum, copies of all public notices, fact sheets, and documents relating to public comment periods shall be promptly placed in these repositories. A copy of all documents related to this Site shall be maintained in the repository at Ecology's Headquarters Office in Lacey, Washington.

G. Retention of Records

During the pendency of this Order, and for ten (10) years from the date of completion of work performed pursuant to this Order, the Port shall preserve all records, reports, documents, and underlying data in its possession relevant to the implementation of this Order and shall insert a similar record retention requirement into all contracts with project contractors and subcontractors. Upon request of Ecology, the Port shall make all records available to Ecology and allow access for review within a reasonable time.

Nothing in this Order is intended to waive any right the Port may have under applicable law to limit disclosure of documents protected by the attorney work-product privilege and/or the attorney-client privilege. If the Port withholds any requested records based on an assertion of privilege, the Port shall provide Ecology with a privilege log specifying the records withheld and the applicable privilege. No Site-related data collected pursuant to this Order shall be considered privileged.

H. Resolution of Disputes

1. In the event that the Port elects to invoke dispute resolution the Port must utilize the procedure set forth below.

a. Upon the triggering event (receipt of Ecology's project coordinator's written decision or an itemized billing statement), the Port has fourteen (14) calendar days within which to notify Ecology's project coordinator in writing of its dispute ("Informal Dispute Notice").

b. The Parties' project coordinators shall then confer in an effort to resolve the dispute informally. The Parties shall informally confer for up to fourteen (14) calendar days from receipt of the Informal Dispute Notice. If the project coordinators cannot resolve the dispute within those 14 calendar days, then within seven (7) calendar days following the close of the 14 day informal conference period Ecology's project coordinator shall issue a written decision ("Informal Dispute Decision") stating: the nature of the dispute; the Port's position with regard to the dispute; Ecology's position with regard to the dispute; and the extent of resolution reached by informal discussion.

c. The Port may then request regional management review of the dispute. This request ("Formal Dispute Notice") must be submitted in writing to the Headquarters Toxics Cleanup Section Manager within seven (7) calendar days of receipt of Ecology's Informal Dispute Decision. The Formal Dispute Notice shall include a written statement of dispute setting forth: the nature of the dispute; the disputing Party's position with respect to the dispute; and the information relied upon to support its position.

d. The Section Manager shall conduct a review of the dispute and shall issue a written decision regarding the dispute ("Decision on Dispute") within thirty (30) calendar days of receipt of the Formal Dispute Notice. The Decision on Dispute shall be Ecology's final decision on the disputed matter.

2. The Parties agree to only utilize the dispute resolution process in good faith and agree to expedite, to the extent possible, the dispute resolution process whenever it is used.

3. Implementation of these dispute resolution procedures shall not provide a basis for delay of any activities required in this Order, unless Ecology agrees in writing to a schedule extension.

4. In case of a dispute, failure to either proceed with the work required by this Order or timely invoke dispute resolution may result in Ecology's determination that insufficient progress is being made in preparation of a deliverable, and may result in Ecology undertaking the work under Section VII. (Work to be Performed) or initiating enforcement under Section X (Enforcement).

I. Extension of Schedule

1. An extension of schedule shall be granted only when a request for an extension is submitted in a timely fashion, generally at least thirty (30) days prior to expiration of the deadline for which the extension is requested, and good cause exists for granting the extension. All extensions shall be requested in writing. The request shall specify:

- a. The deadline that is sought to be extended;
- b. The length of the extension sought;
- c. The reason(s) for the extension; and
- d. Any related deadline or schedule that would be affected if the extension were granted.

2. The burden shall be on the Port to demonstrate to the satisfaction of Ecology that the request for such extension has been submitted in a timely fashion and that good cause exists for granting the extension. Good cause may include, but may not be limited to:

- a. Circumstances beyond the reasonable control and despite the due diligence of the Port including delays caused by unrelated third parties or Ecology, such as (but not limited to) delays by Ecology in reviewing, approving, or modifying documents submitted by the Port;
- b. Acts of God, including fire, flood, blizzard, extreme temperatures, storm, or other unavoidable casualty; or
- c. Endangerment as described in Section VIII.K (Endangerment).

However, neither increased costs of performance of the terms of this Order nor changed economic circumstances shall be considered circumstances beyond the reasonable control of the Port.

3. Ecology shall act upon any written request for extension in a timely fashion. Ecology shall give the Port written notification of any extensions granted pursuant to this Order. A requested extension shall not be effective until approved by Ecology. Unless the extension is a substantial change, it shall not be necessary to amend this Order pursuant to Section VIII.J (Amendment of Order) when a schedule extension is granted.

4. An extension shall only be granted for such period of time as Ecology determines is reasonable under the circumstances. Ecology may grant schedule extensions exceeding ninety (90) days only as a result of:

- a. Delays in the issuance of a necessary permit which was applied for in a timely manner;
- b. Other circumstances deemed exceptional or extraordinary by Ecology; or
- c. Endangerment as described in Section VIII.K (Endangerment).

J. Amendment of Order

The project coordinators may verbally agree to minor changes to the work to be performed without formally amending this Order. Minor changes will be documented in writing by Ecology within seven (7) days of verbal agreement.

Except as provided in Section VIII.L (Reservation of Rights), substantial changes to the work to be performed shall require formal amendment of this Order. This Order may only be

formally amended by the written consent of both Ecology and the Port. The Port shall submit a written request for amendment to Ecology for approval. Ecology shall indicate its approval or disapproval in writing and in a timely manner after the written request for amendment is received. If the amendment to this Order represents a substantial change, Ecology will provide public notice and opportunity to comment. Reasons for the disapproval of a proposed amendment to this Order shall be stated in writing. If Ecology does not agree to a proposed amendment, the disagreement may be addressed through the dispute resolution procedures described in Section VIII.H (Resolution of Disputes).

K. Endangerment

In the event Ecology determines that any activity being performed at the Site under this Order is creating or has the potential to create a danger to human health or the environment on or surrounding the Site, Ecology may direct the Port to cease such activities for such period of time as it deems necessary to abate the danger. The Port shall immediately comply with such direction.

In the event the Port determines that any activity being performed at the Site under this Order is creating or has the potential to create a danger to human health or the environment, the Port may cease such activities. The Port shall notify Ecology's project coordinator as soon as possible, but no later than twenty-four (24) hours after making such determination or ceasing such activities. Upon Ecology's direction, the Port shall provide Ecology with documentation of the basis for the determination or cessation of such activities. If Ecology disagrees with the Port's cessation of activities, it may direct the Port to resume such activities.

If Ecology concurs with or orders a work stoppage pursuant to this section, the Port's obligations with respect to the ceased activities shall be suspended until Ecology determines the danger is abated, and the time for performance of such activities, as well as the time for any other work dependent upon such activities, shall be extended in accordance with Section VIII.I (Extension of Schedule) for such period of time as Ecology determines is reasonable under the circumstances.

Nothing in this Order shall limit the authority of Ecology, its employees, agents, or contractors to take or require appropriate action in the event of an emergency.

L. Reservation of Rights

This Order is not a settlement under Chapter 70.105D RCW. Ecology's signature on this Order in no way constitutes a covenant not to sue or a compromise of any of Ecology's rights or authority. Ecology will not, however, bring an action against the Port to recover remedial action costs paid to and received by Ecology under this Order. In addition, Ecology will not take additional enforcement actions against the Port regarding remedial actions required by this Order, provided the Port complies with this Order.

Ecology nevertheless reserves its rights under RCW 70.105D, including the right to require additional or different remedial actions at the Site should it deem such actions necessary to protect human health and the environment, and to issue orders requiring such remedial actions. Ecology also reserves all rights regarding the injury to, destruction of, or loss of natural resources resulting from the release or threatened release of hazardous substances at the Site.

By entering into this Order, the Port does not admit to any liability for the Site. Although the Port is committing to conducting the work required by this Order under the terms of this Order, the Port expressly reserves all rights available under law, including but not limited to its rights regarding any future agency action not covered by the scope of this Order, the right to seek cost recovery or contribution against third parties, and the right to assert any defenses to liability in the event of enforcement.

M. Transfer of Interest in Property

No voluntary conveyance or relinquishment of title, easement, leasehold, or other interest in any portion of the Site shall be consummated by the Port without provision for continued implementation of all requirements of this Order and implementation of any remedial actions found to be necessary as a result of this Order.

Prior to the Port's transfer of any interest in all or any portion of the Site, and during the effective period of this Order, the Port shall provide a copy of this Order to any prospective

purchaser, lessee, transferee, assignee, or other successor in said interest; and, at least thirty (30) days prior to any transfer, the Port shall notify Ecology of said transfer. Upon transfer of any interest, the Port shall notify all transferees of the restrictions on the activities and uses of the property under this Order and incorporate any such use restrictions into the transfer documents.

N. Compliance with Applicable Laws

1. All actions carried out by the Port pursuant to this Order shall be done in accordance with all applicable federal, state, and local requirements, including requirements to obtain necessary permits, except as provided in RCW 70.105D.090. At this time, no federal, state, or local requirements have been identified as being applicable to the actions required by this Order.

2. Pursuant to RCW 70.105D.090(1), the Port is exempt from the procedural requirements of Chapters 70.94, 70.95, 70.105, 77.55, 90.48, and 90.58 RCW and of any laws requiring or authorizing local government permits or approvals. However, the Port shall comply with the substantive requirements of such permits or approvals. At this time, the following state or local permits or approvals have been identified as being potentially applicable but procedurally exempt under this section: Washington Department of Fish and Wildlife for conducting sediment sampling; and City of Anacortes for conducting upland investigation within the shoreline jurisdictional area and/or the City right-of-way.

The Port has a continuing obligation to determine whether additional permits or approvals addressed in RCW 70.105D.090(1) would otherwise be required for the remedial action under this Order. In the event either Ecology or the Port determines that additional permits or approvals addressed in RCW 70.105D.090(1) would otherwise be required for the remedial action under this Order, it shall promptly notify the other Party of its determination. Ecology shall determine whether Ecology or the Port shall be responsible to contact the appropriate state and/or local agencies. If Ecology so requires, the Port shall promptly consult with the appropriate state and/or local agencies and provide Ecology with written documentation from those agencies of the substantive requirements those agencies believe are applicable to the remedial action. Ecology shall make the final determination on the additional substantive requirements that must be met by

the Port and on how the Port must meet those requirements. Ecology shall inform the Port in writing of these requirements. Once established by Ecology, the additional requirements shall be enforceable requirements of this Order. The Port shall not begin or continue the remedial action potentially subject to the additional requirements until Ecology makes its final determination.

3. Pursuant to RCW 70.105D.090(2), in the event Ecology determines that the exemption from complying with the procedural requirements of the laws referenced in RCW 70.105D.090(1) would result in the loss of approval from a federal agency that is necessary for the state to administer any federal law, the exemption shall not apply and the Port shall comply with both the procedural and substantive requirements of the laws referenced in RCW 70.105D.090(1), including any requirements to obtain permits.

O. Periodic Review

As remedial action, including groundwater monitoring, continues at the Site, the Parties agree to review the progress of remedial action at the Site, and to review the data accumulated as a result of monitoring the Site as often as is necessary and appropriate under the circumstances. At least every five (5) years after the initiation of cleanup action at the Site, the Parties shall meet to discuss the status of the Site and the need, if any, for further remedial action at the Site. At least ninety (90) days prior to each periodic review, the Port shall submit a report to Ecology that documents whether human health and the environment are being protected based on the factors set forth in WAC 173-340-420(4). Ecology reserves the right to require further remedial action at the Site under appropriate circumstances. This provision shall remain in effect for the duration of this Order.

P. Indemnification

The Port agrees, to the extent permitted by law, to indemnify and save and hold the State of Washington, its employees, and agents harmless from any and all claims or causes of action (1) for death or injuries to persons, or (2) for loss or damage to property, to the extent arising from or on account of acts or omissions of the Port, its officers, employees, agents, or contractors in entering into and implementing this Order. However, the Port shall not indemnify the State of

Washington nor save nor hold its employees and agents harmless from any claims or causes of action to the extent arising out of the negligent acts or omissions of the State of Washington, or the employees or agents of the State, in entering into or implementing this Order.

IX. SATISFACTION OF ORDER

The provisions of this Order shall be deemed satisfied upon the Port's receipt of written notification from Ecology that the Port has completed the remedial activity required by this Order, as amended by any modifications, and that the Port has complied with all other provisions of this Agreed Order.

X. ENFORCEMENT

Pursuant to RCW 70.105D.050, this Order may be enforced as follows:

A. The Attorney General may bring an action to enforce this Order in a state or federal court.

B. The Attorney General may seek, by filing an action, if necessary, to recover amounts spent by Ecology for investigative and remedial actions and orders related to the Site.

C. A liable party who refuses, without sufficient cause, to comply with any term of this Order will be liable for:

1. Up to three (3) times the amount of any costs incurred by the State of Washington as a result of its refusal to comply.

2. Civil penalties of up to twenty-five thousand dollars (\$25,000) per day for each day it refuses to comply.

D. This Order is not appealable to the Washington Pollution Control Hearings Board.

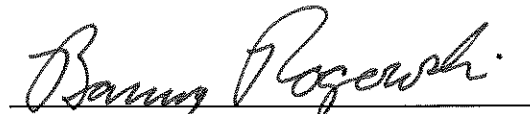
This Order may be reviewed only as provided under RCW 70.105D.060.

Effective date of this Order: 2/23/16

The Port of Anacortes


Daniel C. Worra

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY


Barry Rogowski

Model Agreed Order No. DE 11346
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Executive Director
Port of Anacortes
(360) 299-1812

Section Manager
Toxics Cleanup Program
Headquarters Office
(360) 407-7226

EXHIBIT – A

QUIET COVE SITE SITE DIAGRAM

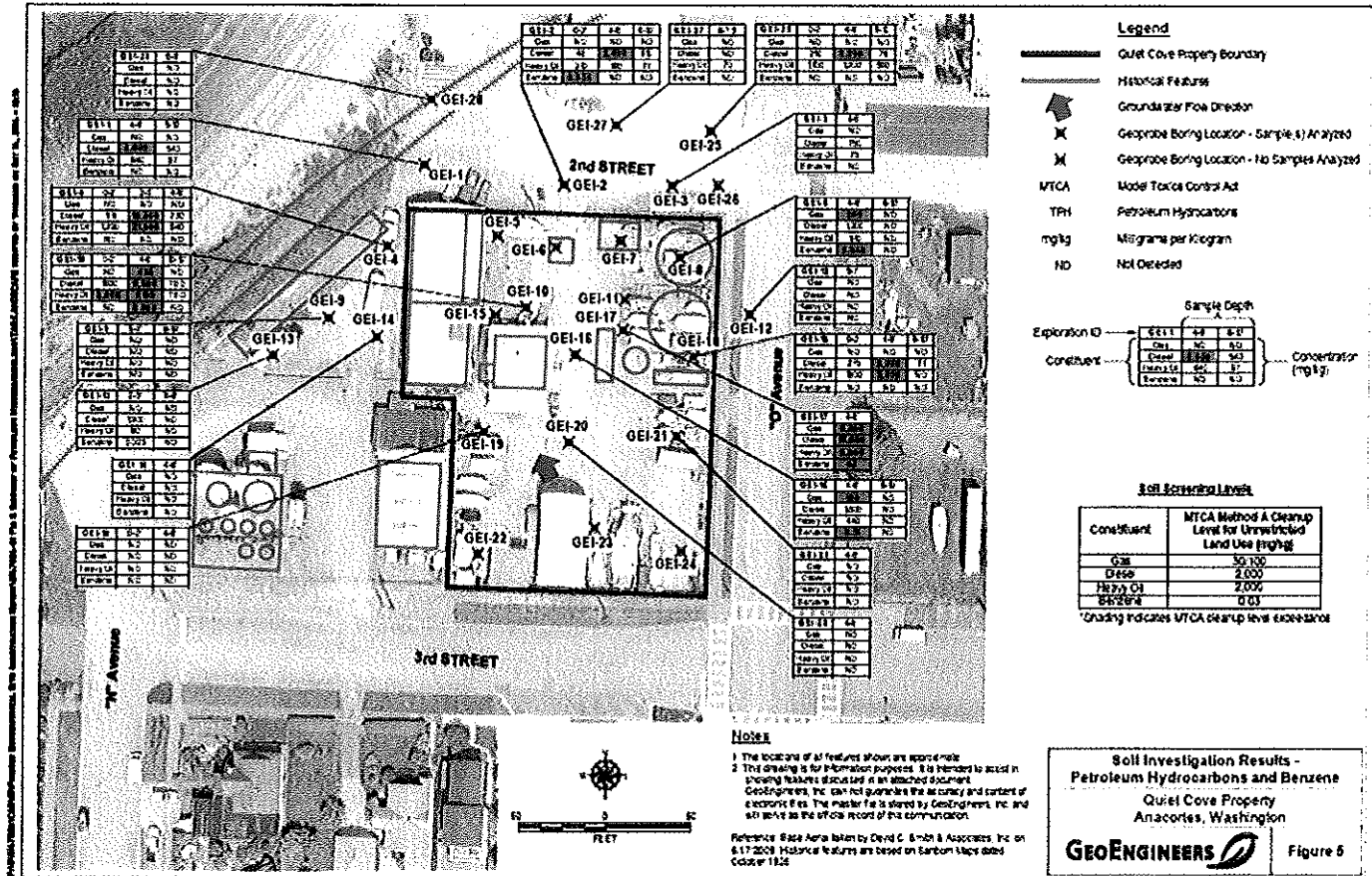


EXHIBIT – B

CHECKLIST FOR KEY PROJECT MEETING #2

THE REMEDIAL INVESTIGATION PLANNING MEETING

ATTENDANCE

THE ECOLOGY CLEANUP PROJECT MANAGER (CPM), THE PERSON OR PERSONS RESPONSIBLE FOR THE SITE CLEANUP (PLPs AND CONSULTANTS), PERSONS WHO ARE OR WILL BE INVOLVED IN DRAFTING THE REMEDIAL INVESTIGATION (RI) WORK PLANS, OTHER AGENCIES IF APPLICABLE.

IF ATTORNEYS FOR EITHER PLPs OR ECOLOGY ARE ATTENDING THIS (OR ANY) MEETING IT SHOULD BE COMMUNICATED TO OTHER PARTIES BEFORE THE MEETING. (THIS IS A STANDARD BUSINESS COURTESY.)

PURPOSE OF THIS MEETING

- ☐ PLAN THE REMEDIAL INVESTIGATION FIELD WORK.
- ☐ REVIEW SAMPLING AND ANALYSIS PLAN AND QUALITY ASSURANCE PROJECT PLAN REQUIREMENTS.
- ☐ ESTABLISH COMMUNICATIONS STRATEGY AROUND REVIEWING DATA.

AGENDA TOPICS (EXPAND AS NEEDED)

- ☐ BRING FORWARD THE CONCEPTUAL SITE MODEL BASED ON WHAT IS CURRENTLY KNOWN ABOUT THE SITE AND POTENTIAL EXPOSURE PATHWAYS.
- ☐ PLAN SITE VISIT(S) TO OBSERVE VISIBLE CHARACTERISTICS AND SURROUNDING AREAS. DETERMINE IF OFF-SITE CONTAMINATION SOURCES ARE KNOWN OR SUSPECTED.
- ☐ DISCUSS PLANNED FIELD ACTIVITIES INCLUDING AREAS TO BE INVESTIGATED, CHARACTERIZATION OBJECTIVES FOR EACH AREA, LOCATIONS AND SITING OF SAMPLING AND/OR OTHER DATA COLLECTION POINTS, FIELD METHODOLOGIES, FIELD DATA COLLECTION, FIELD CONTINGENCIES, LABORATORY ANALYSES AND DATA EVALUATION METHODS.
- ☐ IDENTIFY POTENTIAL INTERIM ACTIONS USING CURRENT KNOWLEDGE OF POTENTIAL SOURCES, EXPOSURE PATHWAYS AND IMMEDIATE THREATS TO HUMAN HEALTH AND THE ENVIRONMENT.
- ☐ DISCUSS SEPARATING OR COMBINING RI AND FS ACTIVITIES IF IT REDUCES COMPLEXITY OR ASSISTS IN RUNNING THE TWO FUNCTIONS IN PARALLEL. IDENTIFY WHERE RI AND FS ACTIVITIES CAN BE PERFORMED CONCURRENTLY TO PRODUCE AN RI/FS REPORT WITHIN 2 YEARS.
- ☐ DISCUSS SEPA PROCESS AND RESPONSIBILITIES.

REVIEW RI EXPECTATIONS

- ☐ THE ECOLOGY CPM MAY PARTICIPATE IN FIELD ACTIVITIES SO THAT DECISIONS ARE MADE IN REAL TIME AND WITH OBSERVATIONS AND DISCUSSION THROUGH THE DESIGNATED POINT OF CONTACT (POC).

QUIET COVE SITE

SCOPE OF WORK AND SCHEDULE

Pursuant to the Agreed Order to which this Scope of Work and Schedule is attached, the Port of Anacortes (Port) shall take the following remedial actions at the Quiet Cove Site (Site) and these actions shall be conducted in accordance with Chapters 173-340 and 173-204 WAC unless otherwise specifically provided herein.

The anticipated schedule for major project milestones and deliverables is outlined below. The final schedule will be determined by Ecology based on project progress and conditions. Documents become final upon written approval by Ecology.

A. Remedial Actions to be Performed

1. Preparation of a Remedial Investigation/Feasibility Study Work Plan.

The Port shall develop an RI/FS Work Plan (including draft, draft final (if necessary), and final versions) that includes a scope of work to delineate and quantify (i.e., identify the levels of contamination) the potential contaminants in all media (i.e., soil, groundwater, surface water, and adjacent marine sediments). The Work Plan shall also address the proper handling of all wastes generated from the Site during the RI/FS (e.g., soil cuttings, groundwater development and purge water, excess sediment sample material, free-product, etc.). Note that all draft documents for Ecology review may be submitted in redline strike-out format (preferably in Microsoft® WORD format) to facilitate the review. The RI/FS Work Plan shall meet the requirements of WAC 173-340-350 for upland areas and WAC 173-240-550 for in-water areas. The RI/FS Work Plan shall also evaluate whether an Interim Action is appropriate for the Site, following the requirements of WAC 173-340-430. An Interim Action may be identified and implemented at any point during

the RI/FS process, subject to the procedures in Section VI(E) and Section VII(H) of the Agreed Order.

a. Investigation of Site Background and Setting

This section of the RI/FS Work Plan shall include descriptions of the following, detailed as information is available:

- (i) The property and site operational/industrial history (including current and previous ownership).
- (ii) Historical sources and releases of contamination to upland and in-water areas (include a review of historical photos, Sanborn Maps, and available information on Site fill).
- (iii) Current site conditions (including descriptions and mapping of surface features, stormwater features, topography, geology, soil and the vadose zone, surface water hydrology, hydrogeology, meteorology, and bathymetry of in-water areas including mean higher high water and mean lower low water contours).
- (iv) Current and future land and water use, including both human and ecological uses and services.
- (v) The terrestrial/aquatic ecological setting including a description of onsite and surrounding habitat types and conditions, ecological receptors, and potentially threatened/endangered species.

b. Previous Investigations

A summary of environmental investigations performed to date, including media sampled and types of analyses performed, both upland and in-water, shall be included in

the RI/FS Work Plan. In addition, this section should identify any data gaps that need to be filled to fully define the nature and extent of contamination/toxicity associated with all media of concern at the Site.

c. Development of Preliminary Conceptual Site Model (CSM)

The CSM should describe general release mechanisms from the potential primary sources of hazardous substances to secondary and tertiary sources, the exposure media and routes, and potential receptors, both human and ecological, upland and offshore. The CSM should reflect historical and current conditions as well as potential future development in assessing exposure pathways. In accordance with WAC 173-340-720(2), rationale should be included to substantiate that groundwater at the Site cannot be used, or has an extremely low probability to be used, for potable purposes (i.e. as viable drinking water aquifer).

d. Establishment of Screening Levels

Identify appropriate screening levels consistent with the exposure pathways and receptors (both human and ecological) identified in the CSM per WAC 173-340-700 through 173-340-760 and WAC 173-204-560. Note that the screening levels must consider all applicable pathways including direct contact (including inhalation); media transfer pathways (e.g. leaching to groundwater, groundwater migration to surface water, and sediment, etc.); and exposure by terrestrial and/or aquatic ecological and human receptors.

Sediment screening levels shall include both the chemical and biological standards of Chapter 173-204 WAC, and should take into account the presence of contaminants of concern identified in the CSM. Bioaccumulative pathways to higher trophic levels and human receptors must be considered, along with potential toxicity due to deleterious substances without chemical cleanup standards under SMS.

e. Evaluation of Existing Data and Identification of Preliminary Hazardous Substances

The existing analytical data should be plotted as accurately as possible on a base map using geo-referencing techniques to depict identified sources and areas where suspected releases have occurred. Review the prior sample locations with respect to identified sources and areas where suspected releases (e.g. outfalls, spills, dumping, leaks, etc.) have occurred. All of the existing analytical data collected at the Site should be evaluated in terms of data usability (analytical methods used to evaluate the effectiveness of a cleanup action shall comply with the requirements in WAC 173-340-830) and be screened against the screening levels identified based on the conceptual site model (CSM) for the Site (*see* Sections A.1.c and A.1.d above). Both non-detect and detected data should be included in the screening.

Identify sampling points containing exceedances on a map, and discuss the adequacy of the reporting limits (i.e., Method Detection and Practical Quantification Limits) in terms of achieving the Site screening levels. Constituents exceeding the screening levels should be identified as preliminary indicator hazardous substances. Additionally, where no existing and or valid data is available, preliminary indicator hazardous substances will be identified based on historical site use.

f. RI Study Approach

This section of the RI/FS Work Plan shall provide an overview of the methods that will be used in conducting the RI for the Site. Based on the background information gathered and the evaluation of existing data, discuss by medium (e.g. soil, sediment, surface water, etc.) the data required to complete an RI for the Site. The RI approach shall be consistent with WAC 173-340-350 and WAC 173-204-550.

Identify data gaps and the overall approach for conducting the RI. The Sampling Analysis Plan (SAPs) (*see* Section A.1.h below) will provide the details on numbers and locations of samples for each medium and associated analytical or toxicity testing requirements. The RI field investigation will be designed to identify the full nature and extent of contaminants and toxic and bioaccumulative effects in upland and in-water areas.

The Port shall provide Ecology with the results of the field investigation in the form of a Data Report Technical Memorandum so that a determination can be made with regard to whether additional investigation is required to define the full nature and extent of contamination. The information provided to Ecology should describe the analytical results of the field activities including the identification of indicator hazardous substances, the affected media, preliminary cleanup levels, the extent of contamination (plotted on maps), and any data gaps that need to be filled to define the nature and extent of contamination, impacts to site habitat, and toxic/bioaccumulative effects. Note that the preliminary cleanup levels may be different than the screening levels used in the RI/FS Work Plan based on a better understanding of the CSM (e.g., contaminants in soil may not be impacting Site groundwater) for the Site. Additional field investigation (if necessary, based on initial results) will be conducted to further define the nature and extent of contamination and toxic/bioaccumulative effects based on findings during the initial investigation.

g. FS Approach

This section of the RI/FS Work Plan shall provide an overview of the methods that will be used in conducting the FS for the Site. The FS approach shall be consistent with WAC 173-340-350 and WAC 173-204-550 and should consist of the following sections:

- (i) **Establishment of Cleanup Levels, Points of Compliance, and Remediation Levels.**

The Port will work with Ecology to develop indicator hazardous substances, cleanup levels and points of compliance consistent with Model Toxics Control Act (MTCA) and Sediment Management Standards (SMS) regulations. The Port may also consider establishing potential remediation levels as defined per WAC 173-340-355. Cleanup levels, site boundaries, and site units for aquatic areas should be established in accordance with WAC 173-204-560 and -570.

(ii) Applicable or Relevant and Appropriate Requirements.

The FS should identify all applicable federal, state, and local requirements, including requirements to obtain necessary permits, to comply with applicable laws, except as provided in RCW 70.105D.090. The FS should also include information on actions to be taken to meet these requirements.

(iii) Delineation of Media Requiring Remedial Action.

Based on the results of the RI, determine areas and/or volumes of affected media to which remedial action objectives might be applied.

(iv) Development of Remedial Action Objectives.

Remedial action objectives are established on the basis of extent and magnitude of the contamination, the resources that are currently and potentially threatened, and the potential for human and ecological (both terrestrial and aquatic) exposures at the Site. The Remedial Action Objectives should provide general descriptions of what the Site cleanup is designed to accomplish. The FS approach section must clearly define a

basis and rationale for Remedial Action Objectives for each medium at the Site.

(v) Screening and Evaluation of Cleanup Action Alternatives.

A reasonable number and type of cleanup action alternatives should be evaluated, taking into account the characteristics and complexity of the Site, including current site conditions and physical constraints. Evaluation of cleanup action alternatives and the selection of a preferred cleanup alternative must meet the requirements of WAC 173-340-360, WAC 173-204-550, WAC 173-204-560 and WAC 173-204-570. A detailed evaluation of the following criteria should be included in the RI/FS report for each cleanup alternative:

- Compliance with cleanup standards and applicable laws
- Protection of human health
- Protection of the environment
- Provision for a reasonable restoration time frame
- Use of permanent solutions to the maximum extent practicable
- The degree to which recycling, reuse, and waste minimization are employed
- Potential habitat restoration (should sediment contamination be identified)

Short-term effectiveness

- Long-term effectiveness (Must include a recontamination evaluation)
- Net environmental benefit
- Implementability

- Provision for compliance monitoring
- Cost-effectiveness
- Prospective community acceptance

The remedial alternative that is judged to best satisfy the evaluation criteria will be identified. Justification for the selection will be provided, and the recommended remedial alternative further developed, in the RI/FS report.

h. Development of a Site-Specific Health and Safety Plan and

Sampling and Analysis Plan

The RI/FS Work Plan shall include a site-specific Health and Safety Plan (HSP), describing worker safety during the project will be developed in accordance with WAC 173-340-810, as well as a site-specific Sampling and Analysis Plan (SAP), which includes quality assurance/quality control requirements. An upland SAP and a sediment SAP, consistent with WAC 173-340-350(7)(c)(iv), shall be submitted to Ecology for review and approval prior to any sampling being conducted. The SAP should be based on the type, quality, and quantity of data necessary to support selection of a cleanup action. The SAP should provide the details on numbers and locations of samples for each media and the analytical requirements. The SAP shall conform to the requirements specified in WAC 173-340-820. Sediment sampling is also required under the Sediment Management Standards (SMS; Chapter 173-204 WAC) to fully investigate the nature and extent of potential marine sediment contamination released at the Site. In addition, any sampling of the marine sediments must be done in accordance with the SMS and the "Sediment Sampling and Analysis Plan Appendix," Ecology Publication No. 03-09-043.

i. Public Involvement

This section shall present the general process for public involvement (in accordance with WAC 173-340-600). See 'Section F. Public Participation' of the Order.

j. Project Management

This section shall discuss project staffing and coordination associated with the RI/FS activities for the Site. The organizational structure and responsibilities are designed to provide project control and quality assurance for the duration of the project.

k. Schedule & Reporting

This section should contain the schedule and reporting requirements for the RI/FS Work Plan as defined in this Agreed Order.

2. Data Report Technical Memorandum.

The Port shall provide Ecology with the results of the field investigation in the form of a Data Report Technical Memorandum so that a determination can be made with regard to whether additional investigation is required to fully define the nature and extent of contamination. The information provided to Ecology should describe the analytical results of the field activities, the affected media, the extent of contamination (plotted on maps and screened against preliminary cleanup levels (if appropriate), and identification of data gaps that need to be filled to complete the RI/FS with respect to the nature and extent of contamination and toxic/bioaccumulative effects.

3. Prepare Draft RI/FS Report.

A draft, draft final (if necessary), and final RI/FS report meeting the requirements of WAC 173-340-350, WAC 173-340-560, WAC 173-204-550 and WAC 173-204-560 shall be prepared and submitted to Ecology for review and approval. The RI/FS report

shall contain the results of the RI and will provide information regarding the full extent and magnitude of soil, groundwater, surface water, and/or adjacent marine sediment contamination including toxic and bioaccumulative effects. The FS portion of the report will present and evaluate cleanup action alternatives to address the identified contamination at the Site. Based on the evaluation of alternatives (WAC 173-340-350(8) and WAC 173-204-570), the FS will identify a preferred cleanup action alternative for the Site in compliance with WAC 173-340-360 and WAC 173-204-560.

4. Develop a Draft Cleanup Action Plan (CAP).

Upon Ecology approval of the RI/FS report, the Port shall prepare a draft and draft final CAP in accordance with WAC 173-340-380 and WAC 173-204-570. The draft CAP shall address the proposed cleanup action alternatives for the remediation of all impacted media in the upland and in-water portions of the Site, respectively, based on the results of the RI/FS. The draft CAP shall include a general description of the proposed cleanup actions along with the following sections:

- A general description of the proposed cleanup action and the rationale for selection, including results of any remedial technology pilot studies, if necessary.
- A summary of the other alternatives evaluated in the RI/FS.
- Identification and summary of the applicable local, state, and federal laws pertinent to the proposed cleanup.
- Identification of Cleanup standards and the points of compliance along with a rationale regarding their selection for each hazardous substance and for each medium of concern at the Site based on the results of the RI/FS.
- Descriptions of any institutional/engineering controls, if proposed.
- A preliminary schedule for implementation of field construction work and subsequent maintenance and monitoring.

B. Schedule

The Port shall perform the actions required by this Order according to the schedule below. The Port shall address Ecology comments on all deliverables through written responses. When Ecology provides comments in red-line strikeout format (i.e., comments made directly within the electronic version of the document), the Port may respond to those comments directly within the same electronic document. Ecology will strive to review documents within 45 calendar days of receipt from the Port. If Ecology determines additional time for review is necessary, it will attempt to notify the Port within 10 calendar days of the close of the 45 day deadline.

1. Project Schedule

RI/FS Work Plan
The Draft RI/FS Work Plan shall be submitted to Ecology within 120 calendar days of the effective date of this order.
The Final RI/FS Work Plan shall be submitted to Ecology within 90 calendar days of the receipt of Ecology's comments on the draft RI/FS Work Plan or the draft final RI/FS Work Plan (if it became necessary to produce). The Port shall confer with Ecology about its comments and the Port shall incorporate all of Ecology's final comments into the Final RI/FS Work Plan.
The total time for Ecology review of the RI/FS Work Plan is no more than 90 calendar days, unless Ecology determines that additional review time is necessary. Ecology will attempt to review and provide comments on the draft within 45 calendar days. Ecology will attempt to review and approve the final within 45 calendar days.
Field RI
Field RI activities shall be commenced within 60 calendar days of Ecology approval of the Final RI/FS work plan. It is recognized that sediment sampling will require a Corps permit and conditions of the permit will require sampling to be completed within the in-water work window that may fall outside of the specified 60 day period. Separate mobilizations and field schedules may be required to complete the Site investigation as approved by Ecology.
Data Report Technical Memorandum The field RI results shall be provided to Ecology 60 calendar days after the validation of all RI/FS analytical data.
Additional field RI activities (if needed) Additional field RI activities may be required to adequately delineate the nature and extent of contamination at the Site, and/or to conduct pilot testing of a remedial alternative. The scope, schedule, and submittal requirements for additional field RI activities shall be developed by the Port, and shall be submitted to Ecology for review and concurrence within 60 calendar days of Ecology's determination that the Data Report Technical Memorandum warrants additional RI activities.
RI/FS Report
The Draft RI/FS Report shall be submitted within 180 calendar days of Ecology approval of the Final RI/FS Work Plan. If Ecology review of the Data Report Technical Memorandum finds that significant data gaps have not been filled, at Ecology's discretion, the date of the Draft RI/FS Report submittal may be extended.
The Final RI/FS Report shall be submitted to Ecology within 45 calendar days from receipt of Ecology comments on the Draft RI/FS Report or draft final RI/FS Report (if it became necessary to produce) . The final RI/FS report will undergo a 30-

day public comment period. Ecology will complete a responsiveness summary to public comment on the final RI/FS Report before approving the document.
The total time for Ecology review of the RI Report is no more than 90 days, unless Ecology determines that additional review time is necessary. Ecology will attempt to review and provide comments on the draft within 45 calendar days. Ecology will attempt to review and approve the final within 45 calendar days.
Draft Cleanup Action Plan
The preliminary Draft Cleanup Action Plan shall be submitted within 120 calendar days after the RI/FS report is finalized.
The Final Draft Cleanup Action Plan shall be submitted within 60 calendar days from the date of issuance of Ecology comments to the preliminary Draft Cleanup Action Plan. The Final Draft Cleanup Action Plan will then undergo a 30-day public comment review period.
The total time for Ecology review of the Draft CAP is no more than 90 days, unless Ecology determines that additional review time is necessary. Ecology will attempt to review and provide comments on the draft within 45 calendar days. Ecology will attempt to review and approve the final within 45 calendar days.

2. Environmental Data Submittals

- All sampling data (including any historical data described in 'Section V. Findings of Fact' in the Agreed Order that is used in the RI for decision purposes) shall be submitted to Ecology in both printed (e.g. summarized in report tables) and electronic formats in accordance with Ecology's Toxics Cleanup Program Policy 840 (Data Submittal Requirements) and/or any subsequent procedures specified by Ecology for data submittal.
- Historical data that is used in the RI/FS Work Plan and/or RI/FS Report, to the extent available and determined to be suitable for cleanup action decision-making, shall be supplied to Ecology in electronic format (i.e. EIM) as part of the first draft RI/FS Work Plan deliverable.
- New data collected as part of the initial or first phase of the RI/FS, shall be supplied to Ecology in electronic format (i.e. EIM) 60 calendar days after the new data has been validated. Data collected as part of additional RI/FS activities shall also be supplied to Ecology in electronic format (i.e. EIM) 60 calendar days after the data has been validated.

Based on the work schedule presented above, the Port shall develop an overall cleanup schedule for the site starting from the RI/FS Work Plan to final cleanup construction and long-term compliance monitoring. The Port shall provide Ecology with an updated cleanup schedule when events are identified that may result in significant project schedule changes, or at a minimum, on April 1st and October 1st. It is important that Ecology maintains updated cleanup schedules for project planning, and for periodically updating the public, tribes, and resources/permitting agencies.

C. Progress Reports

The Port shall submit to Ecology a progress report the first week of each month addressing the progress of RI/FS work during periods of field activity until such time as the Port has completed the work required in the RI/FS Work Plan. For the remaining time period, the Port shall submit to Ecology a quarterly report due the first week of the first month per quarter. The progress report shall include work completed to date, problems encountered and how they were resolved, any supporting documentation, and work scheduled for the subsequent time period. Electronic submittals of progress reports are acceptable.

EXHIBIT – C

QUIET COVE SITE
FOCUSED SITE INVESTIGATION RESULTS

**Focused Environmental Site Investigation
Data Report**

Quiet Cove Property
Anacortes, Washington

for
Port of Anacortes

October 20, 2014



GEOENGINEERS 
Soil Science & Technology

**Focused Environmental Site Investigation
Data Report**

**Quiet Cove Property
Anacortes, Washington**

for
Port of Anacortes

October 20, 2014

GEOENGINEERS 

**Plaza 600 Building
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**Focused Environmental Site Investigation
Data Report**

**Quiet Cove Property
Anacortes, Washington**

File No. 5147-024-01

October 20, 2014

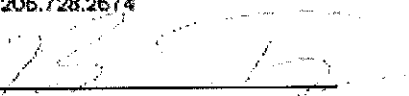
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GEOENGINEERS 

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1.0 INTRODUCTION

The Port of Anacortes (Port) received an Integrated Planning Grant (IPG) from Washington State Department of Ecology (Ecology) to support planning for cleaning up the site and redevelopment of the Quiet Cove Property (Site) for commercial and/or industrial use. A focused environmental investigation of the Site was conducted by the Port as part of the Integrated Planning Grant.

This Focused Environmental Site Investigation Data Report has been prepared for the Quiet Cove property on behalf of the Port. The purpose of this focused site investigation is to complete a cursory, planning-level environmental evaluation of the Site to identify potential environmental issues that need to be addressed as part of the property redevelopment. This report summarizes the results of soil and groundwater sampling and analysis activities that were completed at the Site and characterizes the nature and extent of the hazardous substance contamination.

1.1 Focused Site Investigation Objectives

The primary objective of the focused environmental investigation is to complete a planning-level study of the Site in support of the potential cleanup and redevelopment of the Site under the IPG. The focused environmental investigation sampling and analysis data serves as a basis to determine if soil or groundwater contamination resulting from historical uses of the property is present. Specific objectives for the focused site investigation include:

- Review results of historical site plans and environmental investigations adjacent to the property that were obtained during the Site study to focus the field sampling on areas with the greatest potential for contamination.
- Collect soil and groundwater field and analytical data to determine the presences and extent of contamination at the Site that is the result of historical site uses.

2.0 BACKGROUND

This section describes the physical description and characteristics of the Site and summarizes the Site history including previous investigations completed adjacent to the Site.

2.1 Site Description

The Quiet Cove property is located at 202 O Avenue (Figure 1) and is part of the Port's plans to expand and improve the Curtis Wharf International Shipping Terminal. The Site is currently used as a storage yard for boats, recreational vehicles and other items and contains several buildings. The majority of the ground surface of the Site is paved.

2.2 Site History

Historical maps and aerial photos were reviewed to determine previous uses of the Site. The October 1925 Sandborn Map shows the northern portion of the Site was operated by the Standard Oil Company. The Port also received a copy of Standard Oil Company Site plans dated May 31, 1921. Figure 2 provides the approximate location of historical structures on and adjacent to the Site. From about the early 1920s until at least 1971 (the date when fuel operations ceased is unknown) the Site

was used as a bulk fuel storage facility. Five steel oil tanks of unknown capacity and an oil pump house were located in the northeast portion of the Site. Historical structures located in the northwest portion of the Site included a filling shed, an office and oil warehouse, an oil staging area and an "autos" shed. The southern portion of the Site was primarily vacant as indicated by the October 1925 Sanborn Map and 1921 Site Plan. A former railroad track and a structure used for coal storage were located west of the Site in the vicinity of the adjacent property currently owned by the Port. The property located to the southwest of the Site is currently owned by Texaco/Reisner and was used as a bulk fuel facility in 1925, consistent with its current use. An aerial photo from 1971 generally confirms the historic structures located on the Site as indicated by the October 1925 Sanborn Map, but the coal shed located west of the Site was not present in 1971.

2.3. Previous Investigations and Cleanup Adjacent to the Property

Previous investigations have not been conducted for the Quiet Cove property, but the City of Anacortes provided documents to the Port for investigations that were conducted adjacent to the Site. Summaries of these investigations and results are summarized below.

2.3.1. Results of Soil and Groundwater Sampling, Former Anacortes Terminal, Corner of 3rd Street and N-Avenue (May 26, 2000)

ThermoReteo completed a soil and groundwater investigation to characterize the type and extent of petroleum contamination located within the N-Avenue right-of-way directly adjacent to the Quiet Cove property to the west. The study was completed because the City of Anacortes was developing a public beach access and parking area. The investigation methods and results included:

- Soil samples were collected using geoprobe drilling methods at six locations (see Figure 3). Soil was field screened and selected samples were collected for chemical analysis of petroleum hydrocarbons. Soil analytical results showed detections of petroleum hydrocarbons at locations B1, B2, B3, B4 and B5 ranging from 4 to 8 feet below ground surface.
- Groundwater was collected from temporary well screen at three of the soil boring locations (B1, B2 and B3) and analyzed for petroleum hydrocarbons (see Figure 3). Analytical results found detections of petroleum hydrocarbons in each groundwater sample.
- Shallow soil samples were collected using hand auger at 13 locations in the beach area (see Figure 3). Samples were field screened and selected samples were collected for chemical analysis of petroleum hydrocarbons. Analytical results found detected concentrations of petroleum hydrocarbons at locations HA-1, HA-2, HA-11 and HA-12.

2.3.2. Removal of Contaminated Soils From the N-Avenue Right-of-Way, Reisner Petroleum Terminal, Corner of 3rd Street and N-Avenue (May 16, 2001)

Cleanup activities were completed in March 2001 to remove contaminated soil and underground petroleum piping originating from the Reisner Property within the N-Avenue right-of-way. Figure 3 shows the approximate locations and extent of excavation and piping removal. Petroleum piping filled with diesel and kerosene (in separate lines) were capped and removed. Extensive corrosion of the piping was noted during piping removal. Petroleum hydrocarbon contamination was also noted in portions of the piping trench. Contaminated soils from the trench were stockpiled and transported for off-site treatment and disposal. After the piping was removed a total of approximately 580 tons of petroleum contaminated soil was excavated and transported for thermal treatment and disposal. During excavation a 4-inch

diameter metal pipeline was encountered that ran parallel to the shoreline of the Guemes Channel and extended into the Port of Anacortes property. The metal line was maintained in place during excavation because the ownership and location of the pipe could not be verified. During excavation activities approximately 1,500 gallons of water were removed from the excavation, placed in a temporary storage tank and transported for treatment and disposal. Clean backfill material was placed and compacted to construct the parking area for the N-Avenue beach area.

Confirmation samples were collected and analyzed from the sidewalls and bottom of the excavation and results confirmed that petroleum contamination was removed from the excavation bottom and from the south, east and west sidewalls.

2.4. Geology and Hydrogeology

The United States Geological Survey (USGS) map of the Bellingham Quadrangle (Lapen, 2000) was reviewed for geologic information in the vicinity of the Site. Mapped soils in the vicinity of the property include both glacial and non-glacial processes that have occurred during the last 12,000 years. Surface soil deposits are identified as artificial fill and recessional marine (glaciomarine) drift from the Everson interstade of the Fraser glaciation.

Based on previous environmental investigations at nearby locations and this Focused Site Investigation, soil at the Site consists of fill material overlying glaciomarine deposits. Fill deposits consist primarily of fine to coarse sand with gravel and varying silt content. The underlying glaciomarine deposits consist primarily of unsorted, unstratified silt and clay with varying amounts of sands and gravels. The inferred groundwater flow is to the northwest and may be locally affected by tidal intrusion of salt water from Guemes Channel.

3.0 FIELD AND ANALYTICAL METHODS

A focused environmental site investigation was completed to determine the presence of petroleum contamination at the Quiet Cove Property. Soil and groundwater was field screened, sampled and submitted for laboratory analysis consistent with the Focused Site Investigation Plan (GeoEngineers, 2014). The following sections summarize the field activities completed and analytical methods used for the focused site investigation.

3.1. Soil Sampling

A direct-push soil investigation was completed to identify potentially contaminated soil at the Site. Continuous soil cores were obtained from direct-push borings using 2.0- to 2.5-inch diameter sampling rods with acetate liners. The drilling rods were driven with a pneumatic hammer in five foot intervals. Drilling activities were monitored continuously by a technical representative from GeoEngineers who observed and classified the soil encountered and prepare a detailed boring log. Soil samples obtained from the borings were visually classified in general accordance with American Society of Testing and Materials (ASTM) D-2488. The samples also were evaluated for the potential presence of hydrocarbon- and volatile organic compound (VOC) contamination using field screening techniques that include water shleen tests and photoionization (PID) measurements. Observations of soil and groundwater conditions and soil field screening results for each exploration were recorded and documented in field boring logs.

Soil samples were submitted to OnSite Environmental Inc. (OnSite), an Ecology-certified laboratory, for analysis of selected contaminants. In general, three sample intervals were collected at each soil boring location for potential chemical analyses including:

- Sample collected from the fill layer above the water table;
- Sample collected at the water table; and
- Sample collected from native soil at fill/native interface.

In general, samples were collected in 1-foot or 2-foot intervals to provide sufficient material for chemical analysis.

3.2. Monitoring Well Installation and Development

Drilling and construction of the monitoring wells was completed by a Washington State licensed driller in accordance with the Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 WAC). Installation of the monitoring wells was observed by a GeoEngineers representative who maintained a detailed log of the materials and depths of the wells. Monitoring well borings were completed using a hollow-stem auger drilling rig. Documentation of soil lithology and construction of the monitoring wells was documented in boring logs. Upon completion, each monitoring well was surveyed to obtain the elevation of the top of well casing to determine groundwater elevation. Prior to sampling, each monitoring well was developed to remove water introduced into the well during drilling (if any), stabilize the filter pack and formation materials surrounding the well screen and restore the hydraulic connection between the well screen and the surrounding soil.

3.3. Groundwater Sampling

Groundwater samples were obtained using low-flow/low-turbidity sampling techniques to minimize the suspension of sediment in the samples. Groundwater samples were collected from monitoring wells using a peristaltic pump and disposable polyethylene tubing. Groundwater was pumped at approximately 0.5 liter per minute using a peristaltic pump attached to tubing placed within the screened interval. A Horiba U-22 water quality measuring system with a flow-through-cell was used to monitor the following water quality parameters during purging: electrical conductivity, dissolved oxygen, pH, salinity, total dissolved solids, turbidity, oxidation-reduction potential and temperature. Purging was complete when ambient groundwater conditions varied by less than 10 percent on three consecutive measurements. The stabilized field measurements were documented in the field log. Following well purging, the flow through cell was disconnected and groundwater samples were collected in laboratory-prepared containers. The samples were placed into a cooler with ice and logged on the chain-of-custody using the procedures described in the Quality Assurance Project Plan (QAPP) included as an appendix to the Focused Site Investigation Plan.

4.0 SCREENING LEVELS

Soil and groundwater data collected during the site characterization were evaluated against soil and groundwater screening levels to delineate the extent of detected contamination.

4.1. Soil Screening Levels

For the purposes of this planning-level Focused Site Investigation, soil screening levels will be conservatively based on unrestricted land use. The soil screening levels were selected from Model Toxics Control Act (MTCOA) Method A and Method B Soil Cleanup Levels (WAC 173-340-704 and -705). In general the lowest applicable soil criteria were identified as the screening level for comparison to soil analytical results.

4.2. Groundwater Screening Levels

Groundwater at the Site is not used for drinking water at this time and is not a reasonable future source of drinking water due to its proximity to marine waters and likely brackish nature. MTCOA Method A Groundwater Cleanup Levels were identified as the screening levels for comparison to groundwater analytical results.

5.0 FOCUSED SOIL AND GROUNDWATER INVESTIGATION RESULTS

5.1. Focused Soil Investigation Results

5.1.1. Soil Field Screening Results

Subsurface soil conditions were evaluated by completing direct-push borings GEI-1 through GEI-28 between March 31 and April 2, 2014. Borings were completed and sampled utilizing field procedures described in the Focused Site Investigation Plan dated February 24, 2014. Subsurface conditions encountered during soil sampling generally consist of fill material ranging from silty sand to coarse sand with gravel overlying marine deposits consisting of silt. Exploration logs are provided in Attachment 1.

Soil sampling cores were screened in the field for evidence of petroleum hydrocarbons and VOCs. Field screening results indicated evidence of petroleum contamination at multiple soil sampling locations throughout the northern part of the investigation area including some locations where petroleum product was observed in subsurface soil. The exploration logs (Attachment 1) provide results of field screening including sheen and headspace vapor testing results. Figure 4 summarizes the results of field screening for each soil boring location.

5.1.2. Soil Chemical Analytical Results

Soil samples were collected consistent with procedures detailed in the Focused Site Investigation Plan (GeoEngineers, 2014) and submitted to OnSite located in Redmond, Washington for analysis of one or more contaminants of potential concern (COPCs). Soil samples were selected for analysis based on field screening results and location relative to potential sources of contamination. A total of 35 soil samples were selected for analysis for one or more COPCs. Gasoline-, diesel-, and heavy oil-range petroleum hydrocarbons and BETX (benzene, ethylbenzene, toluene and xylene) analyses were performed on all 35 soil samples. Three samples with field screening evidence of petroleum contamination were selected for analysis of additional COPCs including carcinogenic polycyclic aromatic hydrocarbons (CPAHs), naphthalenes, halogenated volatile organic compounds (HVOCs), n-hexane, methyl tertiary-butyl ether (MTBE), metals (arsenic, cadmium, chromium, mercury and lead) and polychlorinated biphenyls (PCBs). The objective of these analyses was to determine the general composition of the petroleum contaminated soil in accordance with MTCOA testing requirements for petroleum releases (WAC 173-340-900, Table B30-1). Tables 1 through 4 summarize the chemical analytical results for the soil analyses

completed. Figure 5 summarizes the chemical analytical results for gasoline-, diesel-, and heavy oil-range petroleum hydrocarbons and BETX (benzene, ethylbenzene, toluene and xylene) analyses. Figure 6 summarizes the chemical analytical results for rest of the COPCs. Analytical results are compared to screening levels detailed in the Focused Site Investigation Plan.

Results show evidence of gasoline-, diesel-, and heavy oil-range petroleum hydrocarbons and benzene contamination in soil throughout the northern area of the Site where the former fuel facility and petroleum storage tanks were located and to the north and west of the former tank farm facility. Ethylbenzene, toluene and xylene were detected at concentrations greater than the screening level in one of 35 samples analyzed. Carcinogenic PAHs (cPAHs) and naphthalene exceeded the screening level in all of the three samples that were analyzed and cadmium exceeded screening levels in one of three samples analyzed. All other analytes were either not detected or detected at concentrations less than their associated screening levels in soil samples submitted for chemical analysis. Laboratory method reporting limits (MRLs) for all analytes were below the associated screening levels with the exception of HVOCs 1,2-dibromoethane (EDB), methylene chloride, tetrachloroethene, and trichloroethene.

Laboratory analytical results are presented in Attachment 2 and a Data Validation Report is included in Attachment 3.

5.1.3. Deviations from Focused Site Investigation Plan for Soil Investigation

The Focused Site Investigation Plan identified Tier 1 and Tier 2 soil sampling locations to provide an approach for determining soil samples for analysis. Based on the results of field screening, deviations were made from the Focused Site Investigation Plan to maximize the use of the data collected during the soil investigation for the purposes of the Integrated Planning Grant. Deviations from the Focused Site Investigation Plan include the following:

- Four (4) additional soil borings were completed (GEI-25 through -28) in 2nd Street right-of-way to improve characterization of the extent of contamination to the north of the Site. GEI-25, GEI-27 and GEI-28 were analyzed for petroleum hydrocarbons and GEI-25 was analyzed for the additional contaminants of potential concern.
- Analysis of soil samples was modified based on results of field screening to delineate the lateral extent of petroleum contamination at the Site. Deviations to the analysis of soil samples include:
 - Representative samples were selected for analysis at locations within the highly contaminated area based on field screening (i.e. locations where product was observed). Tier 1 locations GEI-8, GEI-7 and GEI-15 were not analyzed, but Tier 2 location GEI-10 was analyzed.
 - Tier 2 locations located on the edge of the contaminated area based on field screening were selected for analysis to define the extent of contamination including locations GEI-1, GEI-3, GEI-18, GEI-20 and GEI-21.
 - Tier 1 and Tier 2 locations in the southern portion of the Site that did not show any evidence of contamination were not analyzed including Tier 1 location GEI-24.

5.2. Focused Groundwater Investigation Results

5.2.1. Monitoring Well Installation and Development

The monitoring well locations were determined after review of the soil analytical results and were approved by Ecology prior to installation. Five monitoring wells (MW-1 through MW-5) were installed on June 23 and 24, 2014 in accordance with field procedures described in the Focused Site Investigation Plan. Each monitoring well was developed on June 25 and 26, 2014 prior to sampling.

5.2.2. Groundwater Flow Direction

On August 7, 2014 water levels were collected from each monitoring well during low tide to evaluate the groundwater flow direction. Figure 7 provides the groundwater elevations measured at each monitoring well and presents the estimated groundwater flow direction based on the field measurement data. In general groundwater at the Site flows to the northwest towards Guemes Channel. A concrete bulkhead exists at Curtis Wharf to the north of the Site and may be influencing groundwater flow by forcing water to the west and east of the bulkhead towards Guemes Channel or north along O Avenue, respectively.

5.2.3. Groundwater Chemical Analytical Results

Groundwater samples were collected from five monitoring wells (MW-1 through MW-5) on July 1, 2014 consistent with procedures detailed in the Focused Site Investigation Plan (GeoEngineers, 2014) and submitted to OnSite for analysis of one or more COPCs. Consistent with the soil analytical results, gasoline, diesel, and heavy oil-range petroleum hydrocarbons and BETX (benzene, ethylbenzene, toluene and xylene) analyses were performed on groundwater samples collected from each monitoring well. Groundwater samples obtained from an upgradient well (MW-5) and downgradient well (MW-3) were also analyzed for COPCs including cPAHs, naphthalenes, HVOCs, total and dissolved metals (arsenic, cadmium, chromium, mercury and lead) and PCBs. Chemical analytical results for the groundwater analyses completed are tabulated in Tables 5 through 8 and presented on Figure 8. Analytical results are compared to screening levels detailed in the Focused Site Investigation Plan.

Diesel and/or heavy oil-range petroleum hydrocarbons were detected at concentrations greater than the screening level in groundwater samples obtained from each monitoring well. Total and dissolved arsenic were detected in the groundwater sample obtained from the upgradient monitoring well MW-5 at concentrations greater than the screening level. All other analytes were either not detected or detected at concentrations less than their associated screening levels in groundwater samples submitted for chemical analysis. Laboratory MRLs for all analytes were below the associated screening levels with the exception of HVOC 1,2-dibromoethane (EDB).

Laboratory analytical results are presented in Attachment 2 and a Data Validation Report is included in Attachment 3.

6.0 NATURE AND EXTENT OF CONTAMINATION

The results of the Focused Site Investigation indicate that petroleum-related contamination related to historical use exists in soil and groundwater in the northern portion of the Site. Currently the Site is not on Ecology's hazardous sites list, but as required by MTCA, the Port notified Ecology that contaminated media was encountered at the Quiet Cove Site during the Focused Site Investigation.

The Focused Site Investigation did not fully identify the extent of soil or groundwater contamination at the Site and data gaps exist including the extent to which the downgradient marine sediments may be impacted. The soil and groundwater analytical results provide information to describe the general extent of contamination. Additional investigation is likely to be required to fully define the extent of contamination.

Sampling locations and concentration exceedances over screening levels for soil is shown on Figures 5 and 6. Contaminants of potential concern were identified in soil located primarily above the water level (between 4 and 6 feet below the ground surface [bgs]) and in some near surface soil (0 to 2 feet bgs) at concentrations exceeding screening levels for unrestricted land use. Figure 5 shows the approximate extent of petroleum hydrocarbon contamination at the Site. The extent of petroleum contamination in soil to the north of the Site along O Avenue (north of location GEI-25) and along the Guemes Channel shoreline will require additional investigation.

Contaminants of concern in soil based on results of the Focused Site Investigation include:

- Gasoline, diesel and heavy oil-range petroleum hydrocarbons;
- Volatile organic compounds (VOCs) including benzene, toluene, ethylbenzene and xylenes (BETX);
- Polycyclic aromatic hydrocarbons (PAHs) including naphthalenes and total carcinogenic PAHs (CPAHs); and
- Metals including cadmium.

Monitoring well locations and concentration exceedances over MTCA Method A for groundwater is shown in Figure 6. Contaminants of potential concern were identified in groundwater throughout the Site at concentrations exceeding MTCA Method A levels for unrestricted land use and are generally consistent with the soil contamination identified at the Site with the exception of arsenic in the upgradient well. Arsenic was not detected in Site soil thus suggesting that the arsenic detections at the site may be the result of a separate and off-site source. This contamination slightly upgradient of the Site is likely due to tidal influence. Additional investigation will be required to fully define the extent of groundwater contamination at the Site.

Contaminants of concern in groundwater based on the results of the Focused Site Investigation include:

- Diesel and heavy oil-range petroleum hydrocarbons; and
- Arsenic.

The Focused Site Investigation did not include sampling or analysis of the marine sediment located to the west of to the Site. Future investigation will be required to fully define the extent of contamination in the sediment adjacent to the Site.

7.0 LIMITATIONS

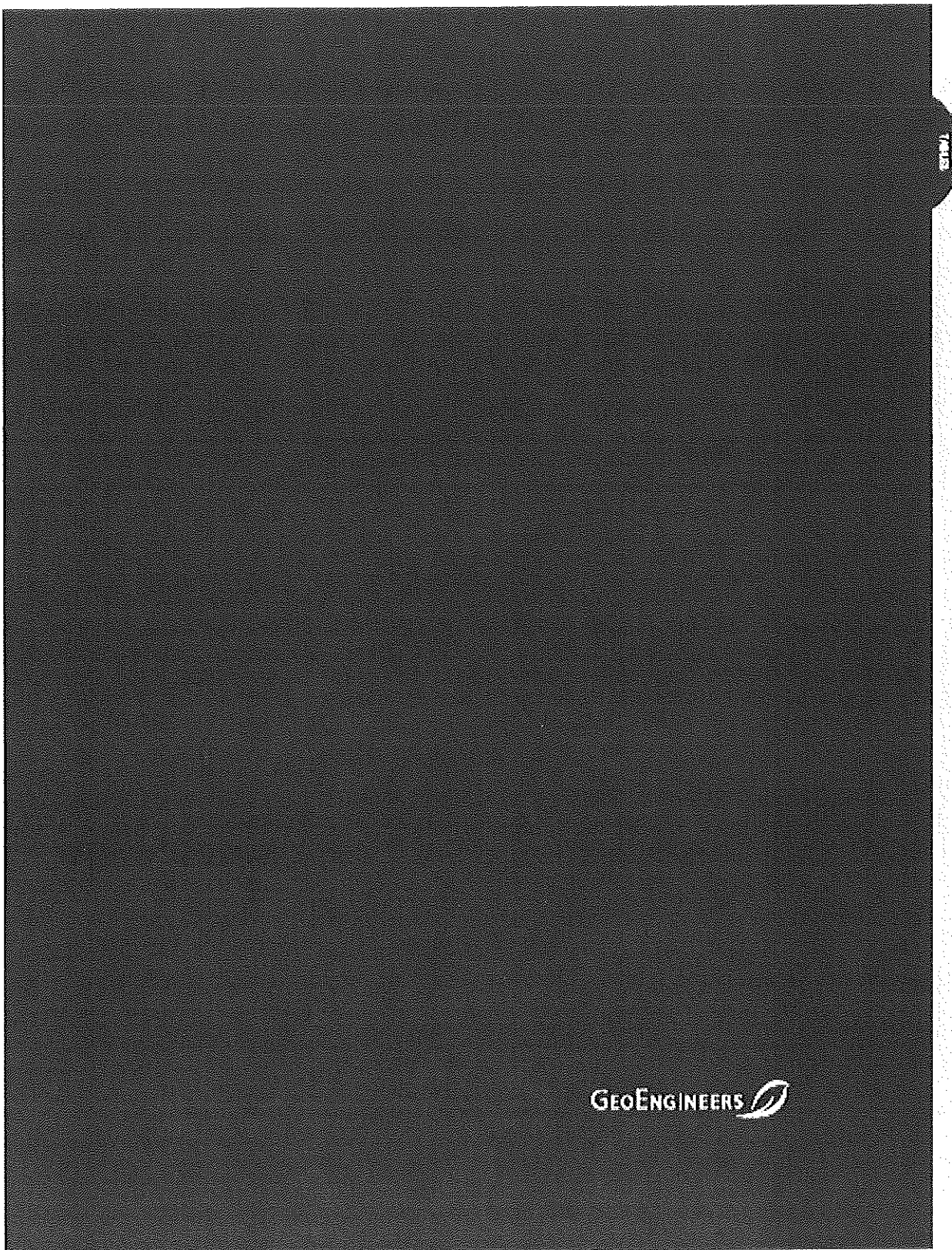
We have prepared this Focused Site Investigation Data Report for the exclusive use of the Port of Anacortes and their authorized agents for the project site. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

8.0 REFERENCES

GeoEngineers. 2014. Focused Site Investigation Plan; Quiet Cove Property; Anacortes, Washington. Prepared for Port of Anacortes. February 6, 2014.

Lapen, Thomas J. 2000. "Geologic Map of the Bellingham 1:100,000 Quadrangle, Washington". Washington State Department of Natural Resources, Division of Geology and Earth Resources. December 2000.



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Table 1
Summary of Soil Chemical Analytical Data - Petroleum Hydrocarbons and VOCs
 Quiet Cove Property
 Anacortes, Washington

Sample Identification	Sample Depth	Sample Date	Field Screening		Petroleum Hydrocarbons ¹ (mg/kg)			VOCs ² (mg/kg)						Methyl Tertiary Butyl Ether (MTBE)
			Shore	Headspace Vapor (ppm)	Immediate Range	Distal Range	Heavy GC Range	Benzene	Toluene	Ethylbenzene	Xylenes	n-Heptane		
GH-1-3-033114	4-6 feet	03/31/14	HS	155	7.4 U	6,800	840	0.02 U	0.074 U	0.24	0.84	-	-	
GH-1-6-033114	8-10 feet	03/31/14	NS	<1	1.8 U	840	67	0.02 U	0.078 U	0.078 U	0.078 U	-	-	
GH-2-1-033114	0-2 feet	03/31/14	NS	<1	5.4 U	48	210	0.055	0.059	0.21	0.51	-	-	
GH-2-3-033114	4-6 feet	03/31/14	HS	255	1.7 U	2,400	440	0.02 U	0.077 U	0.077 U	0.077 U	-	-	
GH-2-6-033114	8-10 feet	03/31/14	NS	53	3.8 U	630	77	0.02 U	0.038 U	0.038 U	0.038 U	-	-	
GH-3-3-033114	8-10 feet	03/31/14	HS	124	1.8 U	780	73	0.02 U	0.078 U	0.30	0.91	-	-	
GH-4-1-040114	0-2 feet	04/01/14	NS	<1	3.3 U	170	1,200	0.02 U	0.033 U	0.033 U	0.033 U	-	-	
GH-4-2-040114	2-3 feet	04/01/14	HS	7	6.9 U	18,000	21,000	0.02 U	0.069 U	0.069 U	0.069 U	0.069 U	0.069 U	
GH-4-3-040114	4-6 feet	04/01/14	NS	<1	9.3 U	730	840	0.02 U	0.093 U	0.093 U	0.093 U	-	-	
GH-5-3-033114	4-6 feet	03/31/14	HS	252	260	1,200	810	0.048	0.11 U	0.24	0.28	-	-	
GH-5-6-033114	8-10 feet	03/31/14	NS	<1	5.3 U	29 U	58 U	0.02 U	0.033 U	0.033 U	0.033 U	-	-	
GH-6-3-040114	6-7 feet	04/01/14	HS	5	5.0 U	30 U	60 U	0.02 U	0.05 U	0.05 U	0.05 U	-	-	
GH-6-6-040114	8-10 feet	04/01/14	NS	<1	4.8 U	29 U	59 U	0.02 U	0.048 U	0.048 U	0.048 U	-	-	
GH-10-1-033114	0-2 feet	03/31/14	NS	<1	3.3 U	1,800	1,600	0.02 U	0.033 U	0.033 U	0.033 U	-	-	
GH-10-3-033114	4-6 feet	03/31/14	HS	123	420	5,800	8,100	0.048	0.083 U	0.21	0.63	0.083 U	0.059 U	
GH-10-6-033114	8-10 feet	03/31/14	NS	<1	8.3 U	780	780	0.02 U	0.083 U	0.083 U	0.083 U	-	-	
GH-12-3-040114	6-7 feet	04/01/14	NS	<1	3.5 U	29 U	58 U	0.02 U	0.035 U	0.035 U	0.035 U	-	-	
GH-12-6-040114	2-3 feet	04/01/14	HS	382	9.4 U	1,900	80	0.023	0.094 U	0.39	0.71	-	-	
GH-13-4-040114	6-8 feet	04/01/14	NS	2	3.7 U	30 U	60 U	0.02 U	0.037 U	0.037 U	0.037 U	-	-	
GH-14-3-040114	4-6 feet	04/01/14	NS	<1	5.2 U	34 U	68 U	0.02 U	0.052 U	0.052 U	0.052 U	-	-	
GH-16-3-033114	4-6 feet	03/31/14	SS	198	160	1,600	440	0.11	0.43 U	0.83	0.58	-	-	
GH-16-6-033114	8-10 feet	03/31/14	NS	<1	5.4 U	30 U	60 U	0.02 U	0.054 U	0.054 U	0.054 U	-	-	
GH-17-3-033114	4-6 feet	03/31/14	HS	>1,000	8,400	18,000	2,000	0.2	18	180	381	-	-	
GH-18-1-033114	0-2 feet	03/31/14	NS	<1	3.2 U	170	1,800	0.02 U	0.032 U	0.032 U	0.032 U	-	-	
Soil Screening Level ³					30/100	2,000	2,000	0.03	1	8	9	4,000 ⁴	0.1	

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 Table 1 (October 20, 2014)

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Sample Identification	Sample Depth	Sample Date	Field Screening		Petroleum Hydrocarbons ¹ (mg/kg)			VOCs ² (mg/kg)					
			Shoe A	Headspace Vapor (ppm)	Gasoline Range	Diesel Range	Heavy Oil Range	Benzene	Toluene	Ethylbenzene	Xylenes	n-Heptane	Methyl Tertiary Butyl Ether (MTBE)
GL18-3-03114	4-6 feet	03/31/14	NS	24	4.0 U	2,300	2,300	0.02 U	0.04 U	0.33	0.23	-	-
GL18-6-03114	8-10 feet	03/31/14	NS	<1	3.8 U	71	61 U	0.02 U	0.038 U	0.038 U	0.038 U	-	-
GL19-1-040114	0-2 feet	04/01/14	NS	<1	4.0 U	29 U	58 U	0.02 U	0.04 U	0.04 U	0.04 U	-	-
GL19-3-040114	4-6 feet	04/01/14	NS	<1	3.8 U	29 U	58 U	0.02 U	0.038 U	0.038 U	0.038 U	-	-
GL20-3-040114	4-6 feet	04/01/14	NS	<1	3.5 U	29 U	59 U	0.02 U	0.039 U	0.039 U	0.039 U	-	-
GL21-3-040114	4-6 feet	04/01/14	NS	<1	5.8 U	29 U	59 U	0.02 U	0.058 U	0.058 U	0.058 U	-	-
GL25-1-040114	0-2 feet	04/01/14	NS	<1	3.3 U	260	1,100	0.02 U	0.033 U	0.033 U	0.042	-	-
GL25-3-040114	4-6 feet	04/01/14	NS	32	3.5 U	4,300	1,200	0.02 U	0.039 U	0.24	0.18	0.074	0.048 U
GL25-6-040114	8-10 feet	04/01/14	NS	<1	1.7 U	78	580	0.033 U	0.17 U	0.17 U	0.17 U	-	-
GL27-3-040214	6-7.5 feet	04/02/14	NS	<1	4.5 U	32 U	84 U	0.02 U	0.049 U	0.049 U	0.049 U	-	-
GL28-4-040214	8-8 feet	04/02/14	NS	<1	4.0 U	29 U	58 U	0.02 U	0.04 U	0.04 U	0.04 U	-	-
Soil Screening Level ³					30/100	2,000	2,000	0.03	?	6	9	4,900 ⁴	0.1

Notes:

¹ Analyzed using Institute of Petroleum Hydrocarbon (IPI) Method 8240/8260.² Analyzed using Environmental Protection Agency (EPA) Method 8260/8260C.³ Model Toxic Control Act (MTEA) Method A Cleanup Level for unsaturated and low.⁴ Screening level for n-Heptane is the MTEA Method B Cleanup Level for non-halogenated compounds.⁵ Screening level for EDC is the MTEA Method B Cleanup Level for carcinogenic compounds.

NS = Not Screened

mg/kg = milligrams per kilogram

NI = Not In

SS = Not Screened

U = Not Detected Above the Laboratory Reporting Limit

VOCs = Volatile Organic Compounds

BTEX = Benzene, Toluene, Ethylbenzene, Xylenes

Green shading indicates that the compound was detected at a concentration greater than the screening level.

Table 2
Summary of Soil Chemical Analytical Data - HVOCs¹
 Quiet Cove Property
 Anacortes, Washington

HVOCs (µg/kg)	Screening Level ²	Sample ID, Depth and Date		
		GEI-4-2-040114	GEI-10-3-033114	GEI-25-3-040114
		2-3 feet	4-6 feet	4-6 feet
		04/01/14	03/31/14	04/01/14
1,1,1,2-Tetrachloroethane	NE	65 U	45 U	37 U
1,1,1-Trichloroethane	2000	65 U	45 U	37 U
1,1,2,2-Tetrachloroethane	NE	65 U	45 U	37 U
1,1,2-Trichloroethane	NE	65 U	45 U	37 U
1,1-Dichloroethane	NE	65 U	45 U	37 U
1,1-Dichloroethene	NE	65 U	45 U	37 U
1,1-Dichloropropane	NE	65 U	45 U	37 U
1,2,3-Trichlorobenzene	NE	65 U	45 U	37 U
1,2,3-Trichloropropane	NE	65 U	45 U	37 U
1,2,4-Trichlorobenzene	NE	65 U	45 U	37 U
1,2-Dibromo-3-Chloropropane	NE	330 U	230 U	190 U
1,2-dibromoethane (EDB)	5	65 U	45 U	37 U
1,2-Dichlorobenzene (o-Dichlorobenzene)	NE	65 U	45 U	37 U
1,2-Dichloroethane (EDC)	NE	65 U	45 U	37 U
1,2-Dichloropropane	NE	65 U	45 U	37 U
1,3-Dichlorobenzene (m-Dichlorobenzene)	NE	65 U	45 U	37 U
1,3-Dichloropropane	NE	65 U	45 U	37 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	NE	65 U	45 U	37 U
2,2-Dichloropropane	NE	65 U	45 U	37 U
2-Chloroethyl vinyl ether	NE	520 U	360 U	290 U
2-Chlorotoluene	NE	65 U	45 U	37 U
4-Chlorotoluene	NE	65 U	45 U	37 U
Bromobenzene	NE	65 U	45 U	37 U
Bromochloromethane	NE	65 U	45 U	37 U
Bromodichloromethane	NE	65 U	45 U	37 U
Bromoform (Trichloromethane)	NE	65 U	45 U	37 U
Bromomethane	NE	65 U	45 U	37 U
Carbon Tetrachloride	NE	65 U	45 U	37 U
Chlorobenzene	NE	65 U	45 U	37 U
Chloroethane	NE	330 U	230 U	190 U
Chloroform	NE	65 U	45 U	37 U
Chloromethane	NE	420 U	290 U	240 U
cis-1,2-Dichloroethene	NE	65 U	45 U	37 U
cis-1,3-Dichloropropane	NE	65 U	45 U	37 U
Dibromochloromethane	NE	65 U	45 U	37 U
Dibromomethane	NE	65 U	45 U	37 U
Dichlorodifluoromethane (CFC 12)	NE	65 U	45 U	37 U
Methyl iodide (iodomethane)	NE	330 U	230 U	190 U
Methylene Chloride	20	330 U	230 U	190 U
Tetrachloroethane	50	65 U	45 U	37 U

HVOs (µg/Kg)	Screening Level ²	Sample ID, Depth and Date		
		GEI-4-2-040114	GEI-10-3-033114	GEI-25-3-040114
		2-3 feet	4-6 feet	4-6 feet
		04/01/14	03/31/14	04/01/14
Trans 1,2-Dichloroethene	NE	65 U	45 U	37 U
Trans 1,3-Dichloropropene	NE	65 U	45 U	37 U
Trichloroethene	30	65 U	45 U	37 U
Trichlorofluoromethane (CFC-113)	NE	65 U	45 U	37 U
Vinyl Chloride	NE	65 U	45 U	37 U

Notes:

¹ Analyzed using Environmental Protection Agency (EPA) Method 8260a/8260C.

² Model Toxic Control Act (MTRCA) Method A Cleanup Level for unrestricted land use.

HVOs = Halogenated volatile organic compounds.

NE = not established

U = not detected above the laboratory reporting limit.

µg/kg = micrograms per kilogram.

Blue shading indicates that the laboratory reporting limit was greater than the screening level.

Table 3
Summary of Soil Chemical Analytical Data - Naphthalenes and cPAHs
Quiet Cove Property
Anacortes, Washington

Sample Identification	Sample Depth	Sample Date	Naphthalenes ¹ (mg/kg)	cPAHs ¹ (mg/kg)							Total cPAHs - TEQ ²
				Benz(a)anthracene	Chrysene	Benz(b)fluoranthene	Benz(k)fluoranthene	Benz(a)pyrene	Indeno(1,2,3-cd)pyrene	Dibenz(a,h)anthracene	
GEI-4-2-040114	2-3 feet	04/01/14	27.4 Y	0.77	1.2	0.22	0.18 U	0.18	0.18 U	0.18 U	0.82 Y
GEI-10-3-033114	4-6 feet	03/31/14	18.6 Y	3.90	2.80	2.40	1.10	3.00	1.30	0.68	2.97 Y
GEI-25-3-040114	4-6 feet	04/01/14	9.3 Y	0.19	0.20	0.08	0.05	0.11	0.08	0.059 U	0.18 Y
Soil Screening Level ³			5	See TEQ							0.1

Notes:
¹ Analyzed using Environmental Protection Agency (EPA) Method 8317 (EPA).
² Total carcinogenic Polycyclic Aromatic Hydrocarbon (cPAH) calculated using toxic equivalency (TEQ) methodology relative to benzo(a)pyrene. cPAHs that were not detected were assigned a value of one-half of the detection limit for those calculations.
³ Model Toxics Control Act (MTOCA) Method A Cleanup Level for unrestricted land use.
cPAHs = Carcinogenic Polycyclic Aromatic Hydrocarbons.
mg/kg = milligrams per kilogram
Y = total concentration
U = not detected above the laboratory reporting limit.
Bold text indicates compound was detected.
Green shading indicates that the compound was detected at a concentration greater than the screening level.

Table 4
Summary of Soil Chemical Analytical Data - PCBs and Metals
 Quiet Cove Property
 Anacortes, Washington

Sample Identification	Sample Depth	Sample Date	PCBs ¹ (mg/kg)	Metals ¹ (mg/kg)				
				Arsenic	Cadmium	Chromium ²	Lead	Mercury
GEI 4 2-040114	2-3 feet	04/01/14	0.068 UT	14 U	2.4	13	79	0.34 U
GEI 10 3-033114	4-6 feet	03/31/14	0.059 UT	12 U	0.59 U	34	13	0.29 U
GEI 25 3-040114	4-6 feet	04/01/14	0.062 UT	12 U	0.62 U	52	17	0.31 U
Soil Screening Level ³			1	20	2	2,000	250	2

Notes:¹ Analyzed using Environmental Protection Agency (EPA) Method 8260A.² Analyzed using EPA Method 6010C/7471B.³ Reported as total chromium.⁴ Model Toxics Control Act (MTOA) Method A (Detection Level) for unrefined lead and zinc.

mg/kg = milligrams per kilogram

PCBs = polychlorinated biphenyls

U = not detected above EPA laboratory reporting limit

UT = not detected for the total PCBs

Bold font indicates compound was detected.

Green shading indicates that the compound was detected at a concentration greater than the screening level.

Table 5
Summary of Groundwater Chemical Analytical Data - Petroleum Hydrocarbons and VOCs
 Quiet Cove Property
 Anacortes, Washington

Sample Identification	Sample Date	Petroleum Hydrocarbons ¹ (µg/l)			VOCs ² (µg/l)					
		Gasoline-Range	Diesel-Range	Heavy Oil-Range	Benzene	Toluene	Ethylbenzene	Xylenes	n-Heptane	Methyl Tertiary-Butyl Ether (MTBE)
QCMW 1 7.1.14	07/01/14	100 U	880	410 U	1 U	1 U	1 U	1 U	-	-
QCMW 2 7.1.14	07/01/14	310	2,100 I	980	1 U	1 U	1 U	1 U	-	-
QCMW 3 7.1.14	07/01/14	480	2,600 I	700	0.2 U	1 U	0.49	1.56	-	-
QCMW 3 DUP 7.1.14	07/01/14	630	2,400 I	640	1 U	1 U	1 U	1.8	-	0.2 U
QCMW 4 7.1.14	07/01/14	610	1,800 I	410 U	1 U	1 U	1 U	1 U	-	-
QCMW 5 7.1.14	07/01/14	440	1,800 I	450 U	0.2 U	1 U	0.2 U	0.22	-	0.2 U
Groundwater Screening Level ³		800/1000	500	500	5	1000	700	1000	NE	20

Notes:¹ Analyzed using Northwest Total Petroleum Hydrocarbon (NWTPH) GC or NWTPH-GC.² Analyzed using Environmental Protection Agency (EPA) Method 8260B/8260C.³ Model Toxics Control Act (MTOCA) Method A Cleanup Level for unrestricted land use.

I = estimated value

NE = not established

U = not detected above the laboratory reporting limit

µg/l = micrograms per liter

VOCs = Volatile Organic Compounds

Bold text indicates compound was detected

Green shading indicates that the compound was detected at concentrations greater than the screening level

Table 6
Summary of Groundwater Chemical Analytical Data - HVOCs¹
 Quiet Cove Property
 Anacortes, Washington

HVOCs (µg/l)	Screening Level ²	Sample ID and Date					
		QCMW-1 7.1.14	QCMW-2 7.1.14	QCMW-3 7.1.14	QCMW-3 DUP 7.1.14	QCMW-4 7.1.14	QCMW-5 7.1.14
		07/01/14	07/01/14	07/01/14	07/01/14	07/01/14	07/01/14
1,1,1,2-Tetrachloroethane	NE	-	-	0.2 U	-	-	0.2 U
1,1,1-Trichloroethane	200	-	-	0.2 U	-	-	0.2 U
1,1,2,2-Tetrachloroethane	NE	-	-	0.2 U	-	-	0.2 U
1,1,2-Trichloroethane	NE	-	-	0.2 U	-	-	0.2 U
1,1-Dichloroethane	NE	-	-	0.2 U	-	-	0.2 U
1,1-Dichloroethene	NE	-	-	0.2 U	-	-	0.2 U
1,1-Dichloropropene	NE	-	-	0.2 U	-	-	0.2 U
1,2,3-Trichlorobenzene	NE	-	-	0.2 U	-	-	0.2 U
1,2,3-Trichloropropene	NE	-	-	0.2 U	-	-	0.2 U
1,2,4-Trichlorobenzene	NE	-	-	0.2 U	-	-	0.2 U
1,2-Dibromo-3-Chloropropane	NE	-	-	1 U	-	-	1 U
1,2-dibromochloroethane (EDB)	0.01	-	-	0.2 U	-	-	0.2 U
1,2-Dichlorobenzene (o-Dichlorobenzene)	NE	-	-	0.2 U	-	-	0.2 U
1,2-Dichlorobenzene (EDC)	5	-	-	0.2 U	-	-	0.2 U
1,2-Dichloropropene	NE	-	-	0.2 U	-	-	0.2 U
1,3-Dichlorobenzene (m-Dichlorobenzene)	NE	-	-	0.2 U	-	-	0.2 U
1,3-Dichloropropene	NE	-	-	0.2 U	-	-	0.2 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	NE	-	-	0.2 U	-	-	0.2 U
2,2-Dichloropropene	NE	-	-	0.2 U	-	-	0.2 U
2-Chloroethyl vinyl ether	NE	-	-	1 U	-	-	1 U
2-Chlorotoluene	NE	-	-	0.2 U	-	-	0.2 U
4-Chlorotoluene	NE	-	-	0.2 U	-	-	0.2 U
Bromobenzene	NE	-	-	0.2 U	-	-	0.2 U
Bromochloromethane	NE	-	-	0.2 U	-	-	0.2 U
Bromodichloromethane	NE	-	-	0.2 U	-	-	0.2 U
Bromoform (Tribromomethane)	NE	-	-	1 U	-	-	1 U
Bromomethane	NE	-	-	0.2 U	-	-	0.2 U
Carbon Tetrachloride	NE	-	-	0.2 U	-	-	0.2 U
Chlorobenzene	NE	-	-	0.2 U	-	-	0.2 U
Chloroethane	NE	-	-	1 U	-	-	1 U
Chloroform	NE	-	-	0.2 U	-	-	0.2 U
Chloromethane	NE	-	-	1 U	-	-	1 U
cis-1,2-Dichloroethane	NE	-	-	0.2 U	-	-	0.2 U
cis-1,3-Dichloropropene	NE	-	-	0.2 U	-	-	0.2 U
Dibromodichloromethane	NE	-	-	0.2 U	-	-	0.2 U
Dibromomethane	NE	-	-	0.2 U	-	-	0.2 U
Dichlorodifluoromethane (CFD-12)	NE	-	-	0.28 U	-	-	0.28 U
Methyl Iodide (Iodomethane)	NE	-	-	1 U	-	-	1 U
Methylene Chloride	5	-	-	1 U	-	-	1 U
Tetrachloroethane	5	-	-	0.2 U	-	-	0.2 U

HVOGs (µg/l)	Screening Level ²	Sample ID and Date					
		QC MW-1 T.1.14	QC MW-2 T.1.14	QC MW-3 T.1.14	QC MW-3 DUP-T.1.14	QC MW-4 T.1.14	QC MW-5 T.1.14
		07/01/14	07/01/14	07/01/14	07/01/14	07/01/14	07/01/14
Trans-1,2-Dichloroethane	NE	-	-	0.2 U	-	-	0.2 U
Trans-1,3-Dichloropropene	NE	-	-	0.2 U	-	-	0.2 U
Tribromoethane	S	-	-	0.2 U	-	-	0.2 U
Trichloroethylene (CFC-11)	NE	-	-	0.2 U	-	-	0.2 U
Vinyl Chloride	0.2	-	-	0.2 U	-	-	0.2 U

Notes:¹ Analyzed using Environmental Protection Agency (EPA) Method 8260a/8260c.² Model Toxics Control Act (MICA) Method A Cleanup Level for unrestricted land use.

HVOGs = Halogenated volatile organic compounds.

NE = not established

U = not detected above the laboratory reporting limit.

µg/l = micrograms per liter

Bold text: Indicates compound was detected.

Blue shading: Indicates that the laboratory reporting limit was greater than the screening level.

Table 7
Summary of Groundwater Chemical Analytical Data - Naphthalenes and cPAHs
 Quiet Cove Property
 Anacortes, Washington

Sample Identification	Sample Date	Naphthalenes ¹ (ug/l)	cPAHs ¹ (ug/l)							Total cPAHs - TEQ ²
			Benzo[a]anthracene	Chrysene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzo[a]pyrene	Indeno[1,2,3-c,d]pyrene	Benzo[e]anthracene	
QC-MW-1-7-14	07/01/14	-	-	-	-	-	-	-	-	-
QC-MW-2-7-14	07/01/14	-	-	-	-	-	-	-	-	-
QC-MW-3-7-14	07/01/14	66	0.015	0.017	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0083 T
QC-MW-3-DUP-7-14	07/01/14	-	-	-	-	-	-	-	-	-
QC-MW-4-7-14	07/01/14	-	-	-	-	-	-	-	-	-
QC-MW-5-7-14	07/01/14	18.8	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0072 UT
Groundwater Screening Level ³		160	See TEQ							0.1

Notes:

¹ Analyzed using Environmental Protection Agency (EPA) Method 8270SW.

² Total carcinogenic Polycyclic Aromatic Hydrocarbon (cPAH) calculated using toxic equivalent (TEQ) methodology relative to benzo[a]pyrene. cPAHs that were not detected were assigned a value of one-half of the detection limit for those concentrations.

³ Model Toxic Concentration (MTCM) Method A Cleanup Level for unrestricted land use.

cPAHs = Carcinogenic Polycyclic Aromatic Hydrocarbons

T = Total concentration

U = not detected above the laboratory reporting limit

ug/l = microgramme per liter

Read from indicator compound was detected

Table B
Summary of Groundwater Chemical Analytical Data - PCBs and Metals
 Quist Coys Property
 Anacortes, Washington

Sample Identification	Sample Date	PCBs ¹ ng/l ²	Metals ³ µg/l ⁴									
			Total					Dissolved				
			Arsenic	Cadmium	Chromium ⁵	Lead	Mercury	Arsenic	Cadmium	Chromium ⁵	Lead	Mercury
QC-MW-1-7.1.14	07/01/14	-	-	-	-	-	-	-	-	-	-	-
QC-MW-2-7.1.14	07/01/14	-	-	-	-	-	-	-	-	-	-	-
QC-MW-3-7.1.14	07/01/14	0.642 U	4.5	4.4 U	22	1.1 U	0.5 U	4.5	4 U	10 U	1 U	0.5 U
QC-MW-3-DON-7.1.14	07/01/14	-	-	-	-	-	-	-	-	-	-	-
QC-MW-4-7.1.14	07/01/14	-	-	-	-	-	-	-	-	-	-	-
QC-MW-5-7.1.14	07/01/14	0.054 U	20	4.4 U	40	2.2	0.5 U	4.5	4 U	10 U	1 U	0.5 U
Groundwater Screening Level ⁶		0.1	5	5	50	15	2	5	5	50	15	2

Notes:¹ Analyzed using Environmental Protection Agency (EPA) Method 8260A.² Analyzed using EPA Method 8210C/7471B.³ Reported as total chromium.⁴ Metal Toxicity Control Act (MTCOA) Method A Cleanup Level for unrestricted land use.

PCBs = Polychlorinated Biphenyls

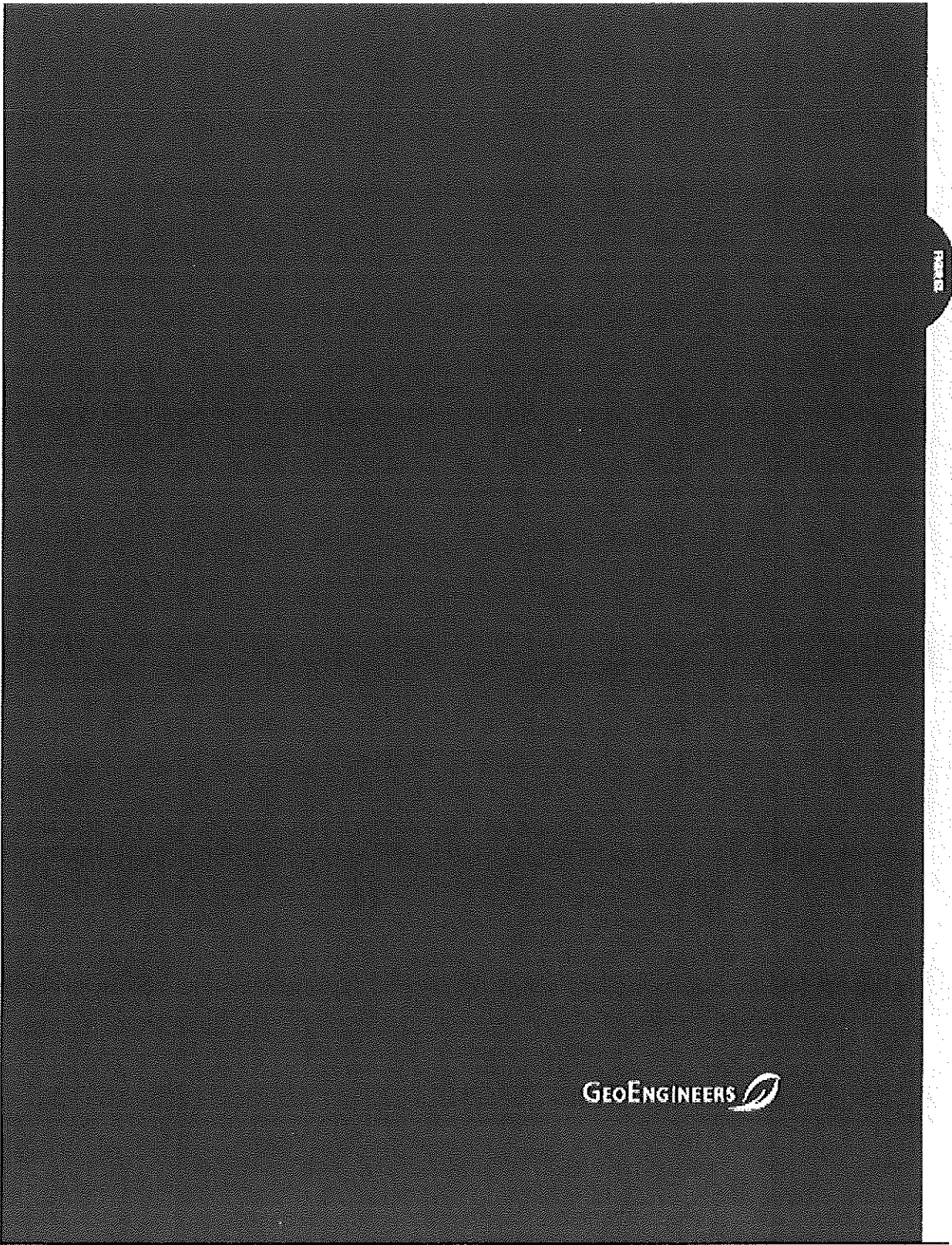
U = not detected above the laboratory reporting limit

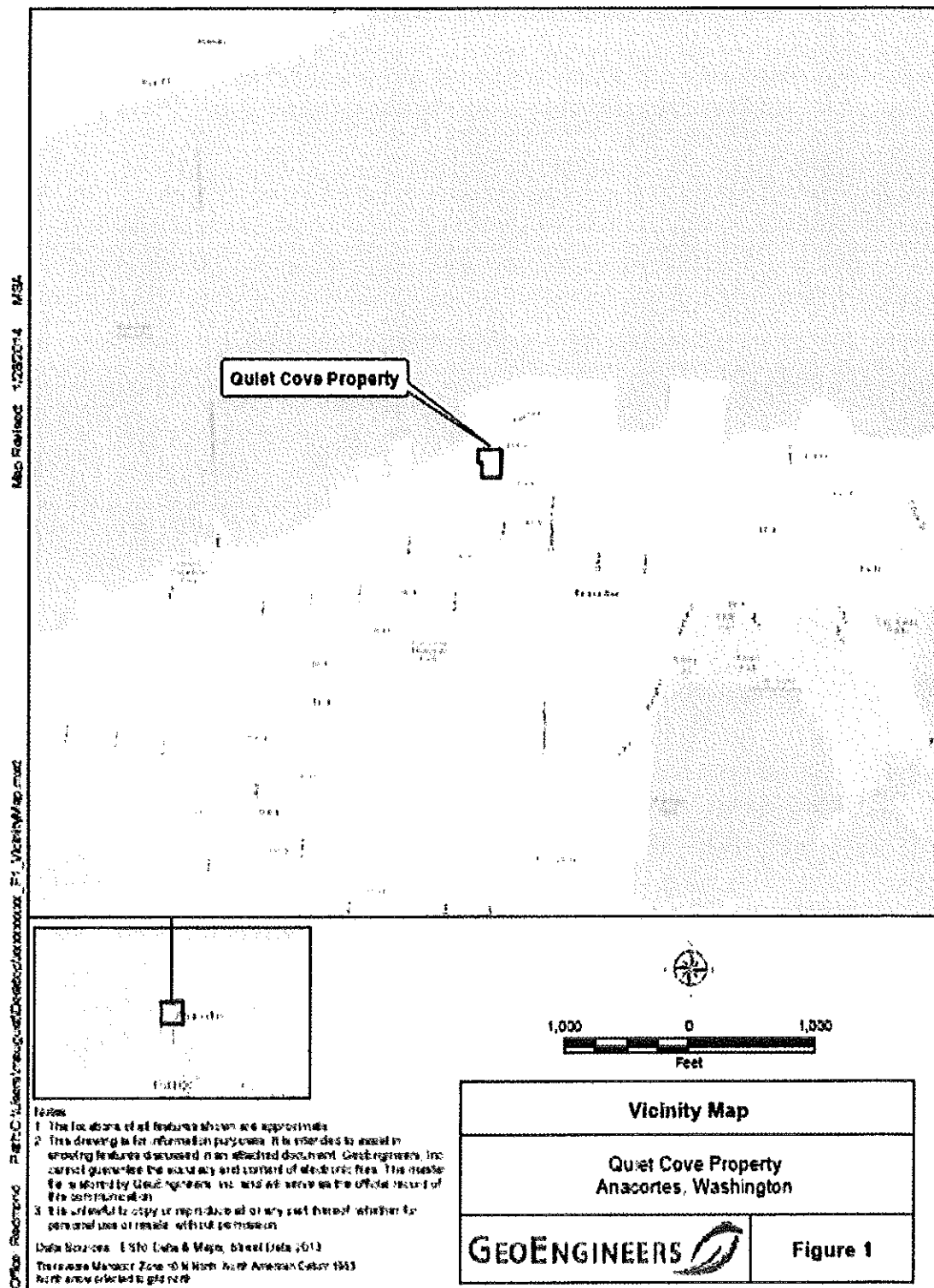
µg/l = micrograms per liter

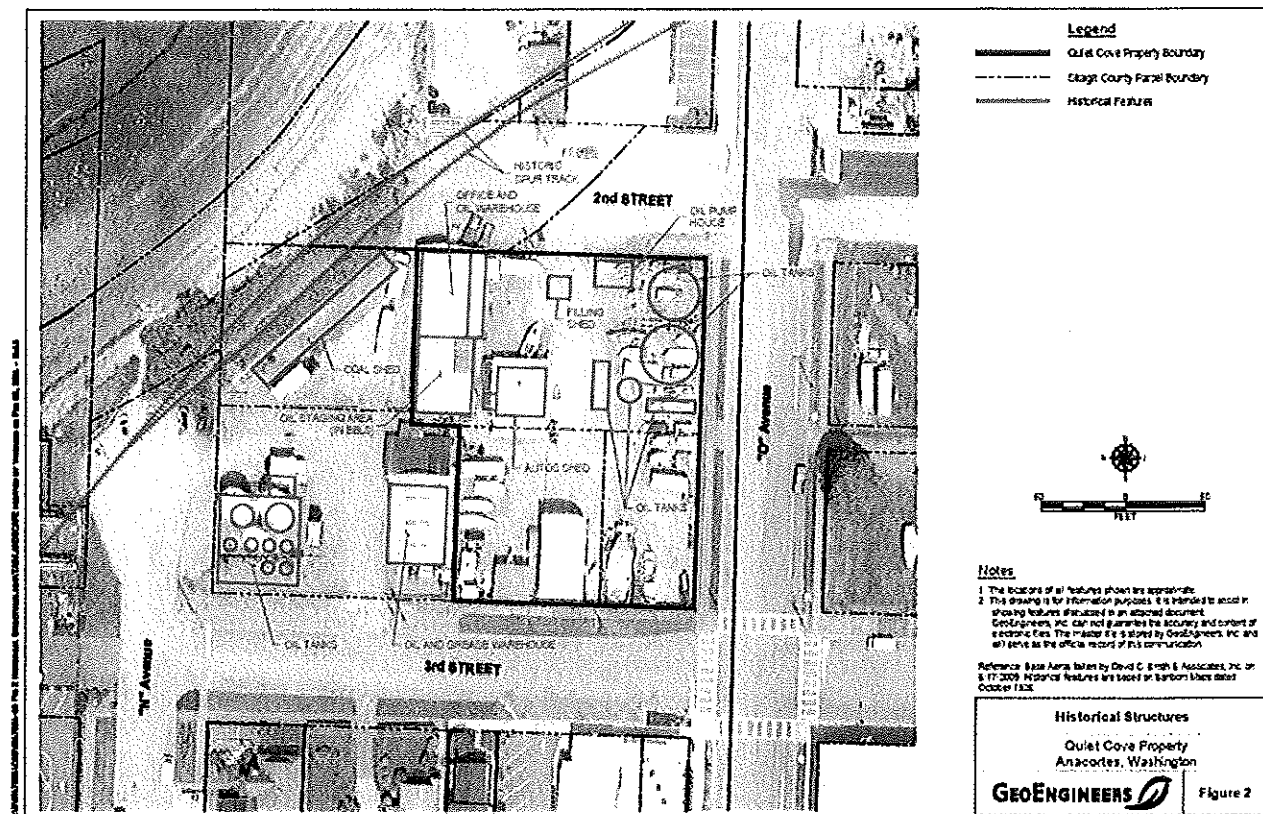
UT = not detected for the total PCBs

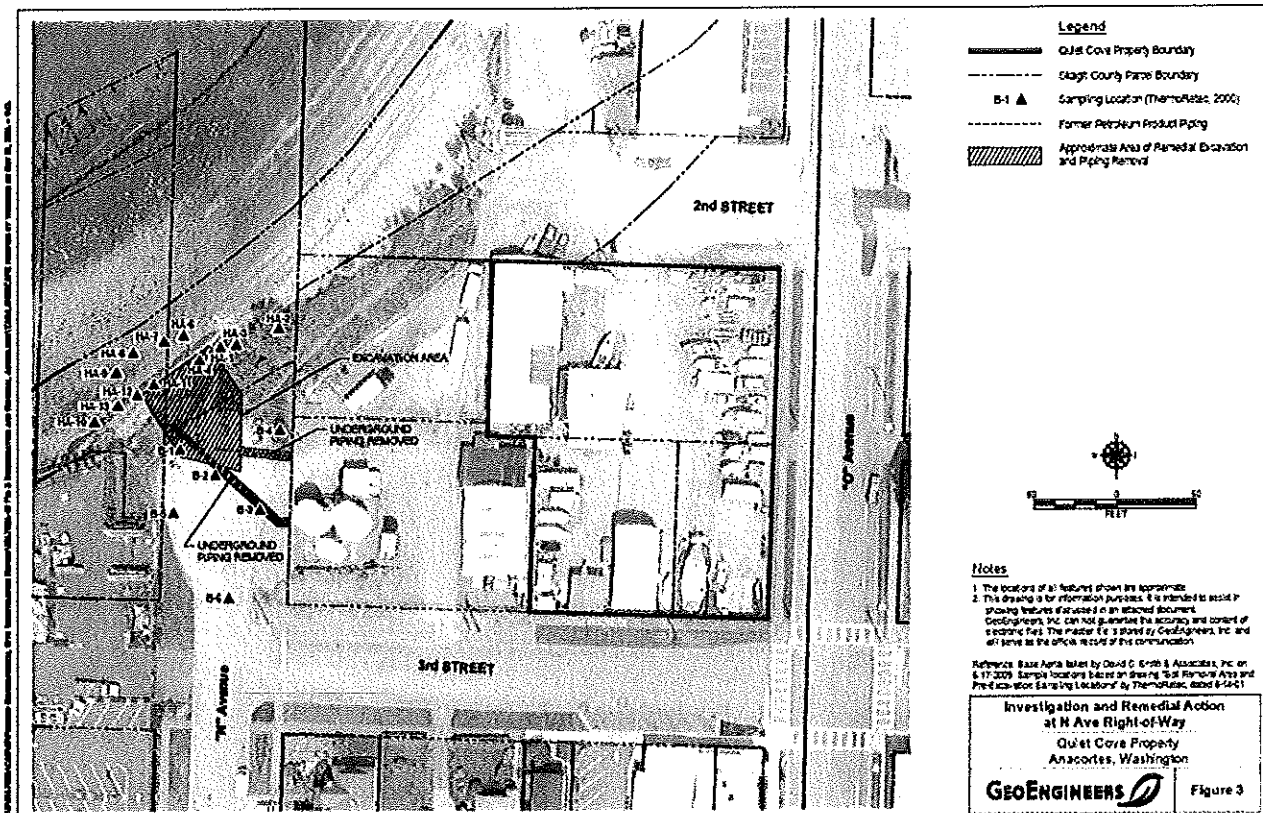
Bold font indicates compound was detected.

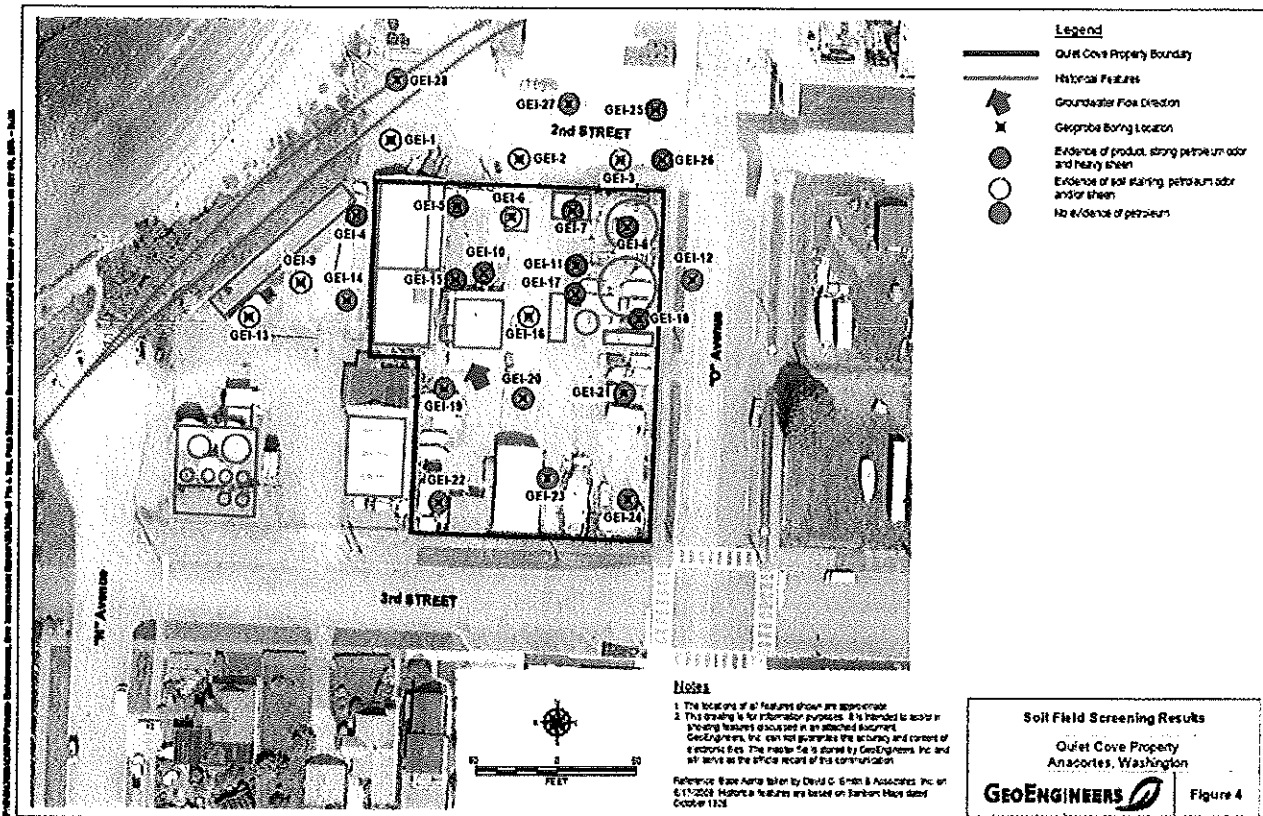
 Detected (µg/l) and bolded: the compound was detected at a concentration greater than the screening level.

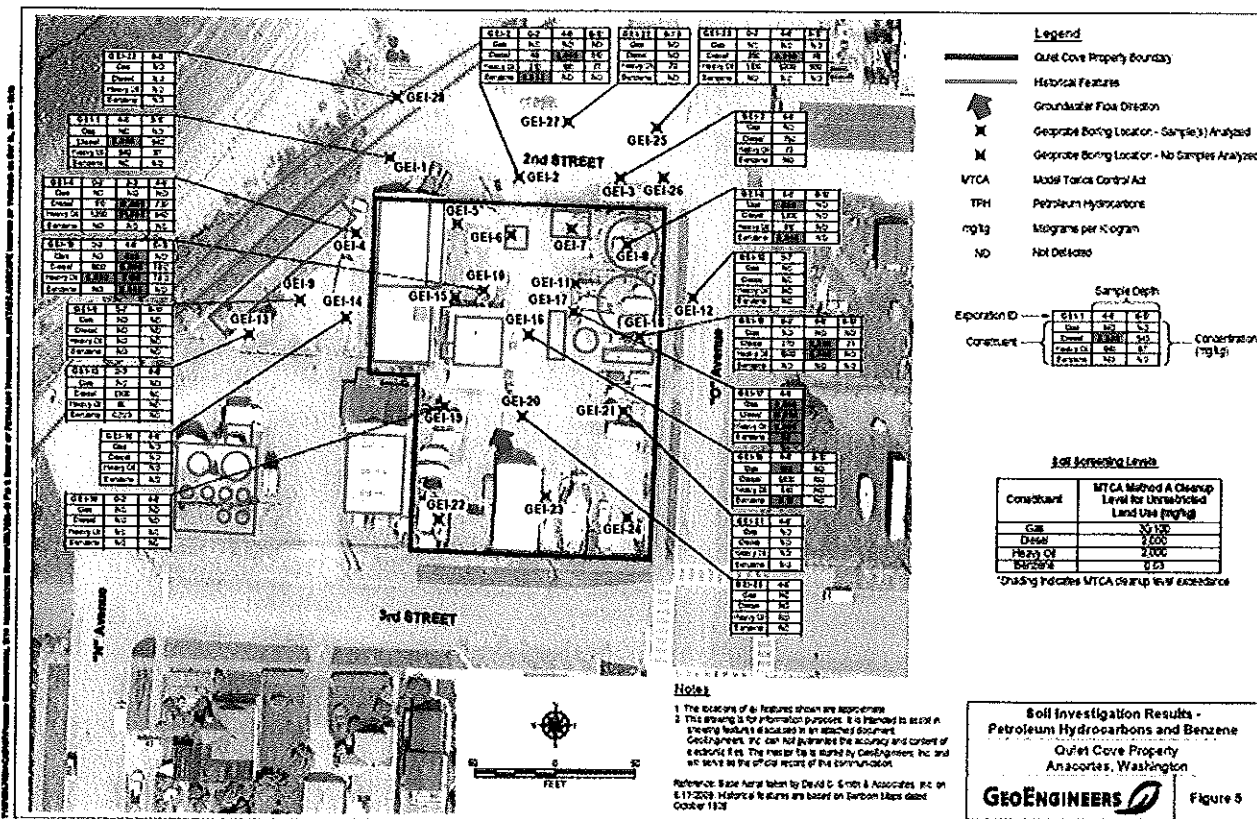


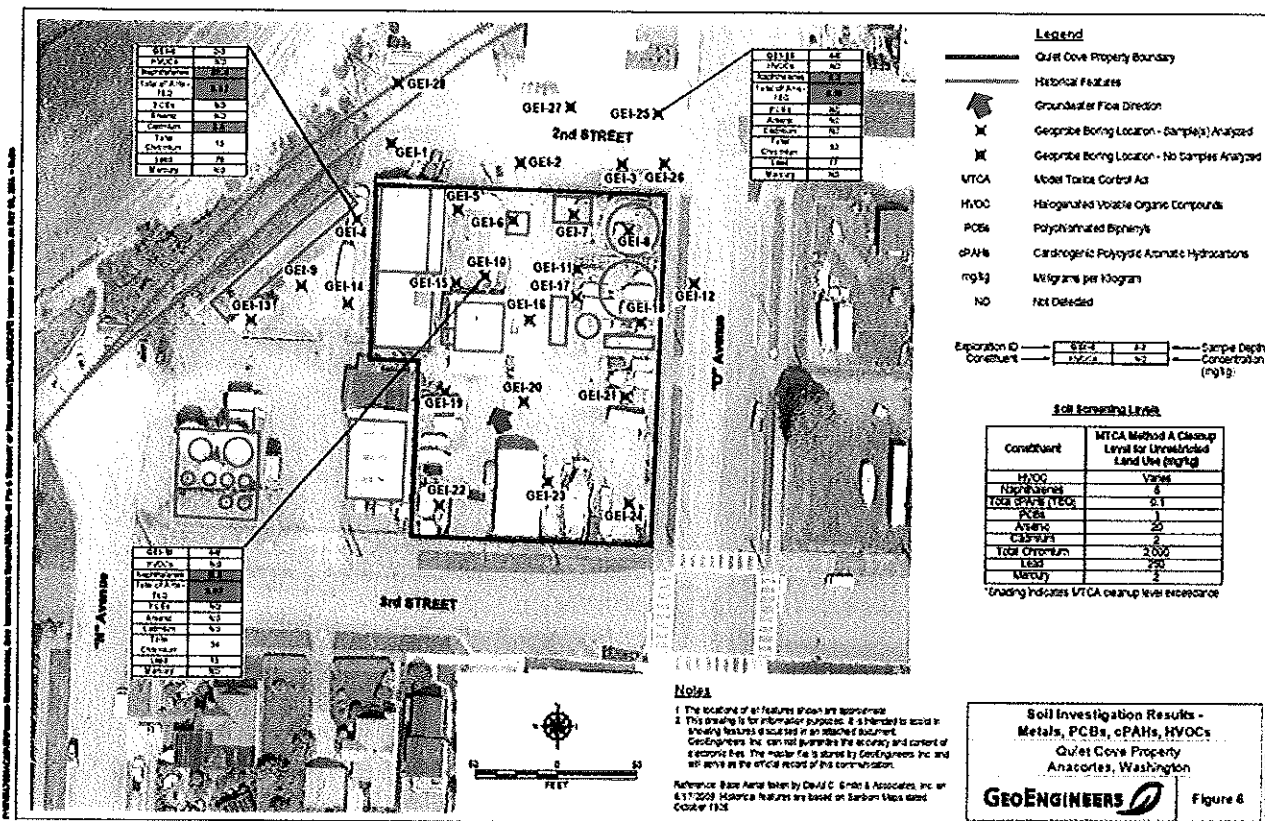


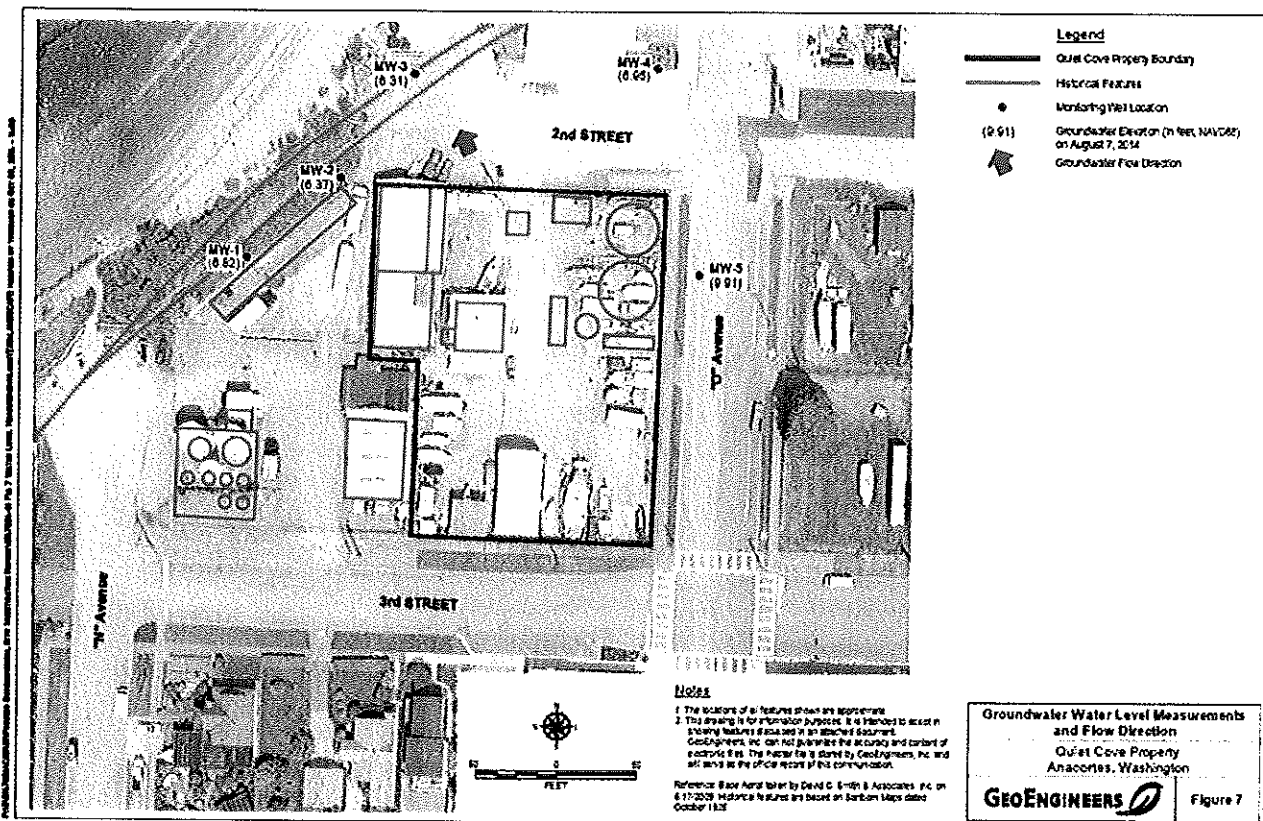


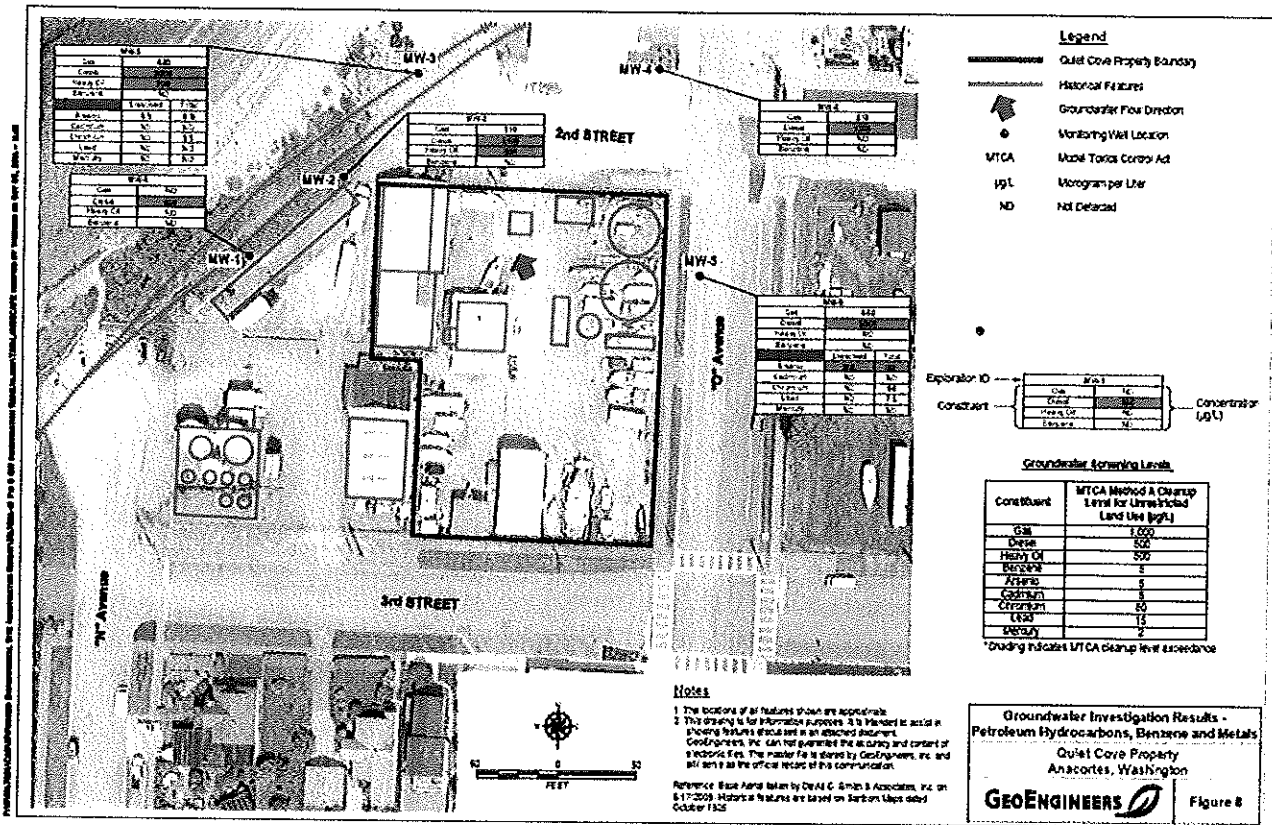












**FINAL Remedial Investigation/
Feasibility Study Work Plan**

Quiet Cove Property
Anacortes, Washington
Ecology Agreed Order No. DE 11346

for

**Washington State Department of Ecology
on Behalf of Port of Anacortes**

January 25, 2017



GEOENGINEERS 
Earth Science + Technology

**FINAL Remedial Investigation/
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January 25, 2017



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Ecology Agreed Order No. DE 11346**

File No. 5147-024-03

January 25, 2017

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym/ Abbreviation	Description
AET	Apparent Effects Threshold
ARI	Analytical Resources, Inc.
ARARs	Applicable or Relevant and Appropriate Requirements
AST	aboveground storage tank
ASTM	ASTM International
BETX	benzene, ethylbenzene, toluene and xylenes
bgs	below ground surface
BSAF	biota-sediment accumulation factor
CF	conversion factor
CFR	Code of Federal Regulations
City	City of Anacortes
CLARC	Cleanup Levels and Risk Calculation
cPAHs	carcinogenic polycyclic aromatic hydrocarbons
COPC	contaminant of potential concern
CSL	Cleanup Screening Level
CUL _{sed}	sediment cleanup level
Cw	groundwater concentration protective of sediment
DAHP	Department of Archaeology and Historic Preservation
DCAP	Draft Cleanup Action Plan
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethylene
DP	direct-push
DPS	Distinct Population Segment
DNR	Washington Department of Natural Resources
Ecology	Washington State Department of Ecology
EDB	1,2 dibromoethane
EDC	1,2 dichloroethane

EPA	United States Environmental Protection Agency
EPH	extractable petroleum hydrocarbons
EPI	Estimation Program Interface
ESA	Endangered Species Act
ESU	evolutionarily significant unit
Frontier	Frontier Analytical
GeoEngineers	GeoEngineers, Inc.
GPS	global positioning system
HASP	Health and Safety Plan
HSA	hollow-stem auger
HSP	Habitat Survey Plan
HVOCs	halogenated volatile organic compounds
IPG	Integrated Planning Grant
ISIS	Integrated Site Information System
K _{oc}	organic carbon partitioning coefficient
L/kg	liter per kilogram
LIDAR	Light Detection and Ranging
mg/kg	milligrams per kilogram
MLLW	mean lower low water
MS	Manufacturing/Shipping
MTCA	Model Toxics Control Act
MTBE	methyl tertiary-butyl ether
ng/kg	nanograms per kilograms
NMFS	National Marine Fisheries Service (now NOAA Fisheries)
Order	Agreed Order No. DE 11346
ORNL	Oak Ridge National Laboratory
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PCSM	preliminary conceptual site model
Port	Port of Anacortes
ppm	parts per million
PPP	Public Participation Plan

PQL	practical quantitation limit
PSEP	Puget Sound Estuary Program
QA/QC	quality assurance/quality control
RAIS	Risk Assessment Information System
RAOs	remedial action objectives
RCW	Revised Code of Washington
RI/FS	remedial investigation/feasibility study
ROW	right-of-way
SAP	Sampling and Analysis Plan
SCO	Sediment Cleanup Objective
SCUM II	Sediment Cleanup User's Manual II
SIM	selective ion monitoring
Site	Quiet Cove
SMS	Sediment Management Standards
SVOCs	semi-volatile organic compounds
TEE	terrestrial ecological evaluation
TEF	toxicity equivalency factor
TEQ	toxicity equivalent (refers to concentration basis)
TOC	total organic carbon
TS	total solids
TVS	total volatile solids
USFWS	United States Fish and Wildlife Service
µg/L	micrograms per liter
µg/mg	micrograms per milligram
USGS	United States Geological Survey
VOCs	volatile organic compounds
VPH	volatile petroleum hydrocarbons
WAC	Washington Administrative Code

1.0 INTRODUCTION

This Remedial Investigation (RI)/Feasibility Study (FS) Work Plan (Work Plan) has been prepared for the Quiet Cove Property (Site) on behalf of the Port of Anacortes (Port). The Site is situated along the southeast shoreline of Guemes Channel at 202 O Avenue (at the intersection of 2nd Street and O Avenue) in Anacortes, Washington (Figure 1) and is part of the Washington State Department of Ecology's (Ecology) Puget Sound Initiative and regional cleanup efforts on Fidalgo Island. The Site is listed in Ecology's Integrated Site Information System (ISIS) under Facility Site Identification No. 20859 and Cleanup Site Identification No. 12482.

Ecology issued Agreed Order No. DE 11346 (Order) pursuant to the authority of the Model Toxics Control Act (MTCA), Revised Code of Washington (RCW) 70.105D.050(1). Under the Order, the Port is required to complete a remedial investigation, per Washington Administrative Code (WAC) 173-340-350 and WAC 173-204-560 to define the nature and extent of previously identified contamination in media of concern at the property. Completion of this Work Plan is an initial requirement of the Order.

This RI/FS Work Plan presents the tasks that will be completed by the Port to delineate the nature and extent of contamination and to evaluate cleanup alternatives for the previously identified contamination at the Site. The objectives of this RI/FS Work Plan include:

- Describe the historical property use, environmental and ecological setting, previous environmental investigations, and current conditions;
- Develop a Preliminary Conceptual Site Model (PCSM) for potentially impacted media and contaminants of potential concern (COPCs);
- Identify contaminant screening levels consistent with the likely exposure pathways and receptors (both human and ecological) identified in the PCSM;
- Summarize existing environmental data with respect to screening levels to complete a preliminary delineation of the nature and extent of contamination;
- Identify data gaps in the existing data for characterization of the nature and extent of contamination;
- Identify the collection approach, procedures and methodology that will be utilized to obtain the required data to fill the identified data gaps and complete the RI;
- Describe the approach that will be used to prepare the RI and FS; and
- Describe the public participation process, project management structure and expected schedule for completing the reporting requirements of the Order.

2.0 SITE BACKGROUND AND SETTING

2.1. Location and Property Description

The 0.8-acre Quiet Cove property lays between 2nd and 3rd Streets on O Avenue and is composed of three tax parcels according to Skagit County records. Tax parcel numbers and legal descriptions are summarized in the following table. Tax parcels for the Site and surrounding area are shown on Figure 2.

Tax Parcel Number	Legal Description
P55354	Lots 1 to 6 of Block 66, Anacortes, Together with the North 1/2 of Vacated Alley adjacent thereto, ORD#1760, Survey AF#201501210019 (0.4500 acre)
P55358	Lots 16 to 18 of Block 66, Anacortes, Together with the South 1/2 of Vacated Alley Adjacent thereto, ORD#1760, Survey AF#201501210019 (0.2200 acre)
P55359	Lots 19 to 20 of Block 66, Anacortes, Together with the South 1/2 of Vacated Alley Adjacent thereto, ORD#1760, Survey AF#201501210019 (0.1500 acre)

Adjacent properties include a Port-owned storage yard to the west and a bulk fuel distribution facility owned and operated by Texaco/Reisner to the southwest. Guemes Channel is north and west of the Site.

The Quiet Cove property is relatively flat, gently sloping to the northwest. The property and surrounding area is generally covered with buildings, concrete, gravel or asphalt with the exception of planter strips located on the 2nd and 3rd Street, and O Avenue Rights-Of-Way (ROWs). Stormwater runoff at the Site is collected in catch basins that discharge to the City of Anacortes (City) stormwater system. The City's stormwater system and other utilities in the vicinity of the Site are shown on Figure 2. Currently, an office and two warehouse buildings are present in the northwest portion of the property. A chain link fence surrounds the property preventing general public access. Vehicle and pedestrian access to the property is through a gated entrance south of 2nd Street.

2.2. Cultural Resources

Guemes Channel connects Rosario Strait with Fidalgo and Padilla Bays, which are high-priority, “early-action” cleanup areas under the Puget Sound Initiative. Ecology is working with stakeholders, including local Indian tribes, to keep them informed of the cleanup of contaminated sites and sediments in the vicinity of the Fidalgo/Padilla Bay areas. Local tribes that have been engaged by Ecology under the Puget Sound Initiative at Fidalgo/Padilla Bays include the Swinomish, Samish and Lummi Tribes.

Cultural records (Lenz, 2013) indicate that the Samish occupied the shoreline areas of Guemes Channel. Large historical middens representing winter villages and smaller sites related to camping and shellfish gathering are common in similar settings. Currently, no archaeological or culturally important sites are known to exist on or immediately adjacent to the Quiet Cove Site. If potential cultural resources are encountered during Site investigation activities, work will be stopped immediately and the Port notified. Procedures for the inadvertent discovery of cultural resources are further discussed in Section 6.0.

2.3. Environmental Setting

The topographic, geologic and hydrogeologic settings of the Site and surrounding area are summarized in the following sections.

2.3.1. Site Topography and Surface Water

The ground surface within the property boundary is generally flat with an approximate elevation of 13 feet above mean lower low water (MLLW)¹. Within the surrounding area, the ground surface gently slopes to the northwest toward the southern shoreline of Guemes Channel.

The marine waters of Guemes Channel represent the closest surface water in the vicinity of the Site (Figure 1). The topography of the Site and surrounding area interpolated from Light Detection and Ranging (LiDAR) aerial imagery dated July 12, 2010 is shown on Figure 2.

2.3.2. Geology/Stratigraphy

Based on previous subsurface investigations (see Section 3.0) and review of the United States Geological Survey (USGS) map of the Bellingham Quadrangle (Lapen, 2000), mapped soils in the vicinity of the property include soils characteristic of both glacial and non-glacial processes that have occurred during the last 12,000 years. Surface soil deposits are identified as artificial fill and recessional marine (glaciomarine) drift from the Everson interstade of the Fraser glaciation.

The stratigraphy of the Site generally consists of fill material overlying native shoreline and glaciomarine deposits. Fill deposits consist primarily of fine to coarse sand with gravel and varying silt content ranging in thickness from 2 to 7 feet. Shoreline deposits consist primarily of well-sorted medium to coarse sand with occasional gravel and varying silt content. Organic deposits (peat) of varying thickness (1 to 3 feet) were observed at several boring locations; however, peat is not continuous throughout the Site and surrounding area. The underlying glaciomarine deposits consist primarily of unsorted, unstratified silt and clay with varying amounts of sands and gravels at depths greater than 14 feet below ground surface (bgs).

2.3.3. Hydrogeology

Groundwater conditions observed during previous investigations indicate the presence of unconfined groundwater in the near-surface fill and shoreline deposits (GeoEngineers, 2014). Measured depth to groundwater ranges from approximately 5 to 10 feet bgs (elevation 6.31 to 9.91 MLLW). Based on measurements recorded in previous environmental investigations, groundwater is inferred to generally flow across the Site to the northwest. Groundwater levels and flow direction are expected to vary northeast of the Site as a result of the presence of a City stormwater line centrally located along O Avenue and discharging to Guemes Channel north of the Site. Groundwater levels and flow direction may also vary west of the Site as a result of tidal fluctuations.

2.4. Ecological Setting

2.4.1. Upland Area

The Site and surrounding area provide little or no wildlife habitat. Surfaces in these areas are paved with asphalt and concrete with the exception of the 2nd Street ROW west of O Avenue and the west/southwest portion of the Port and Texaco/Reisner properties, which consist of compacted gravel.

¹ Surface topography and features were interpolated from Light Detection and Ranging (LiDAR) aerial imagery dated July 12, 2010. Interpolated surface topography and features have an approximate 1-foot accuracy.

The property is zoned MS (Manufacturing/Shipping) and is currently being used for material storage supporting the Curtis Wharf International Shipping Terminal. Trucks and equipment regularly traverse the compacted gravel portions of 2nd Street to transport personnel and cargo. Access to the property and surrounding Port and Texaco/Reisner properties are controlled by fencing.

2.4.1.1. Terrestrial Ecological Receptors

In accordance with WAC 173-340-7491, the Site qualifies for an exclusion from the terrestrial ecological evaluation (TEE) because:

1. There is less than 1.5 acres of contiguous undeveloped land² on the site or within 500 feet of any area of the site; and
2. Contaminants of concern including chlorinated dioxins or furans, polychlorinated biphenyl (PCB) mixtures, dichlorodiphenyltrichloroethylene (DDT), dichlorodiphenyldichloroethylene (DDE), dichlorodiphenyldichloroethane (DDD), aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor or heptachlor epoxide, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, or pentachlorobenzene either were not detected within the source area or are not believed to be present at the Site based on known historical property use and operations.

2.4.1.2. Endangered or Threatened Terrestrial Plants and Animals

The following United States Fish and Wildlife Service (USFWS) endangered or threatened terrestrial animal species are listed for Skagit County; however, because of the lack of suitable habitat, are not expected to occur on or near the Site.

- Oregon spotted frog (*Rana pretiosa*)
- Yellow-billed cuckoo (*Coccyzus americanus*)
- Canada lynx (*Lynx Canadensis*)
- Gray wolf (*Canis lupus*)
- Grizzly bear (*Ursus arctos* = *U. a. horribilis*)
- Northern Spotted Owl (*Strix occidentalis caurina*)

A search of the Washington Department of Natural Resources (DNR) Natural Heritage Program database identified the following federally-listed endangered or threatened plants for Skagit County (DNR, 2016); however, because of the lack of suitable habitat, are not expected to occur on or near the Site.

- Golden paintbrush (*Castilleja levisecta*)

² As defined by Ecology, “undeveloped land” means land that is not covered by buildings, roads, paved areas or other barriers that would prevent wildlife from feeding on plants, earthworms, insects or other food in or on the soil, and “contiguous” undeveloped land means an area of undeveloped land that is not divided into smaller areas by highways, extensive paving or similar structures that are likely to reduce the potential use of the overall area by wildlife.

2.4.2. Marine Area

The Site is adjacent to the southern shoreline of Guemes Channel (Figure 1). The shoreline southwest of the Site is part of the City's N Avenue Park, which spans both City and Port properties. A public parking area and beach access are located at the northern terminus of N Avenue.

Guemes Channel provides juvenile and adult habitat for various marine fishes, anadromous salmonids and invertebrate species. The area also provides seasonal habitat for marine mammals, seabirds and other waterfowl. The following federally-listed species and/or their habitat are known to occur, or potentially occur, in the vicinity of the Site based on the listings under Section 7 of the Endangered Species Act (ESA) from the USFWS (USFWS, 2016a and USFWS, 2016b) and National Marine Fisheries Service (NMFS, 2012a, b, c and d) for the marine waters of Skagit County.

- Washington/Oregon/California Distinct Population Segment (DPS) marbled murrelet (*Brachyramphus marmoratus*)
- Puget Sound Coastal DPS bull trout (*Salvelinus confluentus*)
- Puget Sound evolutionarily significant unit (ESU) Chinook salmon (*Oncorhynchus tshawytscha*)
- Puget Sound DPS steelhead (*Oncorhynchus mykiss*)
- Southern Resident DPS orcas (*Orcinus orca*)
- Humpback whale (*Megaptera novaeangliae*)
- Eastern DPS Steller sea lion (*Eumetopias jubatus*)
- Puget Sound/Georgia Basin DPS bocaccio (*Sebastes paucispinis*)
- Puget Sound/Georgia Basin DPS yelloweye rockfish (*Sebastes ruberrimus*)
- Puget Sound/Georgia Basin DPS canary rockfish (*Sebastes pinniger*)

2.5. Operational History and Use

The property was historically used for bulk fuel storage and distribution from approximately 1909 to at least 1977. The final date when fuel operations ceased is unknown. As reported in the February 17, 1910 Anacortes American, Standard Oil erected a dock (in the general vicinity of what is now Curtis Wharf) and bulk fuel plant on the Anacortes waterfront at 2nd Street and O Avenue in November 1909 selling 40,000 gallons of oil a month. Standard Oil operated the bulk fuel facility until the late 1970s at which time the facility was decommissioned and the aboveground tanks were removed. Skagit County Assessor records indicate that the property was sold to Thomas and Patricia Stowe in 1977. Following the purchase of the property, the Stowes began to operate a storage yard for marine vessels and recreational vehicles, and leased office and warehouse space to various tenants for marine-related sales and services. In 2013, the property was purchased by the Port.

The approximate location of the historical features at the Site are shown on Figure 3 based on historical drawings and photographs. A copy of the Standard Oil facility drawing dated May 31, 1921 shows the property layout while operating as a bulk fuel storage and distribution facility (Appendix A). Historical aerial and other photographs of the property and surrounding area are presented in Appendix B.

According to the Standard Oil engineering drawing, the facility layout included a 280,000 gallon above ground storage tank (AST), a 158,000 gallon AST, a 56,000 gallon AST, a 43,000 gallon AST, four 20,000 gallon ASTs, a pump house, three stall garage with attached boiler room, warehouse with covered area for barrel storage and an office. Product supply lines within the property connected each of the ASTs to the central pump house. During operation, the facility received fuel from a historical wooden pier through a series of product supply lines which were located underground south of the bulkhead (Figure 3). North of the bulkhead (Figure 3), product supply lines were hung beneath the historical wooden pier which was later demolished during the late 1990s according to historical aerial photographs (Appendix B). According to historical aerial photographs (Appendix B), the facility remained largely unchanged throughout its operational history. The facility layout is visible in a circa 1920s, 1971 and 1977 aerial photographs (Appendix B). As noted on the engineering drawing, Lots 16 through 20 located south of the main facility (Parcel No. P55358 and P55359) were acquired during the 1960s.

The property west of the Site is currently owned by the Port and was the location of a former coal storage shed presumably used to support railroad operations in Anacortes due to its proximity to the historical rail line (Figure 3). The property located to the southwest of the Site is currently owned by Texaco/Reisner for use as a bulk fuel facility. Bulk fuel operations at this location began as early as 1925. Historically, the Texaco/Reisner facility also operated a fuel terminal (referred to as the Reisner Petroleum Terminal) located at the northern end of N Avenue. Based on historical aerial photographs (Appendix B), the Reisner Petroleum Terminal was removed between 1971 and 1977. Currently, fuel to the Texaco/Reisner facility is supplied by truck.

The development and operational history for the Quiet Cove property is presented in the following table.

Timeline	Operational History
1910 to late-1970s	Standard Oil operated a bulk fuel storage and distribution facility at the Quiet Cove property. During the 1960s, Standard Oil acquired Parcel No. P55358 and P55359 according to the Engineer's Drawings presented in Appendix A.
Late-1970s	Bulk fuel storage and distribution operations ceased and the above ground storage tanks were removed.
Late-1970s to 2013	Thomas and Patricia Stowe operated a storage yard for marine vessels and recreational vehicles, and leased office and warehouse space to various tenants for marine-related sales and services. Parcels P55358 and P55359 were redeveloped between 1977 and 1994 as shown on historical aerial photographs (Appendix B). During this time, northern and southern portions of the property were paved.
2013 to Present	Port of Anacortes purchased the Quiet Cove property. Currently, the Port plans to redevelop the property in conjunction with expansion and improvements to the Curtis Wharf International Shipping Terminal facility located north of the Site.

2.6. Current and Future Site Use

Since the late 1970s, the property has been used for the storage of marine vessels and recreational vehicles, and contains several buildings that have been leased to various tenants for sales and marine services. The western adjacent property (also owned by the Port) is used for general storage. The southwestern adjacent property (owned by Texaco/Reisner) continues to operate as a bulk fuel storage and distribution facility generally consistent with the past operations. A beach with public access extends along the shoreline in the vicinity of these properties.

Currently, the Port plans to redevelop the property in conjunction with expansion and improvements to the Curtis Wharf International Shipping Terminal facility located north of the Site. Although the proposed redevelopment of the property is in the initial planning phase, the anticipated future use of the property is to support current terminal operations and services.

3.0 PREVIOUS INVESTIGATIONS

Environmental investigations that assessed impacts from historical property and adjacent property operations are summarized below. Previous investigations include a soil and groundwater investigation and cleanup action for the Former Reisner Petroleum Terminal (ThermoRetec, 2000 and 2001, respectively), and soil and groundwater investigation for the Quiet Cove property (GeoEngineers, 2014).

3.1. Former Reisner Petroleum Terminal Soil and Groundwater Investigation

ThermoRetec completed a soil and groundwater investigation (ThermoRetec, 2000) to characterize the type and extent of petroleum contamination located within the N Avenue ROW southwest of the Site in conjunction with a public beach access and parking area development project being completed by the City. This investigation included:

- Collection of soil samples using geoprobe drilling methods at six locations west of the Reisner/Texaco property (Figure 4). Soil was field screened and selected samples were submitted for chemical analysis of petroleum hydrocarbons and fuel additives (benzene, ethylbenzene, toluene and xylenes [BETX]). Analytical results indicated the presence of gasoline-, diesel- and heavy oil-range petroleum hydrocarbons and/or BETX in soil at locations B1, B2, B3, B4 and B5 at depths ranging from approximately 1 to 8 feet bgs.
- Collection of groundwater samples as grab samples from temporary well points at three of the soil boring locations (B1, B2 and B3; Figure 5). Groundwater samples were submitted for chemical analysis of petroleum hydrocarbons and/or benzene from these boring locations. Analytical results indicated the presence of gasoline- and diesel-range petroleum hydrocarbons and benzene at each location sampled.
- Collection of shallow (1 to 2.5 feet bgs) soil samples using hand auger drilling methods at 13 locations in the beach area northwest of the Reisner/Texaco property (Figure 4). Soil was field screened and selected samples were submitted for chemical analysis of petroleum hydrocarbons and BETX. Analytical results identified gasoline-, diesel- and heavy oil-range petroleum hydrocarbons in soil at locations HA-1, HA-2, HA-11 and HA-12.

3.2. Former Reisner Petroleum Terminal Cleanup Action

Cleanup activities were completed in March 2001 to remove contaminated soil in conjunction with buried product pipe removal activities at the northern terminus of N Avenue. Piping historically supplied fuel to the Reisner/Texaco bulk fueling facility from a former marine terminal (former Reisner Petroleum Terminal). The approximate location of the remedial excavation to remove product pipes and associated soil contamination are shown on Figure 4. According to the cleanup report (ThermoRetec, 2001), these product pipes were filled with diesel and kerosene (in separate lines) at the time of removal and that extensive corrosion of the piping was observed. Petroleum hydrocarbon contamination was also noted in portions of the piping removal trench.

Contaminated soil found during the pipe removal activities was temporarily stockpiled on-site. Upon completion of the pipe removal and excavation activities, a total of approximately 580 tons of petroleum-contaminated soil were transported off-site for thermal treatment and disposal. In addition, approximately 1,300 gallons of water was removed from the excavation, placed in a temporary storage tank and later transported from the site for treatment and disposal. During excavation, a 4-inch diameter metal pipeline was encountered that ran parallel to the Guemes Channel shoreline and extended northeast of the excavation. The metal line was left in place during excavation because the ownership and alignment of the pipe could not be verified³.

To confirm the removal of petroleum contaminated soil, ThermoRetec collected four sidewall and four base samples from the excavation trench for chemical analysis of gasoline-, diesel-, and heavy oil-range petroleum hydrocarbons and BETX. Analytical results confirmed that petroleum contamination was not present at the excavation limit. The locations of the remedial excavation confirmation samples are unknown. The approximate location of the remedial excavation and product pipes removal area is shown relative to the Site on Figure 4. Following confirmation of the excavation sidewalls and base, clean backfill material was used to construct the parking area for the N Avenue Park.

In addition to the remedial excavation confirmation samples, four sediment samples (Shore-1, Shore-3, Shore-4 and Shore-5) were collected within the beach area below the high water line for chemical analysis of petroleum hydrocarbons, BETX and polycyclic aromatic hydrocarbons (PAHs). The results of these analyses indicated the presence of gasoline-, diesel- and heavy oil-range petroleum hydrocarbons and PAHs within the beach area downgradient from the remedial excavation. The depth and locations of the shoreline sediment samples are unknown.

3.3. Focused Quiet Cove Soil and Groundwater Investigation

A focused site investigation of the Quiet Cove property was completed under Ecology review and approval through an Integrated Planning Grant (IPG; GeoEngineers 2014). The primary objective of this investigation was to complete a planning-level study of the Site to evaluate the potential options for cleanup and redevelopment of the Site. The purpose of the focused environmental investigation was to gather RI-level

³ Although ownership of the pipe encountered during excavation activities could not be identified, review of the the May 21, 1921 Engineers Drawing (Appendix A) which shows the layout of the Standard Oil bulk fuel and distribution facility makes no reference to a pipe extending west of the facility in the vicinity of the Reisner Petroleum remedial excavation.

environmental data to determine the extent of soil or groundwater contamination resulting from historical uses of the property. The focused environmental investigation included:

- Collection of soil samples using geoprobe drilling methods at 28 locations and collection of soil samples using hollow-stem auger drilling methods within the Site and surrounding area (Figure 4). Soil was field screened and selected samples were submitted for chemical analysis of one or more of the following:
 - Gasoline-, diesel- and oil-range petroleum hydrocarbons.
 - Carcinogenic polycyclic aromatic hydrocarbons (cPAHs) and naphthalenes;
 - Halogenated volatile organic compounds (HVOCs);
 - Volatile organic compounds (VOCs) including BETX, n-hexane, and the fuel oxygenates methyl tertiary-butyl ether (MTBE), 1,2-dibromoethane (EDB) and 1,2-dichloroethane (EDC);
 - PCBs; and
 - Metals including arsenic, cadmium, chromium, mercury and lead.

Analytical results indicated the presence of gasoline-, diesel- and heavy oil-range petroleum hydrocarbons, BETX, cPAHs and metals (cadmium) in soil at multiple locations between 2 and 6 feet bgs exceeding MTCA Method A cleanup levels. The highest levels of observed contamination were centrally located within the Site.

- Collection of groundwater samples from permanent monitoring wells at five locations (MW-1 through MW-5) positioned both upgradient and downgradient of the Site (Figure 5). Groundwater samples were submitted for chemical analysis of one or more of the following:
 - Gasoline-, diesel- and oil-range petroleum hydrocarbons.
 - cPAHs and naphthalenes;
 - HVOCs;
 - VOCs including BTEX, and n-hexane, and the fuel oxygenates MTBE, EDB and EDC;
 - PCBs; and
 - Metals including arsenic, cadmium, chromium, mercury and lead.

Analytical results confirmed the presence of diesel- and heavy oil-range petroleum hydrocarbons in groundwater at the Site exceeding MTCA Method A cleanup levels. The highest levels of contamination were located near the former ASTs. Additionally, arsenic was detected in groundwater upgradient of the Site at a concentration exceeding the MTCA Method A cleanup level.

4.0 PRELIMINARY CONCEPTUAL SITE MODEL

A PCSM was developed based on the observed conditions at the Site, identified historical and current sources of contamination to Site media, the findings from previous investigations, and evaluation of the potential contaminant transport and exposure pathways. The PCSM was prepared to assist in identifying data gaps, develop an investigation approach to fill the data gaps, and for evaluating and identifying remedial actions for the Site.

The PCSM is presented on Figure 6 as a typical cross-section illustrating the general physical conditions and potential contaminant transport and exposure pathways that may be present at the Site. The following sections describe the specific elements of the PCSM.

4.1. Physical Conditions

4.1.1. Soil

Fill is present from the surface to depths ranging from approximately 2 to 7 feet bgs. The source of fill is not known; however, the material is similar in consistency with the underlying native soil suggesting that the fill was likely sourced from reworking/grading of the native material during initial property/area development. Native shoreline and glaciomarine deposits are under the fill.

4.1.2. Groundwater

Depth to groundwater is approximately 5 to 10 feet bgs. Groundwater flow is generally to the northwest; however, groundwater levels and flow direction may vary due to the presence of a City stormwater drain line and tidal influence from Guemes Channel.

Human ingestion of Site groundwater is not considered a potential exposure pathway because groundwater at the Site is not a current or reasonable future source of drinking water due to its proximity to Guemes Channel. Groundwater withdrawal from the Site over time would likely cause saltwater intrusion, which would make it unsuitable as a potable water source.

4.1.3. Stormwater

Precipitation falling on paved portions of the Quiet Cove property and surrounding area is directed toward one or more catch basins shown on Figure 2. In unpaved areas, stormwater either infiltrates into the ground or travels by overland flow down slope. Known components of the stormwater system including the locations of the catch basins and storm drain pipes as well as flow directions in the vicinity of the Site are shown on Figure 2.

4.1.4. Sediment

Intertidal and subtidal marine areas (Guemes Channel) are located west of the Site. The upper intertidal area primarily consists of loose beach sand and gravel deposits whereas the lower intertidal area primarily consists of gravel with varying silt and sand content. Below approximately -1 feet MLLW, surface sediment primarily consists of silt and sand (native glacial marine drift). Offshore, some piling and remnant pier structures associated with historical fueling (Reisner Petroleum Pier), marine shipping and/or fishing services are present. The shoreline west of Curtis Wharf includes an armored bulkhead with a mixture of riprap, rock and concrete debris.

4.2. Media of Potential Concern

The media of potential concern at the Site are soil, groundwater, marine sediment and marine surface water.

Based on the results of previous environmental studies, soil and groundwater beneath the property are impacted from historical operations. Groundwater flows through Site soil, to downgradient marine sediment and then discharges to the adjacent marine surface water.

There is currently no evidence that marine sediment has been impacted by the previously identified Site-related soil and groundwater contamination; however, Ecology has required a tiered evaluation of sediment quality and an evaluation of the groundwater-to-sediment pathway via an assessment of uplands soils to complete the Site characterization.

4.3. Release and Transport Mechanisms

Release and transport mechanisms for contaminants to media of potential concern are presented on Figure 6 and may include:

- Direct releases of hazardous substances to soil and/or groundwater;
- Leaching of hazardous substances from soil into groundwater and potential lateral migration of these substances in groundwater to the shoreline and into the adjacent marine surface water and sediment;
- Erosion of potentially-contaminated surface soil to the adjacent marine environment;
- Volatilization of contaminants from soil and groundwater to indoor/outdoor air;
- Deposition of hazardous substances to sediment from off-site sources; and
- Re-suspension (and potential transport) of contaminated sediment through bioturbation or marine disturbances (i.e., wave and current action).

4.4. Exposure Pathways and Potential Receptors

Potential exposure pathways related to the media of concern are discussed in the following sections.

4.4.1. Soil

Potential exposure pathways and receptors for contaminants in soil are:

- Direct contact, including incidental ingestion of soil, by workers performing excavation beneath Site pavement or performing work in the unpaved portions of the Site within the western adjacent Port property and/or 2nd Street ROW;
- Direct contact, including incidental ingestion of soil, by the public (children and adults) visiting the beach;
- Inhalation of VOCs emanating from soil to indoor/outdoor air by on-site workers or by the visitors (children and adults) to the beach; and
- Inhalation of particulates from soil or sediment in outdoor air by workers or by the public in the unpaved open space adjacent to the property and within the beach.

4.4.2. Groundwater

The following are potential exposure pathways and receptors for contaminants in groundwater:

- Direct contact, including incidental ingestion of groundwater, by workers performing excavations that extend past the water table;
- Direct contact, including incidental ingestion of groundwater, by people visiting the beach where groundwater may potentially discharge to the beach surface during low tides; and

- Inhalation of VOCs volatilizing from groundwater into indoor/outdoor air by on-site workers or by the public (children and adults) visiting the beach.

As described in Section 4.1, human ingestion of Site groundwater is not a potential exposure pathway because groundwater at the Site is not a current or reasonable future source of drinking water.

4.4.3. Sediment

The following are the potential exposure pathways and receptors if contaminants are in sediment associated with the adjacent beach:

- Direct contact, including incidental ingestion of sediment by the public (children and adults) and subsequent uptake;
- Direct contact, including incidental ingestion of sediment by benthic organisms and aquatic species and subsequent uptake;
- Ingestion by higher trophic level organisms (e.g., foraging fish, aquatic birds, and marine mammals) of benthic organisms that have accumulated contaminants; and
- Human ingestion of marine organisms (e.g., fish and shellfish) that have accumulated contaminants.

4.4.4. Marine Surface Water

Potential exposure pathways and receptors if contaminants are in marine surface water in Guemes Channel are:

- Direct contact by the public (children and adults) during recreational activities;
- Direct contact and subsequent uptake by aquatic organisms;
- Ingestion of contaminated benthic and aquatic organisms as prey by higher trophic level organisms in the food chain (e.g., foraging fish, aquatic birds, marine mammals, etc.); and
- Human ingestion of marine organisms exposed to waterborne contaminants.

5.0 EVALUATION OF EXISTING DATA

This section identifies preliminary screening levels, compares existing data to these screening levels and identifies COPCs.

5.1. Screening Levels

Screening levels for soil, groundwater and sediment have been developed for contaminants that have the potential to be detected in Site media based on the PCSM. Screening levels will be used to evaluate existing data, identify data gaps and to ensure that appropriate analytical method detection limits are utilized for the RI sampling and analysis. Consistent with Ecology's MTCA Cleanup Regulation (WAC 173-340) and Sediment Management Standard (WAC 173-204), the screening levels address potential exposure pathways for benthic organisms, human and higher trophic level ecological receptors, and the potential environmental impacts based on the current and planned future use of the Site. Several of these pathways may not be applicable for this Site, but were retained to ensure that detection limits would be adequate to assess nature and extent of contamination regardless of the exposure pathway.

Screening levels for soil and groundwater are presented in Tables 1 and 2. Screening levels for sediment are presented in Tables 3 and 4. Table 3 presents screening levels for protection of benthic organisms. Table 4 presents screening levels for protection of human health and higher trophic level ecological receptors in sediment.

For this Work Plan, cPAH, dioxin and furan, and dioxin-like PCBs data are presented as toxicity equivalents (TEQs) in accordance with WAC 173-340-708(8). Concentrations are weighted based on the toxicity of individual chemical relative to the most toxic chemical using toxicity equivalency factors (TEF) adopted by Ecology (Ecology 2015). When all constituents are not detected, the TEQ is derived using the detection limits, based on half their value.

Total PCBs in a given sample are calculated by summing all detected PCB Aroclors (i.e., detection limits are treated as zero in the sum) according to Ecology regulation. When all Aroclors are not detected, then the single highest detection limit is reported. If total PCBs are based on congeners, rather than Aroclors, undetected congeners are included in the sum at half the detection limit value. If none are detected, the highest individual detection limit is reported.

The criteria utilized in the development of soil, groundwater and sediment screening levels are presented in the following sections.

5.1.1. Soil

Soil screening levels presented in Table 1 were identified based on anticipated future property land use, property zoning and public access. Potentially applicable regulatory criteria considered for the derivation of soil screening levels, based on exposure and transport pathways, and potential receptors, include:

- MTCA Method A soil cleanup levels protective of human health and the environment for unrestricted land use (WAC 173-340-740[2]) for those chemicals for which Method B values are not available (e.g., petroleum hydrocarbons and lead). The MTCA Method A value for total PCBs is also included in the table because it captures the chemical-specific level mandated in the Federal Toxic Substance Control Act;
- MTCA Method B soil cleanup levels (standard formula values for carcinogens and non-carcinogens) protective of human health (ingestion only) for unrestricted land use (WAC 173-340-740(3)(b)(iii)(B);
- Soil criteria protective of groundwater calculated using the MTCA three-phase partitioning model (WAC 173-340-747[3] [a]). For each constituent, the protective groundwater concentration used in the calculation was selected as the lowest of the respective applicable marine surface water regulatory criteria or non-potable groundwater criteria. Note that a detection of a constituent exceeding this screening level will not necessarily trigger a subsequent tier of assessment, but instead will be evaluated based on the specific constituent and magnitude of the detection, as several of the models used in developing the screening levels are known to be conservative, particularly those based on protection of the vapor pathway. Ecology has indicated, “Use of the groundwater and deep soil gas screening levels will often be overly-conservative when the VOCs of interest are those described with the types of fuel releases described in EPA’s 2015 document *Technical Guide for Addressing Petroleum Vapor Intrusion at Leaking Underground Storage Tank Sites*.” (Ecology, 2016).
- Groundwater exposure pathways will be further evaluated as part of the development of preliminary cleanup levels during the FS. At that time, the soil protective of groundwater as marine surface water

pathway will be recalculated for those chemicals with groundwater exceedances using the current exposure endpoint. For the purpose of developing screening levels, default assumptions provided in WAC 173-340-747(4) for saturated and unsaturated zone soil were used in the calculations. Model input parameter values were taken directly from Ecology's Cleanup Levels and Risk Calculations (CLARC) database dated August 2015 (Ecology, 2015a) with the following exceptions:

- Where K_{oc} and Henry's Law constant values were not available in the CLARC database, the values were generally obtained from the United States Environmental Protection Agency's (EPA's) Estimation Program Interface (EPI) Suite, Version 4.11 (EPA, 2016) or Oak Ridge National Laboratory (ORNL) Risk Assessment Information System (RAIS).
- K_{oc} values for Aroclor 1242 and Aroclor 1254 were obtained from EPA's "Technical Background Document for Draft Soil Screening Level Guidance" dated March 1994 and K_{oc} values for Aroclor 1221, Aroclor 1232 and Aroclor 1248 were obtained from EPA's "Aquatic Fate Process Data for Organic Priority Pollutants" dated 1982.
- The default fraction of organic carbon (f_{oc}) of 0.001 from WAC 173-340-747(4)(c)(i)(B) (Equation 747-2) was used to calculate soil screening levels based on the protection of groundwater.

The selected soil screening levels are the lowest of the applicable numerical values from the above listed regulatory criteria. In accordance with WAC 173-340-705(6), the screening levels were adjusted as necessary based on background concentrations and practical quantitation limit (PQL) such that the derived screening level for a given constituent was not set at a level below the natural background concentration or the PQL, whichever is higher. Natural background concentrations (except for arsenic) were referenced from Ecology Publication 94-115 "*Natural Background Soil Metals Concentrations in Washington State*" (Ecology, 1994) using 90th percentile values published for the Puget Sound Basin. The arsenic background is established in regulation and published as the MTCA Method A value. Analytical PQLs were obtained from Analytical Resources, Inc. (ARI) of Tukwila, Washington, an Ecology accredited analytical laboratory. Discussions with ARI regarding the analytical requirements for this project indicate that the soil PQLs listed in Table 1 are the lowest practicably achievable values that can be obtained using conventional, accepted analytical methods.

5.1.2. Groundwater

Groundwater screening levels presented in Table 2 were identified based on the anticipated future land use, property zoning and proximity to marine surface water. Potential risks associated with groundwater at the Site include:

- Acute and chronic effects to aquatic organisms resulting from exposure to contaminants in surface water and sediment where groundwater discharges to adjacent marine surface water.
- Human consumption of seafood exposed to contaminants in surface water and sediment where groundwater discharges to adjacent marine surface water.
- Vapor intrusion from contaminants in groundwater.

As indicated in Section 4.1, groundwater at the property is not currently being used for drinking water and is not likely to be a future source of potable or drinking water. Potentially applicable regulatory criteria considered for the derivation of groundwater screening levels, based on exposure and transport pathways, and potential receptors, include:

- Marine surface water criteria protective of aquatic organisms and human health, including:
 - Water quality criteria published in the Water Quality Standards for Surface Waters of the State of Washington (WAC 173-201A).
 - Concentrations established under the National Toxics Rule (Code of Federal Regulations [CFR] Title 40, Part 131).
 - Water quality criteria based on the protection of aquatic organisms (acute and chronic criteria) and human health published under Section 304 of the Federal Clean Water Act.
 - MTCA Method B standard formula values (for carcinogens and non-carcinogens) protective of human health (consumption of aquatic organisms) (WAC 173-340-730[3]). As noted in WAC 173-340-730(3)(b)(iii), the standard formula values are necessary when sufficiently protective criteria have not been established under applicable state and federal laws. Ecology considers a criteria sufficiently protective if the excess cancer risk is not greater than 1×10^{-5} or the hazard quotient is not greater than 1 (Ecology, 2005). State or federal criteria that are not sufficiently protective were adjusted to a cancer risk of 1×10^{-5} or a hazard quotient of 1.
- Groundwater criteria protective of indoor air from vapor intrusion.
 - Screening levels for indoor air from vapor intrusion were calculated from MTCA Method B air cleanup levels (for carcinogens and non-carcinogens) referenced Ecology's CLARC database dated August 2015 (Ecology, 2015a) adjusted for Henry's Law constants and temperature. As noted above in 5.1.1, these values for petroleum hydrocarbons are known to be overly conservative.
- Groundwater criteria protective of sediment.
 - Screening levels were developed for groundwater to be protective of sediment quality in consideration of the groundwater to sediment transport pathway. The screening levels for groundwater protective of sediment were calculated assuming equilibrium between sediment and groundwater in the sediment pore spaces. The sediment screening levels for protection of benthic organisms and higher trophic levels (presented in the following sections) were used to develop the screening levels for the groundwater to sediment transport pathway. The following equations were used to calculate groundwater concentrations protective of organic carbon-normalized and dry weight criteria:

Organic Carbon-Normalized Criteria:

$$C_w = (C_{UL_{sed}}/K_{oc}) \times CF$$

Where:

C_w = groundwater concentration protective of sediment (micrograms per liter [$\mu\text{g/L}$])

$C_{UL_{sed}}$ = Sediment cleanup level (milligrams per kilogram [mg/kg] organic carbon)

K_{oc} = organic carbon partitioning coefficient (liters per kilogram [L/kg])

CF = conversion factor (1,000 micrograms per milligram [$\mu\text{g/mg}$])

Dry Weight Criteria:

$C_w = (C_{sed} / (K_{oc} \times f_{oc})) \times CF$ for organic compounds and $C_w = (C_{sed} / K_d) \times CF$ for inorganic compounds

Where:

C_w = groundwater concentration protective of sediment ($\mu\text{g/L}$)

C_{sed} = sediment concentration protective of benthic organisms and higher trophic levels (mg/kg dry weight)

K_{oc} = organic carbon partitioning coefficient (L/kg)

f_{oc} = decimal fraction organic carbon (f_{oc} of 0.02)

K_d = distribution coefficient (L/kg)

CF = conversion factor (1,000 $\mu\text{g/mg}$)

K_{oc} and K_d values were taken directly from Ecology's CLARC database dated August 2015 (Ecology, 2015a). Where K_{oc} values were not available in CLARC, they were obtained from EPA's EPI Suite, Version 4.11 (EPA, 2016) or ORNL RAIS.

The lowest of the applicable numerical values from the above listed regulatory criteria were selected as groundwater screening levels. In accordance with WAC 173-340-705(6), the screening levels were adjusted as necessary based on analytical PQLs obtained from ARI such that the derived screening level for a given constituent was not set at a level below the PQL. Discussions with this laboratory regarding the analytical requirements for this project indicate that the groundwater PQLs listed in Table 2 are the lowest practicably achievable values that can be obtained using conventional, accepted analytical methods.

5.1.3. Sediment Screening Levels for Protection of Benthic Organisms

Sediment screening levels for protection of benthic organisms are presented in Table 3. Sediment screening levels for benthic invertebrate community health are the numeric Sediment Cleanup Objectives (SCOs) from WAC 173-204-562 for the protection of the benthic community in marine and low salinity sediment corresponding to sediment quality that will result in no adverse effects.

The Sediment Management Standards (SMS) benthic community health-based SCO of WAC 173-204-562 provide numeric criteria for a broad range of chemicals expressed as either dry-weight or organic carbon-normalized concentrations. The analytical results for nonpolar organics are normalized to the organic carbon content of the sediment when the total organic carbon (TOC) in a given sample falls between 0.5 to 3.5 percent (inclusive). The TOC-normalized results are then compared to the SCO. Analytical results for nonpolar organics with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against Marine Sediment Apparent Effects Threshold (AET) values on a dry-weight basis (Ecology's *Sediment Cleanup User's Manual II* [SCUM II] guidance, Table 8-1; Ecology, 2015b). Because SMS do not include a screening level for dioxin/furan TEQ and no regional background study of the area has been completed to date, a screening level based on the programmatic PQL (5 nanograms per kilogram [ng/kg]) provided by Ecology will be used.

5.1.4. Sediment Screening Levels for Protection of Human Health and Higher Trophic Level Ecological Receptors

Sediment screening levels for the protection of human health and protection of higher trophic level ecological receptors are presented in Table 4. Sediment screening levels for human health exposure to sediment via ingestion and dermal contact were developed utilizing equations and parameter values from Ecology's SCUM II guidance. The preliminary sediment screening levels based on sediment ingestion and dermal contact shown in Table 4 represent the values for three potential receptors that were evaluated:

- A child exposed during beach play;
- An adult exposed during clam digging (subsistence harvesting); and
- An adult exposed during net fishing (subsistence harvesting).

For evaluating exposure scenarios, the intertidal area is defined as beach above -3 feet MLLW and the subtidal area as below -3 feet MLLW. Children exposed to sediment during beach play and adults exposed to sediment during clam digging are assumed to be exposed primarily to intertidal sediment (at elevations greater than -3 feet MLLW). Likewise, the clam digging exposure scenario is expected to apply to intertidal sediment (at elevations greater than -3 feet MLLW). The potential exposure scenario for net fishing relates to both intertidal and subtidal sediment but tends to be less conservative than other human health exposure pathways. Beach play and clam digging exposure scenarios, which tend to result in more conservative screening levels, were retained for use in evaluating the exposure of net fishers and higher order aquatic ecological receptors to avoid potential data gaps during RI data collection. The RI/FS Report will confirm the exposure pathways for the Site and define cleanup levels based on the identified exposure pathways.

Because tissue data does not currently exist for the Site, site-specific biota-sediment accumulation factors (BSAFs) are not available to calculate risk-based sediment screening levels. A simplified approach (Option 1 within SCUM II) where the SCO and Cleanup Screening Level (CSL) are established at background (natural and regional, respectively) or the PQL was selected to develop sediment screening levels for evaluation of bioaccumulative effects on human health and higher trophic level organisms. For bioaccumulative chemicals such as dioxins/furans, dioxin-like PCBs, total PCBs, PAHs, arsenic, cadmium, lead and mercury, site-specific risk-based sediment screening levels are presented in Table 4. Sediment screening levels for human health and higher trophic level ecological receptors were chosen from lowest of bioaccumulative and direct contact pathways.

Consistent with the SCUM II guidance, where the risk-based value is lower than natural background or PQL, the screening level defaults to the higher of natural background or PQL. Table 4 presents the natural background, PQL and the screening level selected for each chemical constituent.

5.1.5. Wood Debris and Biological Testing

Currently, there are no sediment cleanup levels established for wood waste. However, studies conducted in Washington State (Kathman et. al., 1984; Kirkpatrick et. al., 1998; Floyd and Snider, 2000; and SAIC, 1999) show that sediment with 20 percent wood waste by volume could negatively impact the benthic community resulting from:

- The physical presence of wood waste, which prevents biota from thriving and recruiting in and on native, healthy substrate.

- Decreased dissolved oxygen due to microbial decomposition, which can create an unhealthy or toxic environment for biota.
- Decomposition by-products such as sulfides, ammonia, and phenols, which can cause or contribute to toxicity.

The degree of wood waste impacts on the benthic community depends on factors such as physical attributes of the wood waste (i.e., bark, scraps, chips, sawdust, logs, and dimensional lumber), degree of incorporation into sediment, volume present, currents and flushing in the area, type of habitat present (i.e., freshwater or marine), source of the wood waste and degree of decomposition and weathering.

To evaluate adverse benthic community effects from chemicals and other potential environmental stressors such as wood debris (if found to be present at the Site), biological testing as a direct measure of toxicity (which is considered definitive) may be performed to override chemical results per SMS, with respect to the potential for benthic community impacts⁴. Based on an evaluation of initial and/or follow-up sediment sampling results (further described in Section 6.5), the Port in consultation with Ecology may elect to conduct individual bioassays on a location-by-location basis. The need for bioassays will be determined after review of the planned RI activities and if elected, would be completed under an addendum to the Work Plan.

5.2. Comparison of Existing Data to Screening Levels

Existing soil and groundwater data were compared to screening levels presented in Section 5.1 and results are presented in Tables 6 and 7 and summarized below. Figures 4 and 5 summarize screening level exceedances in the existing soil and groundwater data at the Site and surrounding area.

5.2.1. Comparison of Existing Soil Data to Screening Levels

5.2.1.1. Metals

Metals including arsenic, cadmium, chromium (total), lead and mercury either were not detected or were detected at concentrations less than soil screening levels in soil samples obtained from the Site. Although mercury was not detected, the reporting limit for mercury was greater than the soil screening level.

Metals were not analyzed in soil samples collected as part of the Former Reisner Petroleum Terminal Investigation.

5.2.1.2. Petroleum Hydrocarbons

Gasoline-range petroleum hydrocarbons were detected in soil collected at four locations (GEI-8, GEI-10, GEI-16 and GEI-17; Figure 4) within the central portion of the Site at a concentration greater than the soil screening level. Diesel-and heavy oil-range petroleum hydrocarbons were detected in soil collected at seven locations (GEI-1, GEI-2, GEI-4, GEI-10, GEI-17, GEI-18 and GEI-25; Figure 4) at concentrations greater than the soil screening levels.

Southwest of the Site, gasoline-range hydrocarbons were detected at concentrations greater than the soil screening level at locations HA-11 and B2. Diesel-range hydrocarbons were detected at a concentration greater than the soil screening level at location B5. These exceedances are near the location where the Texaco/Reisner product pipes were removed in 2001.

⁴ Human health effects are evaluated separately and cannot be overridden by aquatic toxicity tests.

5.2.1.3. Volatile Organic Compounds

BETX constituents were detected in soil samples collected from seven locations (GEI-1, GEI-2, GEI-3, GEI-10, GEI-16, GEI-17 and GEI-25; Figure 4) at concentrations greater than their soil screening levels. At locations GEI-4, GEI-8, GEI-10 and GEI-25, ethylbenzene did not exceed soil screening level; however, the reporting limit for ethylbenzene was greater than the soil screening level and therefore, presence of this contaminant cannot be confirmed. In addition to BETX, HVOCs, n-hexane, and fuel oxygenates MTBE, EDB and EDC were analyzed in soil samples collected from the Site, These compounds either were not detected or were detected at concentrations less than soil screening levels. However, multiple compounds had elevated reporting limits exceeding the soil screening levels.

Southwest of the Site, BETX either was not detected or was detected at concentrations less than the soil screening levels. However, the BETX compounds had elevated reporting limits exceeding the soil screening levels at multiple locations. HVOCs, n-hexane and fuel oxygenates were not analyzed in soil samples collected during the Former Reisner Petroleum Terminal Investigation.

5.2.1.4. Polycyclic Aromatic Hydrocarbons

Carcinogenic PAHs and naphthalenes were detected at concentrations greater than the soil screening levels at each of the three locations (GEI-4, GEI-10 and GEI-25; Figure 4) submitted for chemical analysis.

PAHs and naphthalenes were not analyzed in soil samples collected during the Former Reisner Petroleum Terminal Investigation.

5.2.1.5. Polychlorinated Biphenyls

PCBs were not detected at concentrations greater than the soil screening levels at in soil samples submitted for chemical analysis. However, the reporting limits for PCB Aroclors exceeded the soil screening level for the saturated zone at locations GEI 10 and GEI-25 (Figure 4).

PCBs were not analyzed in soil samples collected during the Former Reisner Petroleum Terminal Investigation.

5.2.2. Comparison of Existing Groundwater Data to Screening Levels

5.2.2.1. Metals

Total and dissolved metals including arsenic, cadmium, chromium (total), lead and mercury either were not detected or were detected at concentrations less than groundwater screening levels with one exception. Total and dissolved arsenic was detected in groundwater from MW-5 (upgradient location; Figure 5) at a concentration greater than the groundwater screening level.

Metals were not analyzed in groundwater samples collected during the Former Reisner Petroleum Terminal Investigation.

5.2.2.2. Petroleum Hydrocarbons

Gasoline-range petroleum hydrocarbons were not detected in groundwater samples collected from monitoring wells MW-1 through MW-5 (Figure 5). Diesel-and/or heavy oil-range petroleum hydrocarbons were detected in groundwater samples collected from monitoring wells MW-1 through MW-5 (Figure 5).

Southwest of the Site, gasoline-range hydrocarbons were detected at a concentration greater than the groundwater screening level at locations B2 and B3 (grab sample locations; Figure 5). Diesel-range hydrocarbons were detected at a concentration greater than the groundwater screening level at locations B1 through B3 (Figure 5).

5.2.2.3. Volatile Organic Compounds

HVOCs, BETX, n-hexane, and fuel oxygenates MTBE, EDB and EDC were not detected in groundwater samples collected from the Site.

Southwest of the Site, benzene was detected in groundwater samples collected from locations B1 through B3 at a concentration exceeding the groundwater screening level. HVOCs, n-hexane and fuel oxygenates were not analyzed in soil samples collected during the Former Reisner Petroleum Terminal Investigation.

5.2.2.4. Polycyclic Aromatic Hydrocarbons

Carcinogenic PAHs and naphthalenes either were not detected or were detected at concentrations less than the groundwater screening levels with three exceptions. Naphthalenes exceeded the groundwater screening level in MW-3 and MW-5. Benzo[a]anthracene exceeded the groundwater screening level at MW-3.

PAHs and naphthalenes were not analyzed in groundwater samples collected during the Former Reisner Petroleum Terminal Investigation.

5.3. Contaminants of Potential Concern

COPCs are identified for each media of concern based on identified exceedances of the screening levels or where data gaps in the existing site characterization exist. The following compounds are identified as COPCs at this Site:

Contaminant of Potential Concern	Rationale
Soil	
Metals (arsenic, cadmium, chromium, lead, and mercury)	The presence of metals including arsenic, cadmium, chromium (total), lead and mercury were evaluated only at a limited number of locations during previous investigations.
Petroleum Hydrocarbons	Soil samples exceed screening levels at multiple locations at the Site and at Texaco/Reisner sample locations southwest of the Site.
BETX	Soil samples exceed screening levels at multiple locations at the Site. Detection limit greater than screening level at multiple Texaco/Reisner sample locations southwest of the Site.
n-Hexane and Fuel Oxygenates MTBE, EDB and EDC	Reporting limits exceed soil screening levels for multiple compounds in samples collected at multiple locations at the Site. Fuel additives were evaluated only at a limited number of soil sampling locations during previous investigations.
cPAHs and Naphthalenes	Soil samples exceed soil screening levels at each location submitted for chemical analysis. PAHs and naphthalenes were evaluated at a limited number of soil sampling locations during previous investigations.
Groundwater	
Metals	Arsenic exceeded the groundwater screening level at location MW-5 located upgradient of the former bulk fuel facility. Metals including arsenic, cadmium, chromium (total), lead and mercury were only evaluated at a limited number of locations during previous investigations.

Contaminant of Potential Concern	Rationale
Petroleum Hydrocarbons	Petroleum hydrocarbons were found to exceed groundwater screening levels at multiple locations at the Site and at Texaco/Reisner sample locations southwest of the Site.
BETX	BETX compounds were found to exceed groundwater screening levels at Texaco/Reisner sample locations southwest of the Site. BETX detected in soil at the Site exceeded screening levels.
n-Hexane and Fuel Oxygenates MTBE, EDB and EDC	Fuel additives were only evaluated at a limited number of soil and groundwater sampling locations during previous investigations.
cPAHs and Naphthalenes	Concentrations of cPAHs and naphthalenes exceed soil screening levels at each location submitted for chemical analysis. CPAHs and naphthalenes were only evaluated at a limited number of groundwater sampling locations during previous investigations.
Sediment	
Wood Debris	There is no identified source in the sediment area. A visual evaluation for the presence/absence of wood debris has been required by Ecology.
Metals (arsenic, cadmium, chromium, copper, mercury, silver and zinc)	Metals including arsenic, cadmium, chromium, lead, and mercury are an upland area COPC. Ecology has required metals including silver and zinc for consistency with the SMS.
Petroleum Hydrocarbons	Upland Area COPC.
BETX	Upland Area COPC.
n-Hexane and Fuel Oxygenates MTBE, EDB and EDC	Upland Area COPC.
SVOCs (including cPAHs, PAHs, phenols, phthalates, chlorinated organics and miscellaneous extractables)	Upland area COPC for cPAH and naphthalene. There is no identified source in the sediment area. Ecology has required SVOCs for consistency with the SMS.
PCBs	There is no identified source in the sediment area and low level aroclor analysis of a discrete set of samples did not identify PCBs in the upland area. Ecology has required PCB congener analysis for consistency with the SMS, based on Tier 1 soil, groundwater and sediment sample results.
Dioxins and Furans	There is no identified source in the sediment area. Ecology has required dioxin and furan congener analysis for consistency with the SMS, based on Tier 1 soil, groundwater and sediment sample results.

Notes:

SVOC = semi-volatile organic compounds

5.4. Identification of Data Gaps

To date, only partial characterization of the Site has been completed. The existing data do not fully characterize the potential source area and the nature and extent of contamination at the Site. Specific data gaps include the following:

- Horizontal and vertical extent of contaminants in fill and native soil north, west and south of the former bulk fuel facility.

- Potential for co-mingling of Site-related contaminants with off-property source areas (i.e., contaminants identified in soil west of the Texaco/Reisner bulk fueling facility).
- Horizontal extent of contaminants in groundwater north, east, south and west of the former bulk fuel facility.
- Potential for transport via groundwater/co-mingling with off-property source areas (i.e., contaminants identified in groundwater west of the Texaco/Reisner bulk fueling facility).
- The extent to which contamination from the uplands may have migrated downgradient to the adjacent sediment area.
- Current hydrological conditions at the Site and surrounding area.
- Current presence or absence of habitat receptors within the intertidal area west of the Site if contamination from the uplands is identified in the sediment area.

6.0 REMEDIAL INVESTIGATION STUDY APPROACH

The RI will include sampling and analysis of soil, groundwater and sediment samples to delineate the nature and extent of contamination at the Site. The approach and rationale to complete the RI is presented in Table 8 and summarized in the following sections. Data gathered to complete the RI will follow a tiered approach consisting of initial and follow-up soil, groundwater and sediment sampling and sample analyses. Information gathered from initial analyses will be used to guide follow-up sampling and analysis activities to define the nature and extent of contamination at the Site and evaluate the potential impact to sediment. In addition, topographic/land, seep and habitat surveys will be completed as part of the RI to further evaluate the environmental and ecological setting of the Site and surrounding area.

Field methods and quality assurance (QA) procedures for sampling and analysis are described in the Sampling and Analysis Plan (SAP) provided in Appendix C. Health and safety procedures for the RI fieldwork are described in the Health and Safety Plan (HASP) presented in Appendix D.

6.1. Topographic/Land Survey

A topographic survey will be performed as part of the RI to characterize current surface conditions at the Site and will include the intertidal portions of the RI study area extending from the northern end of N Avenue to Curtis Wharf. Additional surveys may be performed in other areas based on the result of the RI to further evaluate surface conditions in areas not covered by the initial survey. The survey will be completed by a professional surveyor registered in the State of Washington to create a comprehensive survey of the RI study area.

6.2. Historical Product Supply Line Survey

During the 1990s, the former Curtis Wharf pier structure was demolished and replaced due to disrepair and safety issues. At this time, it is believed that the product supply lines located beneath the former pier structure historically used during bulk fuel operations were removed and capped at the bulkhead. As requested by Ecology, the current condition of the bulkhead area below Curtis Wharf corresponding with the location of the historical product supply lines will be visually evaluated and photo documented during a daytime low tide.

6.3. Seep Survey

As requested by Ecology, a survey of the beach area for groundwater seeps will be completed along the shoreline west of the Site. The survey will be completed during low tide using a hand-held global positioning system (GPS) unit (Trimble GeoExplorer or similar) to identify the location of any observed seeps. The seep survey will be performed during a -1 foot tide (MLLW) or greater to capture the area of transmissive material above bay mud.

6.4. Soil Investigation

The objective of the soil investigation is to define the nature and extent of contamination in soil such that a cleanup action can be selected for the Site. The overall objectives of the soil investigation include:

- Characterization of Site stratigraphy in portions of the Site not previously investigated including areas to the north, east, south and west of the former bulk fueling facility; and
- Characterization of the nature and extent of hazardous substances in soil associated with historical Site operations.

The sample approach and rationale for the soil investigation is summarized in Table 8. Proposed soil sample locations are shown on Figure 7. Discrete soil intervals will be sampled at each boring location for chemical analysis or archived for later analysis (Table 9).

Using information obtained from previous Site investigations, Tier 1 samples (i.e., those locations and depth intervals below ground surface that will be analyzed first) will be collected at locations to address identified data gaps and to provide more comprehensive coverage of the Site. Follow-up analysis will be performed on archived samples representing deeper intervals at Tier 1 locations and/or archived samples from Tier 2 locations to define the vertical and horizontal extent of contamination, where necessary. Follow-up sample analysis of individual Tier 2 samples will be for contaminants exceeding their respective soil screening levels (Table 1) in the closest Tier 1 sample (e.g., next shallower interval within a Tier 1 core or adjacent Tier 1 core). Any additional sample analysis will be determined by the Port in consultation with Ecology.

Soil sampling will be completed using a combination of methodologies including; 1) direct-push (DP) explorations at sampling locations GEI-29 through GEI-45, and 2) hollow-stem auger (HSA) explorations at sampling locations MW-6 through MW-11 (the latter are also proposed well locations). The soil explorations will be advanced to at least three feet into the native soil or to approximately 15 feet bgs, whichever occurs first. If evidence of petroleum contamination is observed, the exploration will be advanced to at least three feet below the observed depth of contamination, regardless of stratigraphy, or until refusal. Anticipated exploration depths range from 5 to 15 feet bgs.

A minimum of three soil samples will be collected from each exploration for chemical analysis targeting the fill and native soil horizons, and the interface between the vadose and saturated zones (water table). Soil will be screened in the field for the presence of contamination (e.g., sheen, odor, detectable vapors). The procedures for field screening are presented in Appendix C. At Tier 1 locations, soil with the greatest evidence of contamination based on the field screening will be initially submitted for chemical analysis. In addition, soil samples obtained above and below the layer with field screening evidence of contamination will also be submitted for chemical analysis from each Tier 1 soil sample location. Additional samples at Tier 1 locations may be collected and archived for potential follow-up analysis depending on observations made at the time of sampling. Soil samples will be submitted for the following analyses that have been identified as COPCs for soil:

- Metals (arsenic, cadmium, chromium, lead and mercury) by EPA Method 6000/7000 series.
- Gasoline-range petroleum hydrocarbons by Ecology Method NWTPH-Gx.
- Diesel- and heavy oil-range petroleum hydrocarbons by Ecology Method NWTPH-Dx.
- BETX by EPA Method 8260.
- Naphthalenes and cPAHs by EPA Method 8270D/SIM.
- Fuel additives including EDB, EDC, MTBE and n-hexane by EPA Method 8260.

If soil samples exceed a screening level based on a protection of a preliminary groundwater screening level, this will not automatically trigger a further tier of assessment. Instead, dependent on the constituent and magnitude of the detection, the Port will evaluate installation of additional groundwater monitoring wells in consultation with Ecology to empirically evaluate groundwater conditions caused by the soil concentration.

6.5. Groundwater Investigation

The objective of the groundwater investigation is to define the nature and extent of contamination in groundwater, where present, to support the analysis, development and selection of a cleanup action for the Site. The overall objectives of the groundwater investigation include:

- Characterization of Site hydrogeology including groundwater gradients/flow direction, hydraulic conductivity/transmissivity and the effect of tidal fluctuations and the Curtis Wharf bulkhead on groundwater gradients and flow direction; and
- Characterization of the nature and extent of hazardous substances in groundwater associated with historical Site operations.

The sample approach and rationale for the groundwater investigation is summarized in Table 8. Proposed groundwater sample locations include both existing and new wells, which are shown on Figure 8. Groundwater sampling and analysis will be completed in a tiered approach (Table 10).

Using information obtained from previous Site investigations, Tier 1 sample locations were positioned to address identified data gaps and to provide comprehensive coverage of the Site. Based on initial analytical results, follow-up samples may be collected during a separate sampling round from either the Tier 1 and/or Tier 2 locations for potential fingerprint analysis to distinguish between Site and off-Site contaminant sources (i.e., potential groundwater contamination sourcing from the Reisner/Texaco property). Additional groundwater collection and analysis may also be performed at Tier 1 and/or Tier 2 locations based on the results of sediment sample analysis to evaluate whether the pathway from the upland to the marine environment is complete. Additional sampling locations to define the nature and extent of contamination, if required, will be determined in consultation with Ecology.

Two groundwater sampling events will be completed to evaluate groundwater conditions. Sampling will be completed at times generally representative of “wet” season and “dry” season conditions. The month of February will be targeted for the “wet” season monitoring event to capture the portion of the year with increased precipitation and for consistency with other Anacortes Sites. The month of August will be targeted for the “dry” season monitoring event to capture the portion of the year with decreased precipitation and for consistency with other Anacortes Sites.

Groundwater samples will be collected using low flow techniques from the existing (MW-1 through MW-5) and new (MW-6 through MW-10) monitoring wells for chemical analysis during low tides, where appropriate. Groundwater samples for potential follow-up chemical analysis may be collected during a subsequent monitoring event based on a review of the initial groundwater and/or sediment investigation results. Procedures for monitoring well installation, well development, and water level monitoring and groundwater sample collection are presented in Appendix C. Groundwater samples will be collected at least two weeks after well development and a tidal study to evaluate groundwater flow characteristics including elevation changes in Site groundwater in response to water level changes in Guemes Channel (see Section 2.3.3). Groundwater samples collected from Tier 1 locations will be submitted for analysis of the following chemicals that have been identified as COPCs for the Site:

- Total and dissolved metals (arsenic, cadmium, chromium, lead and mercury) by EPA Method 200.8 and 6000/7000 series.
- Gasoline-range petroleum hydrocarbons by Ecology Method NWTPH-Gx.
- Diesel- and heavy oil-range petroleum hydrocarbons by Ecology Method NWTPH-Dx.
- BETX by EPA Method 8260.
- Naphthalenes and cPAHs by EPA Method 8270D/SIM.
- Fuel additives including EDB, EDC, MTBE and n-hexane by EPA Method 8260.

If these COPCs are not detected and no other indirect evidence is found as determined in consultation with Ecology, then the pathway from the upland to the marine environment will be deemed incomplete and further evaluation for this pathway will not be conducted. If further investigation of the sediment is triggered, then groundwater samples may be collected for follow-up chemical analysis during a separate monitoring event to evaluate whether the pathway from the upland to the marine environment is complete. In addition, if COPCs are detected at MW-8, groundwater samples may be collected for follow-up chemical analysis during a separate monitoring event for potential fingerprint analysis to distinguish between site and off-site contamination source(s). Groundwater samples for follow-up analysis may include, but are not limited to, the following based on what chemicals exceed screening levels in either Tier 1 groundwater samples or sediment samples and Ecology's requirements:

- Extractable petroleum hydrocarbon (EPH) and volatile petroleum hydrocarbon (VPH) analysis.
- Total and dissolved SMS metals (arsenic, cadmium, chromium [total], copper, lead, mercury, silver and zinc) by EPA Method 200.8 and 6000/7000 series.
- SMS semi-volatile organic compounds (SVOCs) by EPA Method 8270D/SIM.
- PCB congeners by EPA Method 1668C.

6.5.1. Hydraulic Conductivity Testing and 72-Hour Tidal Study

Hydraulic conductivity testing and a 72-hour tidal study will be performed at monitoring well locations MW-2, MW-4 and MW-6 through MW-9 and MW-11 (Figure 8) to characterize groundwater flow characteristics and gradients at the Site. The aquifer hydraulic conductivity will be estimated by conducting slug tests. The 72-hour tidal study will be conducted to evaluate elevation changes in Site groundwater in response to water level changes in Guemes Channel. Water level elevation data will be collected every 15 minutes in each monitoring well using electronic data loggers and well transducers. Electronic data measurements

will be confirmed by periodically obtaining manual water level measurements during the study. Groundwater flow directions determined from the tidal study will be used in conjunction with groundwater monitoring analytical results to better define fate and transport of Site contaminants in groundwater.

Procedures for performing the slug tests and tidal study are presented in Appendix C.

6.6. Sediment Investigation

The objective of the sediment investigation is to evaluate sediment quality west of the former bulk fueling facility to determine if upland contamination has impacted the marine environment. The overall objectives of the sediment investigation include:

- Determine if contamination extends from the upland portion of the Site to the beach area located west of the former bulk fueling facility;
- If the initial testing indicates that contamination does extend to the beach area, use results of chemical analyses to identify surface and/or subsurface locations for follow-up chemical analysis;
- Evaluate for the presence or absence of wood debris; and if present, the nature and extent;
- Evaluate the terrestrial/aquatic ecological setting including a description of onsite and surrounding habitat types and conditions, ecological receptors, and potentially threatened/endangered species, in areas where sediment sampling occurs;
- Evaluate results from chemical analyses to identify the need and locations for potential follow-up bioassay testing to determine compliance with SMS biological criteria, if elected; and
- Evaluate results from chemical analyses to identify the need and locations for potential follow-up site-specific sediment/tissue sampling and analysis to support human health and ecological risk evaluation, if elected.

The sample approach and rationale for the sediment investigation is summarized in Table 8. Proposed sediment sample locations are shown on Figure 7. Federal permits will be required to collect sediment samples and the collection effort will be constrained to the allowable in-water work windows specified by the permit.

Sediment sampling and analysis will be completed in a tiered approach (Table 11). Initially, a three point surface composite sample (Tier 1A sample SED-1-COMP; Figure 7) will be collected west of the Curtis Wharf Bulkhead to evaluate sediment quality downgradient of a known area of contamination⁵. This composite surface sediment sample will be submitted for analysis of upland COPC and Ecology required analysis for consistency with the SMS to determine if the upland to sediment pathway is potentially complete:

- Gasoline-range petroleum hydrocarbons by Ecology Method NWTPH-Gx.
- BETX by EPA 8260.
- Diesel- and heavy oil-range petroleum hydrocarbons by Ecology Method NWTPH-Dx.

⁵ The adjacent upland was the location of historical product supply lines that extended from the Site to the northern pier face of Curtis Wharf and monitoring well MW-3 in which petroleum hydrocarbon-related contamination exceeded groundwater screening levels (Figure 5).

- Fuel additives including EDB, EDC, MTBE and n-hexane by EPA Method 8260.
- SMS metals (arsenic, cadmium, chromium [total], copper, lead, mercury, silver and zinc) by EPA Method 6000/7000 series.
- SMS SVOCs including PAHs and cPAHs by EPA Method 8270/SIM.
- Bulk/porewater ammonia by EPA 350.1 M/SM 4500-NH3.
- Bulk/porewater sulfides by Puget Sound Estuary Program (PSEP) 1986/SM 4500-S2.
- Grain size by PSEP 1986 or ASTM International (ASTM)-Mod.
- TOC by PSEP 1981.
- Total volatile solids (TVS) by PSEP 1986/ASTM D2974.
- Total solids (TS) by SM2540G.

Sample SED-1-COMP may be submitted for additional chemical analysis to evaluate soil/groundwater to sediment exposure pathway or potential off-site contamination source(s), if elected by the Port or required by Ecology. Additionally, selected archived samples collected from discrete boring locations SED-1A through SED-1C (Figure 7) may be submitted for chemical analysis to evaluate soil/groundwater to sediment pathway, evaluate potential off-site contamination source(s) and/or improve delineation of sediment contamination, if elected by the Port or required by Ecology. Further characterization of the composite sample SED-1-COMP and/or discrete archived samples (Tier 1B chemical analysis) may be conducted to evaluate the soil/groundwater to sediment exposure pathway or potential off-site contamination source(s), if elected by the Port or required by Ecology. Follow-up analytes may include, but are not limited to the following:

- PCB congeners by EPA Method 1668C.
- Dioxins and furans by EPA Method 1613

In addition to chemical analysis of sediment samples at SED-1 (Figure 7), upland soil-to-sediment pathway will further be evaluated using the data collected during the soil investigation (upland shoreline sample locations GEI-38 through GEI-40) as described in greater detail above in Section 6.3. If there is evidence that the upland soil-to-sediment pathway may be complete (i.e., COPC are identified in sediment composite sample SED-1-COMP and/or discrete archived samples or at upland shoreline soil sample locations GEI-38 through GEI-40) as determined in consultation with Ecology, sediment samples will be collected from Tier 2 sample locations to further evaluate the soil/groundwater to sediment exposure pathway or potential off-site contamination source(s) west of the former bulk fuel facility. Tier 2 sample locations SED-2 through SED-4 were chosen based on the previously identified elevation of the likely native sediment contact with more recently deposited material (approximately -1 foot MLLW) and represents the area discharge of groundwater to surface water. Tier 2 sample locations (SED-5 through SED-7; Figure 7) were chosen to represent the likely area where upland groundwater may be migrating and ultimately discharging to Guemes Channel based on inferred groundwater flow at the Site.

Surface sediment samples from locations SED-2 through SED-4 and fill sediment horizon, native sediment horizon, and water table samples from locations SED-5 through SED-7 (Figure 7) will be submitted for the above listed initial upland COPC and SMS parameters as required by Ecology to determine if the upland to sediment pathway is potentially complete. Sufficient material will be collected from the Tier 2 sediment sample locations for potential follow-up analysis including but not limited to PCBs and/or dioxins and furans

to evaluate the soil/groundwater to sediment exposure pathway or potential off-site contamination source(s). Determination of the follow-up laboratory analyses will be in accordance with the criteria defined in this Work Plan (including Table 8) and if necessary, in consultation with Ecology.

Details regarding field protocols and quality assurance and control procedures that will be utilized to complete the sediment investigation are presented in Appendix C.

6.6.1. Biological Testing

Biological testing may be performed by the Port on surface sediment samples to better define potential toxic effects of hazardous substances identified in sediment in accordance with SMS. The results for wood debris parameters (bulk/porewater ammonia and bulk/porewater sulfides) and chemical concentrations from the initial and/or follow-up sediment investigations will be evaluated to determine the need for biological testing. If elected, the Port will consult with Ecology to develop a Work Plan addendum to describe the scope and approach of sampling and analysis to support the biological testing study. The addendum would identify the objectives and data to be collected for the study and is subject to Ecology approval. On approval of the addendum, a subsequent field effort would be performed to collect sediment samples for testing.

Biological testing, if elected, will be performed by an Ecology-certified laboratory.

6.6.2. Paired Tissue/Sediment Study

A paired tissue/sediment study may be performed by the Port to provide data for a site-specific human health and ecological receptor risk evaluation on bioaccumulative chemicals exceeding sediment screening levels. The results for chemical concentrations from the initial and/or follow-up sediment investigations will be evaluated to determine the need for paired tissue/sediment testing. If elected, the Port will consult with Ecology to develop a Work Plan addendum to describe the scope and approach of sampling and analysis to support the tissue/sediment study. The addendum would identify the objectives and data to be collected for the study and would be subject to Ecology approval. On approval of the addendum, a subsequent field effort would be performed to collect sediment and tissue samples from selected organisms within the study area to evaluate bioaccumulation factors at the Site.

Chemical analysis of sediment and tissue, if elected, will be performed by an Ecology-certified laboratory.

6.7. Procedures for the Inadvertent Discovery of Cultural Resources

As discussed in Section 2.2, the potential for encountering cultural resources/archaeological materials at the Site is believed to be low. During the RI, field inspectors that are generally aware of the potential types of cultural artifacts that could be encountered will be utilized to oversee the investigation activities. If potential archaeological resources are identified by the field inspector during the RI, work will be stopped immediately and the Port notified. The Port will retain a professional archaeologist to evaluate the potential discovery and determine its cultural significance. If it is determined that the discovery is not culturally significant, work activities will resume. In the unanticipated event of a potential archaeological discovery, the following steps shall be taken:

- 1. Stop Work and Protect the Discovery Site** – If any agency employee, contractor, or subcontractor believes that he or she has uncovered any cultural resources, all work within a minimum of 50 feet of the discovery (“discovery site”) will be stopped to provide for its total security, protection and integrity. The discovery site shall be secured and vehicles, equipment, and unauthorized personnel will not be permitted to traverse the discovery site.

2. **Notify the Port** – The individual making the discovery will immediately contact GeoEngineers, Inc. (GeoEngineers) who will then notify the Project Coordinator for the Port (contact information presented in the table below).
3. **Notify the Project Archaeologist** – Immediately following the work stoppage and notification to the Port, a Project Archaeologist shall be retained by the Port to evaluate the potential discovery.
4. **Identify the Find** – The Project Archaeologist, in coordination with the Port, is responsible for ensuring that appropriate steps have been taken to protect the discovery site. The Project Archaeologist shall be qualified as a professional archaeologist under the Secretary of Interior's Professional Qualification Standards (as outlined in 36 CFR Part 61). As such, the Project Archaeologist shall be qualified to examine the find to determine if it is archaeological. If it is determined not to be archaeological, work may proceed at the discovery site with no further delay.
5. **Notify Additional Parties** – If the discovery is determined by the Project Archaeologist to be a cultural resource, the Port or their designee will provide notification to Ecology, Department of Archaeology and Historic Preservation (DAHP), the Swinomish, Samish, and Lummi Tribes. Confidentiality of the find will be maintained by Project leads and their contractors.
6. **Obtain Consent to Proceed with Construction** – Investigation work will not recommence at the discovery site until treatment has been completed and the Tribes, DAHP, and/or jurisdictional agencies, as appropriate, have provided written or verbal consent to proceed.

Contact information for key personnel for the inadvertent discovery of cultural resources is summarized in the following table.

CONTACT LIST FOR THE INADVERTENT DISCOVERY OF CULTURAL RESOURCES

Contact Name	Organization	Title	Contact Number
John Herzog (Primary Contact)	GeoEngineers, Inc.	Technical Project Manager	(o) 206.728.2674 (c) 206.406.6431
Robert Trahan (Alternate Contact)	GeoEngineers, Inc.	Field Coordinator	(o) 206.728.2674 (c) 206.240.2300
Becky Darden	Port of Anacortes	Project Coordinator	(o) 360.299.1831
Arianne Fernandez	Ecology	Project Coordinator	(o) 360.407.7209
Rob Whitlam	DAHP	State Archaeologist	(o) 360.586.3080
Larry Campbell	Swinomish Nation	Swinomish Indian Tribal Community	(o) 360.466.1615
Jackie Ferry	Samish Nation	Cultural Resources	(o) 360-293-6404
Lena Tso	Lummi Nation	Lummi Tribal Historic Preservation Office	(o) 360.384.2259

7.0 FEASIBILITY STUDY

The FS will utilize the results of the RI to establish proposed cleanup levels for future cleanup actions at the Site. The FS will develop and evaluate cleanup action alternatives for contaminated media so that appropriate cleanup actions may be selected. Specifically, the FS will:

- Establish cleanup levels, points of compliance and as necessary, establish remediation levels;
- Identify Applicable or Relevant and Appropriate Requirements (ARARs);
- Delineate media requiring remedial action;
- Develop remedial action objectives (RAOs);
- Screen and evaluate separate upland and in-water cleanup alternatives, if necessary, in accordance with WAC 173-340-350(8) and WAC 173-204-560(4). Based on this evaluation, select a preferred alternative for upland and sediment cleanup in accordance with WAC 173-340-360 and WAC 173-204-570; and
- If sediment contamination is identified, and if a particular remedial alternative would impact habitat, then mitigation of those impacts will be included in the evaluation of remedial alternatives.

The following sections provide the details of the FS process that will be completed for the Site.

7.1. Establishment of Cleanup Levels, Points of Compliance and Remediation Levels

Cleanup standards, including cleanup levels and points of compliance will be developed for contaminated media in accordance with MTCA and/or SMS regulations. Exposure pathways and receptors will be identified as part of cleanup level development. As needed, remediation levels may also be established for specific cleanup alternatives.

Cleanup levels for soil will be protective of human health and the environment including aquatic ecological receptors, groundwater, and sediment based on current and future uses of the property. The point of compliance for soil will also be established.

Cleanup levels for groundwater will be based on protection of human health, surface water and sediment in Guemes Channel. Groundwater at or potentially affected by the Site is not a current or reasonable future source of drinking water. It is expected that information developed during the RI will be used to demonstrate that groundwater at the property meets the requirements of WAC 173-340-720 for non-potable groundwater. A groundwater point of compliance will be developed. The point of compliance may be conditional, located at or near the groundwater/surface water interface.

Cleanup levels for sediment will be based on protection of human health, higher trophic ecological receptors, and benthic and aquatic species in accordance with the SMS. The point of compliance for sediment will be established and be protective of biologically active zones in sediment throughout the Site, consistent with SMS. The point of compliance may be deeper than biologically active zones, depending upon the contaminant types and concentrations detected, and the lateral and vertical extents of contamination determined during the remedial investigation.

7.2. Applicable or Relevant and Appropriate Requirements

In addition to the cleanup standards developed through the MTCA process, other regulatory requirements will be considered in the selection and implementation of the cleanup action. MTCA requires the cleanup standards to be “at least as stringent as all applicable state and federal laws” [WAC 173-340-700(6)(a)]. Besides establishing minimum requirements for cleanup standards, applicable state and federal laws may also impose certain technical and procedural requirements for performing cleanup actions. These requirements are described in WAC 173-340-710.

MTCA defines applicable state and federal laws to include legally applicable requirements and those requirements that are relevant and appropriate (ARARs). The primary ARARs will be the MTCA and SMS cleanup levels and regulations that address implementation of a cleanup under MTCA (173-340 WAC) and SMS (173-204 WAC). Other potential ARARs may include the following:

- Washington State Water Pollution Control Act (Chapter 90.48 RCW) and the implementing regulations: Water Quality Standards for Surface Waters of the State of Washington (Chapter 173-201A WAC).
- EPA National Recommended Water Quality Criteria – Section 304 Clean Water Act.
- EPA Water Quality Standards (National Toxics Rule) – 40 CFR 131.
- Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 RCW).
- The federal Clean Water Act, with respect to in-water work associated with dredging or sediment capping.
- Endangered Species Act, due to listing of Puget Sound chinook and of Coastal/Puget Sound bull trout.
- Washington Hazardous Waste Management Act and the implementing regulations: Dangerous Waste Regulations (Chapter 173-303 WAC), to the extent that any dangerous wastes are discovered or generated during the cleanup action.
- Washington's Shoreline Management Act with respect to construction cleanup activities conducted within 200 feet of the shoreline.
- Archaeological and Historical Preservation: The Archaeological and Historical Preservation Act (16 USCA 496a-1) would be applicable if any subject materials are discovered during Site grading and excavation activities.
- Archaeological Resources Protection Act, 16 USC 470aa; 43 CFR 7.
- Washington Clean Air Act (Chapter 70.94 WAC).
- Health and Safety: Site cleanup-related construction activities would need to be performed in accordance with the requirements of the Washington Industrial Safety and Health Act (RCW 49.17) and the federal Occupational Safety and Health Act (29 CFR 1910, 1926). These applicable regulations include requirements that workers are to be protected from exposure to contaminants and that excavations are to be properly shored.

The FS will identify additional ARARs that are applicable to the Site cleanup.

7.3. Identification of Media Requiring Remedial Action

The RI process will determine if soil, groundwater or sediment exceed cleanup levels and, if so, identify the locations of the exceedances. Based on any exceedances and the established points of compliance, the FS will identify the extent or volume of soil, groundwater or sediment that requires remedial action and define remedial action areas, as appropriate.

7.4. Development of Remedial Action Objectives

RAOs that define the goals of the cleanup that must be achieved to adequately protect human health and the environment will be developed for each medium and area identified as requiring remedial action. These RAOs will be action-specific and/or media-specific. Action-specific RAOs are based on actions required for environmental protection that are not intended to achieve a specific chemical criterion. Media-specific RAOs are based on developed cleanup levels. The RAOs will specify the contaminant of concern, the potential exposure pathways and receptors, and acceptable contaminant level or range of levels for each exposure pathway, as appropriate.

7.5. Development of Cleanup Alternatives

A reasonable number and type of cleanup alternatives will be developed for each media of concern requiring cleanup. Initially, general remediation technologies will be identified for the purpose of meeting all applicable regulations for each medium. General remediation technologies consist of specific remedial action technologies and process options and will be considered and evaluated based on the media type, specific properties of contaminants and characteristics and complexity of the Site including consideration of specific Site conditions and physical constraints. The range of remedial technologies may include institutional controls, containment or other engineering controls, removal, *in-situ* treatment and natural attenuation.

Specific remedial action technologies are the engineering components of a general remediation technology. Several specific technologies may be identified for each general remediation technology and multiple process options may exist within each specific technology. Specific remedial action technologies and representative process options will be selected for evaluation based on documented development or documented successful use for the particular medium and COPCs. Cleanup alternatives will be developed from the general and specific remedial technologies and process options consistent with Ecology requirements identified in WAC 173-340-370 and WAC 173-204-570 using best professional judgment and guidance documents, as appropriate. During the development of cleanup alternatives, both the current and planned future land use will be considered.

7.6. Evaluation of Cleanup Alternatives

Evaluation of cleanup action alternatives and the selection of preferred cleanup alternative will meet the requirements of WAC 173-340-360 and WAC 173-204-560. Consistent with MTCA, the alternatives will be evaluated with respect to compliance with threshold requirements, permanence, and restoration timeframe, and the results of the evaluation will be documented in the FS Report.

7.7. Habitat Mitigation

If contamination from releases from the uplands bulk fueling facility is found to extend into and impact sediments, then any remedy that impacts habitat will include an evaluation of options to minimize and mitigate any habitat impacts from the remedy.

8.0 PUBLIC PARTICIPATION

A Public Participation Plan (PPP) was prepared by Ecology for the project that summarizes the cleanup process to be conducted at the Site. The PPP is provided in Appendix E. The PPP will be provided to the public to present the opportunity for the public to learn about and provide input on the RI and remedial alternatives as required under MTCA WAC 173-340-600.

9.0 PROJECT MANAGEMENT

This section discusses the organizational structure and responsibilities designed to provide project control and quality assurance for the duration of the project.

9.1. Designated Project Coordinators

As specified in the Agreed Order the coordinators for the project are as follows:

- Arianne Fernandez – Washington State Department of Ecology
- Becky Darden – Port of Anacortes

Each project coordinator will be responsible for overseeing the implementation of the work. Ecology's project coordinator is Ecology's designated representative for the Site. To the maximum extent possible, communications between the involved parties, and all documents, including reports, approvals, and other correspondence concerning the activities performed will be directed through the project coordinators. However, all parties have direct access to Ecology to resolve issues or concerns.

9.2. Technical Project Manager

The Technical Project Manager for the activities that will be completed under this Work Plan is John Herzog. The Technical Project Manager has overall responsibility for executing the project in accordance with contractual requirements. The Technical Project Manager is also responsible for selecting project team members, assigning and coordinating project tasks, determining subcontractor participation, establishing and adhering to budgets and schedules, providing technical oversight, coordinating production and review of project deliverables, and is the primary technical representative.

9.3. Field Coordinator

The Field Coordinator for RI activities that will be completed under this Work Plan is Robert Trahan. The Field Coordinator is responsible for the daily management of activities in the field.

9.4. Quality Assurance Leader

The Quality Assurance (QA) Leader for the RI activities that will be completed under this Work Plan is Mark Lybeer. The QA Leader is responsible for coordinating Quality Assurance/Quality Control (QA/QC) activities as they relate to chemical analytical data and will be responsible for QA/QC oversight of the laboratory programs. The QA Leader will review laboratory QA/QC data to assure validity of data and conformance to QA/QC requirements and will provide a written QA/QC report.

9.5. Laboratory Management

The subcontracted laboratories conducting sample analyses for this project are required to obtain approval from the QA Leader before the initiation of sample analysis to assure that the laboratory QA plan complies with the project QA objectives. The Laboratory's QA Coordinator administers the Laboratory QA Plan and is responsible for QC. Analytical Resources, Inc. (ARI) of Tukwila, Washington and Frontier Analytical (Frontier) of El Dorado Hills, California will perform chemical analysis for this project. It is anticipated that Environ (formerly NewFields) of Port Gamble, Washington would be utilized if bioassay analysis is required for this project.

10.0 REPORTING AND SCHEDULE

10.1. Reporting

The following reports will be prepared under this Work Plan: Data Report Technical Memorandum; RI/FS Report; and Draft Cleanup Action Plan. Specific information on the content of these reports is described in the following sections.

10.1.1. Data Report Technical Memorandum

As required by the Agreed Order, The Port will provide Ecology with the results of the field investigation in the form of a Data Report Technical Memorandum so that a determination can be made with regard to whether additional investigation is required to fully define the nature and extent of contamination. The information provided to Ecology will describe the analytical results of the field activities, the affected media, the extent of contamination (plotted on maps and screened against screening levels, and identification of data gaps that need to be filled to complete the RI/FS with respect to the nature and extent of contamination and toxic/bioaccumulative effects.

10.1.2. RI/FS Report

A draft, draft final (if necessary), and final RI/FS report meeting the requirements of WAC 173-340-350, WAC 173-340-560, WAC 173-204-550 and WAC 173-204-560 will be prepared and submitted to Ecology for review and approval. The RI/FS report will contain the results of the RI and will provide information regarding the full extent and magnitude of soil, groundwater, surface water, and/or adjacent marine sediment contamination including toxic and bioaccumulative effects. The FS portion of the report will present and evaluate cleanup action alternatives to address the identified contamination at the Site. Based on the evaluation of alternatives (WAC 173-340-350(8) and WAC 173-204-570), the FS will identify a preferred cleanup action alternative for the Site in compliance with WAC 173-340-360 and WAC 173-204-560.

10.1.3. Draft Cleanup Action Plan

Upon Ecology approval of the RI/FS report, the Port will prepare a draft and draft final Cleanup Action Plan (CAP) in accordance with WAC 173-340-380 and WAC 173-204-570. The draft CAP will address the proposed cleanup action alternatives for the remediation of all impacted media in the upland and in-water portions of the Site, respectively, based on the results of the RI/FS. The draft CAP will include a general description of the proposed cleanup actions along with the following sections:

- A general description of the proposed cleanup action and the rationale for selection, including results of any remedial technology pilot studies, if necessary.
- A summary of the other alternatives evaluated in the RI/FS.
- Identification and summary of the applicable local, state, and federal laws pertinent to the proposed cleanup.
- Identification of Cleanup standards and the points of compliance along with a rationale regarding their selection for each hazardous substance and for each medium of concern at the Site based on the results of the RI/FS.
- Descriptions of any institutional/engineering controls, if proposed.
- A preliminary schedule for implementation of field construction work and subsequent maintenance and monitoring.

10.2. Schedule

The Agreed Order establishes the RI/FS schedule and reporting requirements for the project. The schedule for specific project milestones is provided in the following table. Ecology will be notified at the time unanticipated conditions or changed circumstances are discovered which might result in a schedule delay to implementation of the Work Plan. Any requests for a schedule extension will be undertaken as required by the Agreed Order. Any completion times that fall on a holiday or weekend will be extended to the next weekday.

PROJECT MILESTONES	SCHEDULE
Remedial Investigation/Feasibility Study (RI/FS) Work Plan Submittal	
Agreed Order Effective Date	February 23, 2016
Draft RI /FS Work Plan	Due to Ecology June 22, 2016
Final RI/FS Work Plan	90 calendar days following receipt of Ecology's review comments on the Draft RI/FS Work Plan, and then will undergo a 45-calendar day review period by Ecology.
Field RI	
Field RI	Commence within 60 calendar days of Ecology's approval of the Final RI/FS Work Plan. Separate mobilizations and field schedules may be required to complete the site investigation.
Data Report Technical Memorandum	60 calendar days following receipt of final validated data from all RI/FS analytical data.
Additional Field RI Activities (if needed)	The scope, schedule, and submittal requirements for additional field RI activities will be developed in consultation with Ecology. Plans for additional field RI activities will be submitted to Ecology for review and concurrence within 60 calendar days of Ecology's determination that additional RI activities are warranted.
RI/FS Report Submittal	
Draft RI/FS Report	180 calendar days following Ecology's approval of the Final RI/FS Work Plan. If Ecology review of the Data Report Technical Memorandum finds significant data gaps have not been filled, at Ecology's discretion, the Draft RI/FS Report submittal may be extended.
Final RI/FS Report	45 calendar days following Ecology comments on the Draft RI/FS. The Final RI/FS Report will undergo a 30-day public comment period. Ecology will complete a responsiveness summary to public comment on the Final RI/FS Report before approval of the document.
Draft Cleanup Action Plan (DCAP) Submittal	
Preliminary DCAP	120 calendar days after the RI/FS Report is finalized.
Final DCAP	60 calendar days following Ecology's comments on the Preliminary DCAP. The Final DCAP will undergo a 30-day public comment review period.

11.0 LIMITATIONS

We have prepared this Work Plan for use by the Port of Anacortes during the RI/FS at the Quiet Cove Site located at 202 O Avenue in Anacortes, Washington. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

12.0 REFERENCES

Floyd and Snider, "Hylebos Waterway Wood Waste Program: Compliance Monitoring Plan," Prepared for the Hylebos Waterway Wood Waste Group, dated June 2000.

Kathman, R.D, S.F. Cross, and M. Waldichuk, "Effects of Wood Waste on the Recruitment Potential of Marine Benthic Communities." Canadian Tech Report: Fisheries and Aquatic Sciences, Vol. 1284, 1984, pp. 50.

Kirkpatrick, B., T.C. Shirley, and C.E. O'Clair. "Deep-water Bark Accumulation and Benthos Richness at Log Transfer and Storage Facilities." Alaska Fisheries Research Bulletin, Vol. 5, No. 2, 1998, pp. 103-115.

Lapen, Thomas J., "Geologic Map of the Bellingham 1:100,000 Quadrangle, Washington," Washington State Department of Natural Resources, Division of Geology and Earth Resources, dated December 2000.

Lenz, Brett. "Cultural Resource Assessment for the Port of Anacortes Wyman's Property Habitat Mitigation (Pier 1 Mitigation Project), Skagit County, WA," dated February 15, 2013.

GeoEngineers Inc., "Focused Environmental Site Investigation Data Report, Quiet Cove Property, Anacortes, Washington," GEI No. 5147-024-01, dated October 20, 2014.

National Marine Fisheries Service (NMFS, 2016a), "Endangered Species Act Status of West Coast Salmon and Steelhead," <http://www.nwr.noaa.gov/ESA-Salmon-Listings/upload/1-pgr-8-11.pdf>, accessed March 22, 2016.

National Marine Fisheries Service (NMFS, 2016b), "ESA Salmon Critical Habitat" <http://www.nwr.noaa.gov/Salmon-Habitat/Critical-Habitat/Index.cfm>, accessed March 22, 2016

National Marine Fisheries Service (NMFS, 2016c), "Stream Net: Critical Habitat Mapper," <http://map.streamnet.org/website/bluecriticalhabitat/viewer.htm>, accessed March 22, 2016

National Marine Fisheries Service (NMFS, 2016d), "Southern Resident Killer Whale Critical Habitat," http://www.nmfs.noaa.gov/pr/pdfs/criticalhabitat/killerwhale_sr.pdf, accessed March 22, 2016.

Science Applications International Corporation (SAIC), "Port Angeles Harbor Wood Waste Study, Port Angeles, Washington," Prepared for the Washington State Department of Ecology, dated February 5, 1999.

ThermoRetec, "Results of Soil and Groundwater Sampling, Former Anacortes Terminal, Corner of 3rd Street and N-Avenue, Anacortes, Washington," dated May 26, 2000.

ThermoRetec, "Removal of Contaminated Soils From N-Street Right-Of-Way, Reisner Petroleum Terminal, Corner of 3rd Street and N-Avenue, Anacortes, Washington," Dated May 16, 2001.

Washington Department of Natural Resources (DNR), "Washington Natural Heritage Information System List of Known Occurrences of Rare Plants in Washington," <http://www1.dnr.wa.gov/nhp/refdesk/search.html>, accessed March 22, 2016.

Washington State Department of Ecology (Ecology), "Natural Background Soil Metals Concentrations in Washington State," Ecology Publication No. 94-115, dated October 1994.

Washington State Department of Ecology (Ecology), "Focus on Developing Groundwater Cleanup Standards Under the Model Toxics Control Act", Ecology Publication No. 01-09-049, dated April 2005.

Washington Department of Ecology (Ecology, 2015a), "Cleanup Levels and Risk Calculation (CLARC)," <https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx>, August 2015 update.

Washington State Department of Ecology (Ecology, 2015b), "Sediment Cleanup User's Manual II, Guidance for Implementing the Cleanup Provisions of the Sediment Management Standards, Chapter 173-204 WAC," Publication No. 12-09-057, dated March 2015.

Washington State Department of Ecology (Ecology 2016), "Updated Process for Initially Assessing the Potential for Petroleum Vapor Intrusion (Implementation Memorandum #14)", Publication No. 16-09-046, Dated March 2016.

U.S. Fish and Wildlife Service (USFWS, 2016a), "Species Information by County: Skagit County," http://ecos.fws.gov/tess_public/reports/species-by-current-range-county?fips=53057, accessed March 22, 2016.

U.S. Fish and Wildlife Service (USFWS, 2016b), "*Critical Habitat Portal*," <http://criticalhabitat.fws.gov/crithab>, accessed March 22, 2016.

U.S. Environmental Protection Agency (EPA), "Estimation Programs Interface Suite v4.11" <http://www.epa.gov/oppt/exposure/pubs/episuitedi.htm>, accessed March 22, 2016.

Table 1
Soil Screening Levels
Quiet Cove Property
Anacortes, Washington

Analyte	Criteria for Protection of Human Health ¹			Criteria for Protection of Groundwater					Modifying Factor		Soil Screening Level (Adjusted for Natural Background and PQL)	
	MTCA Method A Cleanup Level for Unrestricted Land Use	MTCA Method B Cleanup Level for Direct Contact (Standard Formula Value)		Equilibrium Partition Coefficients ²			Soil Concentration Protective of Preliminary Groundwater Cleanup Level ³		Natural Background ⁴	Practical Quantitation Limit (PQL) ⁵		
		Carc.	Non-Carc.	K _{oc} (org.)	K _d (metals)	H	Vadose Zone	Saturated Zone			Vadose Zone	Saturated Zone
Metals (mg/kg)												
Arsenic	--	0.67	24	--	29	--	2.92	0.15	20	5	20	20
Cadmium	--	--	80	--	6.7	--	1.21	0.061	1	0.20	1.2	1
Chromium (total)	--	--	120,000	--	1,000	--	1000	50.01	48	0.50	1,000	50
Lead	250	--	--	--	10,000	--	420	21	24	2	250	24
Mercury	2	--	--	--	52	4.70E-01	0.026	0.0013	0.07	0.05	0.07	0.07
Petroleum Hydrocarbons (mg/kg)												
Gasoline-Range	30/100 ⁶	--	--	--	--	--	--	--	--	5	30/100 ⁶	30/100 ⁶
Diesel-Range	2,000	--	--	--	--	--	--	--	--	5	2,000	2,000
Heavy Oil-Range	2,000	--	--	--	--	--	--	--	--	10	2,000	2,000
BETX Compounds (mg/kg)												
Benzene	--	18.18	320	62	--	2.28E-01	0.0135	0.00084	--	0.05	0.05	0.05
Ethylbenzene	--	--	8,000	204	--	3.23E-01	1.12	0.064	--	0.05	1.12	0.06
Toluene	--	--	6,400	140	--	2.72E-01	3.78	0.22	--	0.05	3.78	0.22
Xylenes	--	--	16,000	233	--	2.79E-01	2.83	0.16	--	0.05	2.83	0.16
Halogenated Volatile Organic Compounds (HVOCs; mg/kg)												
1,1,1,2-Tetrachloroethane	--	38.46	2,400	86.03	--	1.02E-01	0.04	0.00276	--	0.001	0.044	0.003
1,1,1-Trichloroethane	--	--	160,000	135	--	7.05E-01	41.50	2.209	--	0.001	41.5	2.21
1,1,2,2-Tetrachloroethane	--	5	1,600	79	--	1.41E-02	0.0168	0.00110	--	0.002	0.017	0.002
1,1,2-Trichloroethane	--	17.54	320	75	--	3.74E-02	0.0251	0.00163	--	0.001	0.025	0.002
1,1-Dichloroethane	--	175.4	16,000	53	--	2.30E-01	0.061	0.0038	--	0.001	0.061	0.0038
1,1-Dichloroethene	--	--	4,000	65	--	1.07E+00	0.023	0.0011	--	0.001	0.023	0.0011
1,1-Dichloropropene	--	--	--	60.7	--	--	--	--	--	0.001	--	--
1,2,3-Trichlorobenzene	--	--	--	1383	--	5.11E-02	--	--	--	0.005	--	--
1,2,3-Trichloropropane	--	0.033	320	115.8	--	1.40E-02	--	--	--	0.002	0.033	0.033
1,2,4-Trichlorobenzene	--	34.48	800	1,659	--	5.82E-02	0.019	0.001	--	0.005	0.019	0.005
1,2-Dibromo-3-chloropropane	--	1.25	16	116	--	6.01E-03	--	--	--	0.005	1.25	1.25
1,2-Dichlorobenzene	--	--	7,200	379	--	7.79E-02	30.12	1.71	--	0.001	30.12	1.71
1,2-Dichloroethane (EDC)	--	10.99	480	38	--	4.01E-02	0.0203	0.00136	--	0.001	0.02	0.001
1,2-Dichloropropane	--	27.78	7200	47	--	1.15E-01	0.0200	0.00130	--	0.001	0.02	0.001
1,3-Dichlorobenzene	--	--	--	375.3	--	--	--	--	--	0.001	--	--
1,3-Dichloropropane	--	--	--	72.17	--	3.99E-02	--	--	--	0.001	--	--
1,4-Dichlorobenzene	--	185.2	5600	616	--	9.96E-02	0.08	0.0044	--	0.067	0.08	0.067
2,2-Dichloropropane	--	--	--	43.89	--	--	--	--	--	0.001	--	--
2-Chloroethyl Vinyl Ether	--	--	--	18	--	--	--	--	--	0.005	--	--
2-Chlorotoluene	--	--	1,600	382.9	--	1.46E-01	--	--	--	0.001	1,600	1,600
4-Chlorotoluene	--	--	--	375	--	--	--	--	--	0.001	--	--
Bromobenzene	--	--	--	2.34E+02	--	1.01E-01	--	--	--	0.001	--	--
Bromochloromethane	--	--	--	2.17E+01	--	5.97E-02	--	--	--	0.005	--	--

Analyte	Criteria for Protection of Human Health ¹			Criteria for Protection of Groundwater					Modifying Factor		Soil Screening Level (Adjusted for Natural Background and PQL)	
	MTCA Method A Cleanup Level for Unrestricted Land Use	MTCA Method B Cleanup Level for Direct Contact (Standard Formula Value)		Equilibrium Partition Coefficients ²			Soil Concentration Protective of Preliminary Groundwater Cleanup Level ³		Natural Background ⁴	Practical Quantitation Limit (PQL) ⁵		
		Carc.	Non-Carc.	K _{oc} (org.)	K _d (metals)	H	Vadose Zone	Saturated Zone				
Bromoform	--	126.6	1,600	126	--	2.19E-02	0.787	0.0495	--	0.001	0.79	0.05
Bromomethane	--	--	112	9	--	2.56E-01	0.060	0.0038	--	0.001	0.06	0.0038
Carbon Tetrachloride	--	14.29	320	152	--	1.25E+00	0.005	0.00024	--	0.001	0.005	0.001
Chlorobenzene	--	--	1,600	224	--	1.52E-01	2.50	0.146	--	0.001	2.5	0.146
Chloroethane	--	--	--	21.73	--	4.54E-01	95.47	5.64	--	0.005	95.47	5.64
Chloroform	--	32.26	800	53	--	1.50E-01	0.0064	0.00041	--	0.001	0.0064	0.001
Chloromethane	--	--	--	6	--	3.61E-01	0.73	0.045	--	0.001	0.725	0.045
Cis-1,2-Dichloroethene	--	--	160	35.5	--	1.67E-01	--	--	--	0.001	160	160
Cis-1,3-Dichloropropene	--	--	--	72	--	--	--	--	--	0.001	--	--
Dibromochloromethane	--	11.9	1,600	63.1	--	3.21E-02	0.0241	0.00158	--	0.001	0.024	0.002
Dibromomethane	--	--	800	21.73	--	3.36E-02	--	--	--	0.001	800	800
Dichlorodifluoromethane (CFC 12)	--	--	16,000	43.89	--	1.40E+01	0.17	0.0019	--	0.001	0.17	0.0019
1,2-Dibromoethane (EDB)	--	0.5	720	66	--	2.66E-02	0.0015	0.000099	--	0.001	0.002	0.001
Methyl Iodide	--	--	--	13	--	--	--	--	--	0.001	--	--
Methyl t-Butyl Ether (MTBE)	--	555.6	--	11	--	1.80E-02	2.592	0.182	--	0.001	2.59	0.18
Methylene Chloride	--	500	480	10	--	8.98E-02	4.356	0.2967	--	0.002	4.36	0.3
n-Hexane	--	--	4800	1,482	--	6.50E-01	0.27	0.014	--	0.001	0.27	0.01
Tetrachloroethene (PCE)	--	476.2	480	265	--	7.54E-01	0.094	0.0049	--	0.001	0.094	0.0049
Trans-1,2-Dichloroethene	--	--	1,600	38	--	3.85E-01	21.71	1.299	--	0.001	21.71	1.3
Trans-1,3-Dichloropropene	--	--	--	72	--	--	--	--	--	0.001	--	--
Trichloroethene (TCE)	--	12	40	94	--	4.22E-01	0.0103	0.00059	--	0.001	0.01	0.001
Trichlorofluoromethane (CFC 11)	--	--	24,000	44	--	3.97E+00	1.41	0.04	--	0.001	1.4	0.04
Vinyl Chloride	--	0.67	240	18.6	--	1.11E+00	0.0063	0.00031	--	0.001	0.006	0.001
Non-carcinogenic Polycyclic Aromatic Hydrocarbons (PAHs; mg/kg)												
1-Methylnaphthalene	--	34.48	5600	2,528	--	2.10E-02	--	--	--	0.0067	34.48	34.48
2-Methylnaphthalene	--	--	320	2,478	--	2.12E-02	0.77	0.040	--	0.0067	0.77	0.04
Acenaphthene	--	--	4,800	4,898	--	7.52E-03	0.32	0.02	--	0.0067	0.32	0.02
Acenaphthylene	--	--	--	5,027	--	--	--	0.068	--	0.0067	--	0.068
Anthracene	--	--	24,000	23,493	--	2.67E-03	4	0.2	--	0.0067	4.41	0.2
Benzo[g,h,i]perylene	--	--	--	1,951,000	--	--	--	1.95	--	0.0067	--	1.95
Fluoranthene	--	--	3,200	49,096	--	6.60E-04	3.20	0.16	--	0.0067	3.2	0.16
Fluorene	--	--	3,200	7,707	--	2.61E-03	0.46	0.02		0.0067	0.5	0.02
Naphthalene	--	--	1,600	1,191	--	1.98E-02	0.25	0.013	--	0.0067	0.25	0.01
Phenanthrene	--	--	--	16,690	--	--	--	0.10	--	0.0067	--	0.101
Pyrene	--	--	2,400	67,992	--	4.51E-04	20.01	1.00	--	0.0067	20	1
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs; mg/kg)												
Benzo[a]anthracene	--	1.37	--	357,537	--	1.37E-04	0.07	0.0036	--	0.0067	0.07	0.007
Benzo[a]pyrene	--	0.14	--	968,774	--	4.63E-05	0.19	0.010	--	0.0067	0.14	0.010
Benzo[b]fluoranthene	--	1.37	--	1,230,000	--	4.55E-03	0.25	0.012	--	0.0067	0.25	0.012
Benzo[k]fluoranthene	--	13.7	--	1,230,000	--	3.40E-05	0.32	0.016	--	0.0067	0.32	0.016
Chrysene	--	137	--	398,000	--	3.88E-03	0.25	0.0124	--	0.0067	0.25	0.0124
Dibenz[a,h]anthracene	--	0.14	--	1,789,101	--	6.03E-07	0.36	0.018	--	0.0067	0.14	0.018
Indeno[1,2,3-c,d]pyrene	--	1.37	--	3,470,000	--	6.56E-05	0.69	0.035	--	0.0067	0.69	0.035
cPAHs TEQ	--	--	--	968,774	--	4.63E-05	0.22	0.011	--	0.0067	0.22	0.011

Analyte	Criteria for Protection of Human Health ¹			Criteria for Protection of Groundwater					Modifying Factor		Soil Screening Level (Adjusted for Natural Background and PQL)	
	MTCA Method A Cleanup Level for Unrestricted Land Use	MTCA Method B Cleanup Level for Direct Contact (Standard Formula Value)		Equilibrium Partition Coefficients ²			Soil Concentration Protective of Preliminary Groundwater Cleanup Level ³		Natural Background ⁴	Practical Quantitation Limit (PQL) ⁵		
		Carc.	Non-Carc.	K _{oc} (org.)	K _d (metals)	H	Vadose Zone	Saturated Zone			Vadose Zone	Saturated Zone
Polychlorinated Biphenyls (PCBs; mg/kg)												
Total PCBs (Sum of Aroclors or Congeners)	1	0.5	--	309,000	--	1.20E-02	0.062	0.0031	--	0.05	0.062	0.05
Dioxins and Furans (ng/kg)												
Total dioxins/furans - human health TEQ	--	12.82	93	249,100	--	0.002	0.080	0.004	5.2 ⁷	2.2	5.2 ⁷	5.2 ⁷

Notes:

¹MTCA Method A soil cleanup levels are shown for those chemicals for which Method B values are not available (e.g., petroleum hydrocarbons and lead). MTCA Method A value for total PCBs is also included to show chemical-specific cleanup level mandated in the Federal Toxic Substance Control Act (TSCA).

² Values for Kd and/or Koc and/or Henry's Law Constant not available from Cleanup Levels and Risk Calculation (CLARC) database were referenced from Estimation Program Interface (EPI) EPI Suite v4.11 (<http://www.epa.gov/oppt/exposure/pubs/episuitedi.htm>) or Oak Ridge National Laboratory (ORNL) Risk Assessment Information System (RAIS).

³ Soil concentrations protective of groundwater calculated per WAC 173-340-740(3)(b)(iii)(A) using Equations 747-1 and 747-2 referencing groundwater screening levels presented in Table 2. Method A Cleanup Values are used for petroleum hydrocarbon soil concentrations protective of groundwater.

⁴ Metals background values (Puget Sound Region 90th percentile values) are from *Natural Background Soil Metals Concentrations in Washington State* (Ecology Publication #94-115, 1994), with the exception of arsenic which is referenced from MTCA Table 745-1 (WAC 173-340-900).

⁵ Lowest available PQL value from Analytical Resources Inc. (ARI) of Tukwila, Washington.

⁶ Screening level for gasoline-range petroleum hydrocarbons is 30 mg/kg if benzene is present and 100 mg/kg if not present.

⁷ Background for dioxins/furans from "Natural Background for Dioxins/Furans in WA Soils." Ecology Technical Memorandum #8 dated August 9, 2010.

EPA = Environmental Protection Agency

k_d = Distribution coefficient

k_{oc} = Soil organic carbon-water partitioning coefficient (L/kg)

L/kg = Liter per kilogram

mg/kg = Milligrams per kilogram

ng/kg = Nanogram per kilogram

MTCA = Washington State Model Toxics Control Act

PQL = Practical quantitation limit

-- = No screening criteria available.

TEQ = Toxic equivalent concentration (toxicity equivalency factor (TEF) values are presented in Table 5).

Calculated concentrations protective of groundwater as marine surface water assume unsaturated soil, and are calculated based on groundwater screening levels before adjustment for background and PQLs.

Table 2
Groundwater Screening Levels
Quiet Cove Property
Anacortes, Washington

Analyte	Criteria for Protection of Aquatic Organisms and Human Health									Groundwater Screening Level Protective of Sediment ⁵	MTCA Method B Groundwater Screening Level for Protection of Vapor Intrusion		Modifying Factor		Groundwater Screening Level (Adjusted for Natural Background and PQL)
	Marine Surface Water Quality Criteria ¹		National Toxics Rule ²		Clean Water Act ³		MTCA Method B Surface Water Cleanup Level ⁴	Natural Background ⁶	Practical Quantitation Limit (PQL) ⁷						
			Protection of Marine Aquatic Life		AWQC for Protection of Human Health	Protection of Marine Aquatic Life									
			Acute	Chronic		Acute					Chronic	Acute	Chronic		
Metals (µg/L)															
Arsenic	69	36	69	36	0.14	69	36	0.14	0.098	43.1	--	--	5	0.5	5
Cadmium	42	9.3	42	9.3	--	40	8.8	--	40.5	114.5	--	--	--	0.1	8.8
Chromium ⁸ (total)	1,100	50	1,100	50	--	1,100	50	--	243,056	389.9	--	--	--	1	50
Lead	210	8.1	210	8.1	--	210	8.1	--	--	2.1	--	--	--	0.1	2.1
Mercury	1.8	0.025	2.1	0.025	0.15	1.8	0.94	0.3	--	3.8	--	0.89	--	0.02	0.025
Petroleum Hydrocarbons (µg/L)															
Gasoline-Range	--	--	--	--	--	--	--	--	800/1000 ^{9,10}	--	--	--	--	100	800/1000 ⁹
Diesel-Range	--	--	--	--	--	--	--	--	500 ⁹	--	--	--	--	100	500
Heavy Oil-Range	--	--	--	--	--	--	--	--	500 ⁹	--	--	--	--	200	500
BETX Compounds (µg/L)															
Benzene	--	--	--	--	71	71	71	58	22.66	--	2.4	102.7	--	0.2	2.4
Ethylbenzene	--	--	--	--	29,000	29000	29000	130	6,823	--	--	2,783	--	0.2	130
Toluene	--	--	--	--	200,000	200000	200000	520	18,855	--	--	15,584	--	0.2	520
Xylenes	--	--	--	--	--	--	--	--	--	--	--	310	--	0.2	310
Halogenated Volatile Organic Compounds (HVOCs; µg/L)															
1,1,1,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	7.40	--	--	0.2	7.40
1,1,1-Trichloroethane	--	--	--	--	--	--	--	200,000	925,926	--	--	5,238	--	0.2	5,238
1,1,2,2-Tetrachloroethane	11	11	11	11	11	11	11	3	6.48	--	6.20	--	--	0.2	3
1,1,2-Trichloroethane	--	--	--	--	42	42	42	8.9	25.27	--	7.71	4.51	--	0.2	4.51
1,1-Dichloroethane	--	--	--	--	--	--	--	20,000	--	--	11.230	--	--	0.2	11.23
1,1-Dichloroethene	--	--	--	--	3.2	3.2	3.2	7,100	23,148	--	--	130.0	--	0.2	3.2
1,1-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.20	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.50	--
1,2,3-Trichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.5	--
1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	0.076	2.03	--	--	39.18	--	0.5	0.50
1,2-Dibromo-3-chloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.5	--
1,2-Dichlorobenzene	--	--	--	17000	17,000	17000	17000	3,000	4,167	--	--	2,571	--	0.2	2,571
1,2-Dichloroethane (EDC)	--	--	--	99	99	99	99	650	59.35	--	4.20	139.8	--	0.2	4.20
1,2-Dichloropropane	--	--	--	--	--	--	--	31	43.91	--	3.89	28.44	--	0.2	3.89
1,3-Dichlorobenzene	--	--	--	2600	2,600	2600	2600	10	2,600	--	--	--	--	0.2	10
1,3-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.20	--
1,4-Dichlorobenzene	--	--	--	2600	2,600	2600	2600	900	214.3	--	4.85	7,808	--	0.2	4.85
2,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.20	--
2-Chloroethyl Vinyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	1.0	--
2-Chlorotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	1.0	--
4-Chlorotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.20	--
Bromobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.20	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.20	--
Bromoform	--	--	--	--	360	360	360	120	215.9	--	200.0	--	--	0.2	120

Analyte	Criteria for Protection of Aquatic Organisms and Human Health									Groundwater Screening Level Protective of Sediment ⁵	MTCA Method B Groundwater Screening Level for Protection of Vapor Intrusion		Modifying Factor		Groundwater Screening Level (Adjusted for Natural Background and PQL)
	Marine Surface Water Quality Criteria ¹		National Toxics Rule ²		Clean Water Act ³		MTCA Method B Surface Water Cleanup Level ⁴	Natural Background ⁶	Practical Quantitation Limit (PQL) ⁷						
			Protection of Marine Aquatic Life		AWQC for Protection of Human Health	Protection of Marine Aquatic Life									
			Acute	Chronic		Acute					Chronic				
Bromomethane	--	--	--	--	4,000	4000	4000	10,000	955.2	--	--	13.00	--	1.0	13
Carbon Tetrachloride	--	--	--	--	4.4	4.4	4.4	5.0	4.87	--	0.54	59.16	--	0.2	0.54
Chlorobenzene	--	--	--	--	21,000	21000	21000	800	5,185	--	--	285.7	--	0.2	286
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	18,286	--	0.2	18,286
Chloroform	--	--	--	--	470	470	470	2,000	55.02	--	1.20	494.6	--	0.2	1.2
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	152.8	--	0.5	152.8
Cis-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.2	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.2	--
Dibromochloromethane	--	--	--	--	34	34	34	27	20.31	--	4.53	--	--	0.2	4.53
Dibromomethane	--	--	--	--	--	--	--	--	--	--	--	--	--	0.2	--
Dichlorodifluoromethane (CFC 12)	--	--	--	--	--	--	--	--	--	--	--	5.66	--	0.2	5.66
1,2-Dibromoethane (EDB)	--	--	--	--	--	--	--	--	--	--	0.28	276.8	--	0.2	0.3
Methyl Iodide	--	--	--	--	--	--	--	--	--	--	--	--	--	1.0	--
Methyl t-Butyl Ether (MTBE)	--	--	--	--	--	--	--	--	--	--	610.0	87,003	--	0.5	610
Methylene Chloride	--	--	--	--	1,600	1600	1600	1,000	3,601	--	4,434	4,865	--	1.0	1,000
n-Hexane	--	--	--	--	--	--	--	--	--	--	--	7.8000	--	0.2	7.8
Tetrachloroethene (PCE)	--	--	--	--	8.85	8.85	8.85	29	99.56	--	22.89	43.5	--	0.2	8.9
Trans-1,2-Dichloroethene	--	--	--	--	--	--	--	4,000	32,407	--	--	--	--	0.2	4,000
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	0.2	--
Trichloroethene (TCE)	--	--	--	--	81	81	81	7	12.81	--	1.55	3.84	--	0.2	1.55
Trichlorofluoromethane (CFC 11)	--	--	--	--	--	--	--	--	--	--	--	120.0	--	0.2	120
Vinyl Chloride	--	--	--	--	525	525	525	1.6	3.7	--	0.35	56.69	--	1.0	1
Non-carcinogenic Polycyclic Aromatic Hydrocarbons (PAHs; µg/L)															
1-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	1.0	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	14.45	--	--	--	1.0	14.45
Acenaphthene	--	--	--	--	--	--	--	90	648.1	3.17	--	--	--	1.0	3.17
Acenaphthylene	--	--	--	--	--	--	--	--	--	12.75	--	--	--	1.0	12.75
Anthracene	110000	110000	110000	110000	110,000	110000	110000	400	25,926	9.3	--	--	--	1.0	9.3
Benzo[g,h,i]perylene	--	--	--	--	--	--	--	--	--	0.016	--	--	--	1.0	1
Fluoranthene	370	370	370	370	370	370	370	20	86.42	3.25	--	--	--	1.0	3.25
Fluorene	14000	14000	14000	14000	14,000	14000	14000	70	3,457	2.93	--	--	--	1.0	2.93
Naphthalene	--	--	--	--	--	--	--	--	4,714	73.78	8.93	166.5	--	1.0	8.93
Phenanthrene	--	--	--	--	--	--	--	--	--	5.94	--	--	--	1.0	5.94
Pyrene	11000	11000	11000	11000	11,000	11000	11000	30	2,593	14.68	--	--	--	1	14.68
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs; µg/L)															
Benzo[a]anthracene	0.0311	0.0311	0.0311	0.0311	0.031	0.0311	0.0311	0.0013	0.30	0.31	--	--	--	0.01	0.01
Benzo[a]pyrene	0.0311	0.0311	0.0311	0.0311	0.031	0.0311	0.0311	0.00013	0.03	0.033	--	--	--	0.01	0.01
Benzo[b]fluoranthene	0.0311	0.0311	0.0311	0.0311	0.031	0.0311	0.0311	0.0013	0.30	0.19	--	--	--	0.01	0.01
Benzo[k]fluoranthene	0.0311	0.0311	0.0311	0.0311	0.031	0.0311	0.0311	0.013	2.96	0.26	--	--	--	0.01	0.013
Chrysene	0.0311	0.0311	0.0311	0.0311	0.031	0.0311	0.0311	0.130	29.6	0.28	--	--	--	0.01	0.031
Dibenz[a,h]anthracene	0.0311	0.0311	0.0311	0.0311	0.031	0.0311	0.0311	0.00013	0.03	0.0067	--	--	--	0.01	0.01
Indeno[1,2,3-c,d]pyrene	0.0311	0.0311	0.0311	0.0311	0.031	0.0311	0.0311	0.0013	0.30	0.0098	--	--	--	0.01	0.01
cPAHs TEQ	--	--	--	--	0.031	--	--	0.018	0.03	0.011	--	--	--	0.01	0.011

Analyte	Criteria for Protection of Aquatic Organisms and Human Health									Groundwater Screening Level Protective of Sediment ⁵	MTCA Method B Groundwater Screening Level for Protection of Vapor Intrusion		Modifying Factor		Groundwater Screening Level (Adjusted for Natural Background and PQL)
	Marine Surface Water Quality Criteria ¹		National Toxics Rule ²		Clean Water Act ³		MTCA Method B Surface Water Cleanup Level ⁴	Natural Background ⁶	Practical Quantitation Limit (PQL) ⁷						
			Protection of Marine Aquatic Life		AWQC for Protection of Human Health	Protection of Marine Aquatic Life					AWQC for Protection of Human Health				
						Acute						Chronic	Acute	Chronic	
	Acute	Chronic	Acute	Chronic		Acute	Chronic			Carc.	Non-Carc.				
Polychlorinated Biphenyls (PCBs; µg/L)															
Total PCBs (Sum of Aroclors or Congeners)	10	0.03	0.00017	0.03	0.00017	0.00017	0.03	0.000064	0.0001	0.039	–	–	–	0.01	0.010
Dioxins and Furans (ng/L)															
Total dioxins/furans - human health TEQ	–	–	–	–	0.014	–	–	0.0051	0.01	10.56	–	–	–	0.016	0.016

Notes:

- ¹ Water quality criteria for protection of aquatic life from WAC 173-201A-240 (Water Quality Standards for Surface Waters of the State of Washington).
- ² Ambient water quality criteria (AWQC) for protection of human health from 40 CFR Part 131d (National Toxics Rule).
- ³ National Recommended Water Quality Criteria (<http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm>; accessed March 2016).
- ⁴ The values presented are the lowest of the MTCA Method B carcinogenic and non-carcinogenic criteria for surface water. The carcinogenic and non-carcinogenic criteria for surface water are adjusted for cases when a state or federal surface water standard is available, but is not considered to be "sufficiently protective" under MTCA (that is, the standard is based on a hazard quotient greater than 1 or a cancer risk greater than 1 x 10-5). For these cases, WAC 173-340-720(7)(b) and -730(5)(b) allows the standard to be adjusted downward to a hazard quotient of 1 or a cancer risk of 1 x 10-5.
- ⁵ For ionizing organics, C_w (µg/L) = (C_{sed} (mg/kg OC) / K_{oc} (L/kg OC)) x 1000 µg/mg; for non-ionizing organics, C_w (mg/L) = (C_{sed} (mg/kg) / K_d (L/kg)*foc) x 1000 µg/kg (assumes foc of 2%) and for metals, C_w (mg/L) = (C_{sed} (mg/kg) / K_d (L/kg)) x 1000 µg/kg.
- ⁶ Metals background values (Puget Sound Region 90th percentile values) are from *Natural Background Soil Metals Concentrations in Washington State* (Ecology Publication #94-115, 1994), with the exception of arsenic which is referenced from MTCA Table 745-1 (WAC 173-340-900).
- ⁷ Lowest available PQL value from Analytical Resources Inc. (ARI) of Tukwila, Washington.
- ⁸ Trivalent chromium (chromium III) is assumed where no value is available for total chromium.
- ⁹ MTCA Method A groundwater cleanup level; MTCA Method B surface water cleanup level is not available for total petroleum hydrocarbons.
- ¹⁰ The screening level for gasoline-range petroleum hydrocarbons is 800 µg/L if benzene is present and 1,000 µg/L if not present.

MTCA = Washington State Model Toxics Control Act

ng/L = Nanogram per liter

µg/L = Microgram per liter

PQL = Practical quantitation limit

– = No screening criteria available.

TEQ = Toxic equivalent concentration (toxicity equivalency factor (TEF) values are presented in Table 5).

Table 3
Sediment Screening Levels for Protection of Benthic Organisms
Quiet Cove Property
Anacortes, Washington

Analyte	Criteria for Protection of Benthic Organisms						Modifying Factors		Units	Sediment Screening Level for Protection of Benthic Organisms ⁵ (Adjusted for Natural Background and PQL)				
	Sediment Management Standard ¹ (SMS)			Apparent Effects Threshold (AET) Criteria ²			Natural Background ³	Practical Quantitation Limit (PQL) ⁴		Organic Carbon (0.5% to 3.5%)	Units	Organic Carbon (<0.5% or >3.5%)	Units	
	Sediment Quality Objectives (SQO)	Cleanup Screening Level (CSL)	Units	Lowest AET (LAET)	Second Lowest AET (2LAET)	Units								
Metals														
Arsenic	57	93	mg/kg	57	93	mg/kg	11	5	mg/kg	57	mg/kg	57	mg/kg	
Cadmium	5.1	6.7		5.1	6.7		1	0.2		5.1		5.1		
Chromium (total)	260	270		260	270		62	0.5		260		260		
Copper	390	390		390	390		45	0.2		390		390		
Lead	450	530		450	530		21	2		450		450		
Mercury	0.41	0.59		0.41	0.59		0.2	0.05		0.41		0.41		
Silver	6.1	6.1		6.1	6.1		0.2	0.3		6.1		6.1		
Zinc	410	960		410	960		93	1		410		410		
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs)														
Total LPAH ⁶	370	780	mg/kg OC	5.2	5.2	mg/kg	--	0.005	mg/kg	370	mg/kg OC	5.2	mg/kg	
Naphthalene	99	170		2.1	2.1		--	0.005		99		2.1		
Acenaphthylene	66	66		1.3	1.3		--	0.005		66		1.3		
Acenaphthene	16	57		0.5	0.5		--	0.005		16		0.5		
Fluorene	23	79		0.54	0.54		--	0.005		23		0.54		
Phenanthrene	100	480		1.5	1.5		--	0.005		100		1.5		
Anthracene	220	1,200		0.96	0.96		--	0.005		220		0.96		
2-Methylnaphthalene	38	64		0.67	0.67		--	0.005		38		0.67		
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)														
Total HPAH ⁷	960	5,300	mg/kg OC	12	17	mg/kg	--	0.005	mg/kg	960	mg/kg OC	12	mg/kg	
Fluoranthene	160	1,200		1.7	2.5		--	0.005		160		1.7		
Pyrene	1,000	1,400		2.6	3.3		--	0.005		1000		2.6		
Benzo(a)anthracene	110	270		1.3	1.6		--	0.005		110		1.3		
Chrysene	110	460		1.4	2.8		--	0.005		110		1.4		
Total benzo(a)fluoranthenes	230	450		3.2	3.6		--	0.005		230		3.2		
Benzo(a)pyrene	99	210		1.6	1.6		--	0.005		99		1.6		
Indeno(1,2,3-c,d)pyrene	34	88		0.60	0.69		--	0.005		34		0.60		
Dibenzo(a,h)anthracene	12	33		0.23	0.23		--	0.005		12		0.23		
Benzo(ghi)perylene	31	78		0.67	0.72		--	0.005		31		0.67		
Chlorinated Organic Compounds														
1,2-Dichlorobenzene	2.3	2.3	mg/kg OC	0.035	0.05	mg/kg	--	0.2	mg/kg	2.3	mg/kg OC	0.035	mg/kg	
1,4-Dichlorobenzene	3.1	9		0.11	0.11		--	0.2		3.1		0.11		
1,2,4-Trichlorobenzene	0.81	1.8		0.031	0.051		--	0.2		0.81		0.031		
Hexachlorobenzene	0.38	2.3		0.022	0.07		--	0.001		0.38		0.022		
Phthalates														
Dimethyl phthalate	53	53	mg/kg OC	0.071	0.16	mg/kg	--	0.02	mg/kg	53	mg/kg OC	0.071	mg/kg	
Diethyl phthalate	61	110		0.2	> 1.2		--	0.02		61		0.2		
Dibutyl phthalate	220	1,700		1.4	1.4		--	0.02		220		1.4		
Butyl benzyl phthalate	4.9	64		0.063	0.9		--	0.02		4.9		0.063		
Bis(2-ethylhexyl) phthalate	47	78		1.3	1.9		--	0.05		47		1.3		
Di-n-octyl phthalate	58	4,500		6.2	6.2		--	0.02		58		6.2		

Analyte	Criteria for Protection of Benthic Organisms						Modifying Factors		Units	Sediment Screening Level for Protection of Benthic Organisms ⁵ (Adjusted for Natural Background and PQL)				
	Sediment Management Standard ¹ (SMS)			Apparent Effects Threshold (AET) Criteria ²			Natural Background ³	Practical Quantitation Limit (PQL) ⁴		Organic Carbon (0.5% to 3.5%)	Units	Organic Carbon (<0.5% or >3.5%)	Units	
	Sediment Quality Objectives (SQO)	Cleanup Screening Level (CSL)	Units	Lowest AET (LAET)	Second Lowest AET (2LAET)	Units								
Miscellaneous Extractables														
Dibenzofuran	15	58	mg/kg OC	0.54	0.54	mg/kg	--	0.02	mg/kg	15	mg/kg OC	0.54	mg/kg	
Hexachlorobutadiene	3.9	6.2		0.011	0.12		--	0.001		3.9		0.011		
N-nitrosodiphenylamine	11	11		0.028	0.04		--	0.02		11		0.028		
Benzyl alcohol	0.057	0.073	mg/kg	0.057	0.073	mg/kg	--	0.02	mg/kg	0.057	mg/kg	0.057	mg/kg	
Benzoic acid	0.65	0.65		0.65	0.65		--	0.2		0.65		0.65		
Phenols														
Phenol	0.42	1	mg/kg	0.42	1.2	mg/kg	--	0.1	mg/kg	0.42	mg/kg	0.42	mg/kg	
2-Methylphenol	0.063	0.063		0.63	0.063		--	0.02		0.063		0.063		
4-Methylphenol	0.67	0.67		0.67	0.67		--	0.02		0.67		0.67		
2,4-Dimethylphenol	0.029	0.29		0.029	0.029		--	0.025		0.029		0.029		
Pentachlorophenol	0.36	0.69		0.36	0.69		--	0.1		0.36		0.36		
Polychlorinated Biphenyls (PCBs)														
Total PCBs (Sum of Total of Aroclors)	12	65	mg/kg OC	0.13	1	mg/kg	0.0035	0.000002	mg/kg	12	mg/kg OC	0.13	mg/kg	

Notes:

- ¹ Sediment Management Standards (SMS) (Chapter 173-204 WAC).
- ² Apparent Effects Threshold (AET) Criteria from Table 8-1 of the Draft Sediment Cleanup Users Manual II (Ecology, 2015).
- ³ Metals background values (Puget Sound Region 90th percentile values) are from *Natural Background Soil Metals Concentrations in Washington State* (Ecology Publication #94-115, 1994), with the exception of arsenic which is reference from MTCA A Table 745-1 (WAC 173-340-900).
- ⁴ Lowest available PQL value from Analytical Resources Inc. (ARI) of Tukwila, Washington.
- ⁵ The organic carbon normalized SMS criteria are applicable to sediment with a total organic carbon (TOC) concentration ranging from 0.5 to 3.5 percent inclusive. Sediment with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against the AET Screening Level on a dry weight basis (EPA, 1988).
- ⁶ Total LPAHs are the sum of naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene and anthracene; 2-methylnapthalene is not included in the sum of LPAHs.
- ⁷ Total HPAHs are the sum of fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(a)pyrene, indeno(1,2,3-c-d)pyrene, dibenzo(a,h)anthracene and benzo(g,h,i)perylene.

mg/kg = milligram per kilogram

mg/kg OC = milligram per kilogram normalized to organic carbon

ng/kg = nanogram per kilogram

µg/kg = microgram per kilogram

µg/L = microgram per liter

-- = Criteria not applicable or not available

EPA = Environmental Protection Agency

TEQ = Toxic equivalent concentration (toxicity equivalency factor (TEF) values are presented in Table 5).

Table 4											
Sediment Screening Levels for Protection of Human Health and Higher Trophic Level Ecological Receptors											
Quiet Cove Property											
Anacortes, Washington											
Analyte	Criteria for Protection of Human Health							Modifying Factors		Sediment Screening Level for Protection of Human Health and Higher Trophic Level Ecological Receptors ⁵	
	Bioaccumulation via Consumption of Aquatic Organisms	Direct Contact via Beach Play ²		Direct Contact via Clamming ²		Direct Contact via Net Fishing ²		Natural Background ³	Practical Quantitation Limit ⁴ (PQL)		
	Natural Background or PQL ¹	Carcinogenic (at 10 ⁻⁶ risk)	Non-Carcinogenic	Carcinogenic (at 10 ⁻⁶ risk)	Non-Carcinogenic	Carcinogenic (at 10 ⁻⁶ risk)	Non-Carcinogenic			Intertidal Sediment (above -3 ft MLLW)	Subtidal Sediment (below -3 ft MLLW)
Metals (mg/kg)											
Arsenic	11	4.5	160	0.45	190	2.9	1,200	11	5	11	11
Cadmium	0.8	--	380	--	280	--	3,300	0.8	0.2	0.8	0.8
Chromium (total)	--	--	400,000	--	230,000	--	3,700,000	62	0.5	230,000	3,700,000
Copper	--	--	26,000	--	50,000	--	180,000	45	0.2	26,000	180,000
Lead	21	--	--	--	--	--	--	21	2	21	21
Mercury	0.2	--	190	--	370	--	1,400	0.2	0.05	0.2	0.2
Silver	--	--	3,200	--	6,200	--	23,000	0.2	0.3	3,200	23,000
Zinc	--	--	190,000	--	370,000	--	1,400,000	93	1	190,000	1,400,000
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; mg/kg)											
Total LPAH ⁶	--	--	--	--	--	--	--	--	0.005	--	--
Naphthalene	--	--	9,100	--	8,200	--	74,000	--	0.005	8,200	74,000
Acenaphthylene	--	--	27,000	--	25,000	--	220,000	--	0.005	25,000	220,000
Acenaphthene	--	--	27,000	--	25,000	--	220,000	--	0.005	25,000	220,000
Fluorene	--	--	18,000	--	16,000	--	150,000	--	0.005	16,000	150,000
Phenanthrene	--	--	140,000	--	120,000	--	1,100,000	--	0.005	120,000	1,100,000
Anthracene	--	--	140,000	--	120,000	--	1,100,000	--	0.005	120,000	1,100,000
2-Methylnaphthalene	--	--	1,800	--	1,600	--	15,000	--	0.005	1,600	15,000
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; mg/kg)											
Total HPAH ⁷	--	--	--	--	--	--	--	--	0.005	--	--
Fluoranthene	--	--	18,000	--	16,000	--	150,000	--	0.005	16,000	150,000
Pyrene	--	--	14,000	--	12,000	--	110,000	--	0.005	12,000	110,000
Benzo(a)anthracene	--	7.8	--	0.6	--	5.4	--	--	0.005	0.60	5
Chrysene	--	78	--	6	--	54	--	--	0.005	6.0	54
Benzofluoranthenes (b, J, k)	--	7.8	--	0.6	--	5.4	--	--	0.005	0.60	5.4
Benzo(a)pyrene	--	0.78	--	0.06	--	0.54	--	--	0.005	0.060	0.54
Indeno(1,2,3-c,d)pyrene	--	7.8	--	0.6	--	5.4	--	--	0.005	0.60	5.4
Dibenzo(a,h)anthracene	--	7.8	--	0.6	--	5.4	--	--	0.005	0.60	5.4
Benzo(ghi)perylene	--	--	14,000	--	12,000	--	110,000	--	0.005	12,000	110,000
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs; mg/kg)											
Total cPAHs - TEQ	0.021	0.78	--	0.06	--	0.54	--	0.021	0.005	0.021	0.021
Chlorinated Organic Compounds (mg/kg)											
1,2-Dichlorobenzene	--	--	45,000	--	46,000	--	350,000	--	0.2	45,000	350,000
1,4-Dichlorobenzene	--	1,100	35,000	100	36,000	780	270,000	--	0.2	100	780
1,2,4-Trichlorobenzene	--	210	4,900	19	5,100	140	39,000	--	0.2	19	140
Hexachlorobenzene	--	3.9	400	0.34	410	2.6	3,100	--	0.001	0.34	2.6

Analyte	Criteria for Protection of Human Health							Modifying Factors		Sediment Screening Level for Protection of Human Health and Higher Trophic Level Ecological Receptors ⁵	
	Bioaccumulation via Consumption of Aquatic Organisms	Direct Contact via Beach Play ²		Direct Contact via Clamming ²		Direct Contact via Net Fishing ²		Natural Background ³	Practical Quantitation Limit ⁴ (PQL)		
	Natural Background or PQL ¹	Carcinogenic (at 10 ⁻⁶ risk)	Non-Carcinogenic	Carcinogenic (at 10 ⁻⁶ risk)	Non-Carcinogenic	Carcinogenic (at 10 ⁻⁶ risk)	Non-Carcinogenic			Intertidal Sediment (above -3 ft MLLW)	Subtidal Sediment (below -3 ft MLLW)
Phthalates (mg/kg)											
Diethyl phthalate	--	--	400,000	--	410,000	--	3,100,000	--	0.02	400,000	3,100,000
Dibutyl phthalate	--	--	49,000	--	51,000	--	390,000	--	0.02	49,000	390,000
Butyl benzyl phthalate	--	3,300	99,000	290	100,000	2,200	780,000	--	0.02	290	2,200
Bis(2-ethylhexyl) phthalate	--	440	9,900	39	10,000	300	78,000	--	0.05	39	300
Di-n-octyl phthalate	--	--	4,900	--	5,100	--	39,000	--	0.02	4,900	39,000
Miscellaneous Extractables (mg/kg)											
Dibenzofuran	--	--	490	--	510	--	3,900	--	0.02	490	3,900
Hexachlorobutadiene	--	79	490	7	510	54	3,900	--	0.001	7.0	54
N-nitrosodiphenylamine	--	1,300	--	110	--	860	--	--	0.02	110	860
Benzyl alcohol	--	--	49,000	--	51,000	--	390,000	--	0	49,000	390,000
Benzoic acid	--	--	2,000,000	--	2,000,000	--	16,000,000	--	0	2,000,000	16,000,000
Phenols (mg/kg)											
Phenol	--	--	150,000	--	150,000	--	1,200,000	--	0.1	150,000	1,200,000
2-Methylphenol	--	--	25,000	--	25,000	--	200,000	--	0.02	25,000	200,000
4-Methylphenol	--	--	49,000	--	51,000	--	390,000	--	0.02	49,000	390,000
2,4-Dimethylphenol	--	--	9,900	--	10,000	--	78,000	--	0.025	9,900	78,000
Pentachlorophenol	--	11	1,700	0.62	1,200	8.1	15,000	--	0.1	0.6	8.1
Polychlorinated Biphenyls (PCBs; µg/kg)											
Total Dioxin-Like PCBs - human health TEQ	0.0007	0.1	0.73	0.015	1.30	0.062	5.3	--	0.0007 ⁸	0.0007	0.0007
Total PCBs (Sum of Total for Aroclors or Congeners)	--	2,800	8,800	210	7,700	1,900	72,000	--	0.002	210.0	1900.0
Dioxins and Furans (ng/kg)											
Total dioxins/furans - human health TEQ	5	100	730	15	1,300	62	5,300	4	5 ⁹	5	5

Notes:

¹ Bioaccumulative chemicals include arsenic, cadmium, lead, mercury, carcinogenic polycyclic aromatic hydrocarbons (cPAHs), dioxin-like polychlorinated biphenyls (PCBs), total PCBs, dioxins/furans and tributyltin. Currently site-specific human health and ecological risk-based sediment screening levels have not been developed for bioaccumulative chemicals. Therefore, sediment screening levels for these chemicals (with the exception of tributyltin) are based on the natural background or the practical quantification limit (PQL), whichever is higher.

² Sediment screening levels for the protection of human health via direct contact are calculated using equations and input parameters provided by Ecology in the Final Sediment Cleanup Users Manual (SCUM) II guidance (Ecology, 2015).

³ Natural background concentrations are derived from the calculated values (90/90 UTL) from the Bold plus dataset and presented in Table 10-1 of Ecology's Final SCUM II (Ecology, 2015) guidance document.

⁴ PQL values from Analytical Resources, Inc. of Tukwila, Washington and Frontier Analytical Laboratory of El Dorado Hills, California.

⁵ The screening levels for bioaccumulative chemicals presented in this table are to provide a preliminary evaluation of human health and ecological risk for higher trophic level ecological receptors. Human health and higher trophic level ecological receptor screening levels are chosen from lowest of bioaccumulative and direct contact pathways. If the risk-based value is lower than natural background or PQL, the screening level defaults to the higher of natural background or PQL. The human health screening level for intertidal areas includes marine areas at elevations higher than -3 feet mean lower low water (MLLW) and the applicable direct contact pathways include beach play and clamming. The human health screening levels for subtidal areas include marine areas at elevations below -3 feet MLLW and the applicable direct contact pathway is net fishing.

⁶ Total LPAHs are the sum of naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene and anthracene; 2-methylnaphthalene is not included in the sum of LPAHs.

⁷ Total HPAHs are the sum of fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(a)fluoranthenes, benzo(a)pyrene, indeno(1,2,3-c-d)pyrene, dibenzo(a,h)anthracene and benzo(g,h,i)perylene.

⁸ Ecology-recommended PQL of 0.7 parts per trillion (ppt), dry-weight toxicity equivalent quotient (TEQ).

⁹ Ecology-recommended PQL of 5 parts per trillion (ppt), dry-weight toxicity equivalent quotient (TEQ).

mg/kg = milligram per kilogram

µg/kg = microgram per kilogram

ng/kg = nanogram per kilogram

-- = No criterion is currently available for this analyte

TEQ = Toxic equivalent concentration (toxicity equivalency factor (TEF) values are presented in Table 5).

Table 5
Toxicity Equivalency Factors (TEF)
 Quiet Cove Property
 Anacortes, Washington

Analyte	Human Health ¹	Mammals ¹	Birds ²	Fish ²
Dioxins				
2,3,7,8-TCDD	1	1	1	1
1,2,3,7,8-PeCDD	1	1	1	1
1,2,3,6,7,8-HxCDD	0.1	0.1	0.01	0.01
1,2,3,7,8,9-HxCDD	0.1	0.1	0.1	0.01
1,2,3,4,7,8-HxCDD	0.1	0.1	0.05	0.5
1,2,3,4,6,7,8-HpCDD	0.01	0.01	<0.001	0.001
Octa-dibenzodioxin	0.0003	0.0003	0.0001	<0.0001
Furans				
2,3,7,8-TCDF	0.1	0.1	1	0.05
1,2,3,7,8-PeCDF	0.03	0.03	0.1	0.05
2,3,4,7,8-PeCDF	0.3	0.3	1	0.5
1,2,3,6,7,8-HxCDF	0.1	0.1	0.1	0.1
1,2,3,7,8,9-HxCDF	0.1	0.1	0.1	0.1
1,2,3,4,7,8-HxCDF	0.1	0.1	0.1	0.1
2,3,4,6,7,8-HxCDF	0.1	0.1	0.1	0.1
1,2,3,4,6,7,8-HpCDF	0.01	0.01	0.01	0.01
1,2,3,4,7,8,9-HpCDF	0.01	0.01	0.01	0.01
Octa-dibenzofuran	0.0003	0.0003	0.0001	<0.0001
Carcinogenic polycyclic aromatic hydrocarbons (cPAHs)				
Benzo(a)anthracene	0.1	--	--	--
Chrysene	0.01	--	--	--
Benzo(b)fluoranthene	0.1	--	--	--
Benzo(k)fluoranthene	0.1	--	--	--
Benzo(a)pyrene	1	--	--	--
Indeno(1,2,3-cd)pyrene	0.1	--	--	--
Dibenz(a,h)anthracene	0.1	--	--	--
Dioxin-like polychlorinated biphenyls (PCBs)				
3,3',4,4'-Tetrachlorobiphenyl (PCB 77)	0.0001	0.0001	--	--
3,4,4',5'-Tetrachlorobiphenyl (PCB 81)	0.0003	0.0003	--	--
2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	0.00003	0.00003	--	--
2,3,4,4',5-Pentachlorobiphenyl (PCB 114)	0.00003	0.00003	--	--
2,3',4,4',5-Pentachlorobiphenyl (PCB 118)	0.00003	0.00003	--	--
2',3,4,4',5-Pentachlorobiphenyl (PCB 123)	0.00003	0.00003	--	--
3,3',4,4',5-Pentachlorobiphenyl (PCB 126)	0.1	0.1	--	--
2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)	0.00003	0.00003	--	--
2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157)	0.00003	0.00003	--	--
2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167)	0.00003	0.00003	--	--
2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)	0.03	0.03	--	--
2,3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 189)	0.00003	0.00003	--	--

Notes:

¹ Dioxin/Furan TEF source: The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds (Van den Berg et al. 2006).

² Dioxin/Furan TEF Source: Framework for Application of the Toxicity Equivalence Methodology for Polychlorinated Dioxins, Furans and Biphenyls in Ecological Risk Assessment (EPA 2003).

Table 6
Summary of Existing Soil Chemical Analytical Data
Quiet Cove Property
Anacortes, Washington

Sample Location ¹	Soil Screening Level		HA-1	HA-2	HA-4	HA-10	HA-11	HA-12	HA-13	B1	B1	B2	B3
Sample Identification			HA-1	HA-2	HA-4	HA-10	HA-11	HA-12	HA-13	B1-6	B1-8	B2-4	B3-2
Sample Date			04/05/00	04/05/00	04/05/00	04/05/00	04/05/00	04/05/00	04/05/00	04/05/00	04/06/00	04/06/00	04/06/00
Sample Depth (feet bgs)	Vadose Zone	Saturated Zone	1.8	2.3	1.8	1.3	1.3	1.3	1.3	6-8 feet	8-10 feet	4-6 feet	2-4 feet
Sampled By			ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec
Sample Horizon			Vadose	Vadose	Vadose	Vadose	Vadose	Vadose	Vadose	Vadose	Saturated	Saturated	Saturated
Metals (mg/kg)													
Arsenic	20	20	--	--	--	--	--	--	--	--	--	--	--
Cadmium	1.2	1	--	--	--	--	--	--	--	--	--	--	--
Chromium (total)	1,000	50	--	--	--	--	--	--	--	--	--	--	--
Lead	250	24	--	--	--	--	--	--	--	--	--	--	--
Mercury	0.07	0.07	--	--	--	--	--	--	--	--	--	--	--
Petroleum Hydrocarbons (mg/kg)													
Gasoline-Range ²	30/1006	30/1006	5 U	5 U	5 U	5 U	5,770	30.3	5 U	5 U	5 U	1,970	46
Diesel-Range	2,000	2,000	407	10	10 U	10 U	1,590	113	10 U	48	10 U	111	27
Heavy Oil-Range	2,000	2,000	227	25 U	25 U	25 U	275 U	33.5	25 U	30	25 U	25 U	26
BETX Compounds (mg/kg)													
Benzene	0.05	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	2.5 U	0.05 U	0.05 U	1 U	0.09 U
Ethylbenzene	1.12	0.06	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	17.5 U	0.05 U	0.05 U	1 U	0.08 U
Toluene	3.78	0.22	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.341 U	35 U	0.05 U	0.05 U	4 U	0.13
Xylenes	2.83	0.16	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	150 U	0.1 U	0.1 U	20 U	0.19
Volatile Organic Compounds (VOCs; mg/kg)													
1,1,1,2-Tetrachloroethane	0.044	0.003	--	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	41.5	2.21	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	0.017	0.002	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	0.025	0.002	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	0.061	0.0038	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	0.023	0.0011	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichloropropane	0.033	0.033	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	0.019	0.005	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-chloropropane	1.25	1.25	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	30.12	1.71	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane (EDC)	0.02	0.001	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	0.02	0.001	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	0.08	0.067	--	--	--	--	--	--	--	--	--	--	--
2,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloroethyl Vinyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorotoluene	1,600	1,600	--	--	--	--	--	--	--	--	--	--	--
4-Chlorotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	0.79	0.05	--	--	--	--	--	--	--	--	--	--	--

Sample Location ¹	Soil Screening Level		HA-1	HA-2	HA-4	HA-10	HA-11	HA-12	HA-13	B1	B1	B2	B3
Sample Identification			HA-1	HA-2	HA-4	HA-10	HA-11	HA-12	HA-13	B1-6	B1-8	B2-4	B3-2
Sample Date			04/05/00	04/05/00	04/05/00	04/05/00	04/05/00	04/05/00	04/05/00	04/06/00	04/06/00	04/06/00	04/06/00
Sample Depth (feet bgs)			1.8	2.3	1.8	1.3	1.3	1.3	1.3	6-8 feet	8-10 feet	4-6 feet	2-4 feet
Sampled By	Vadose Zone	Saturated Zone	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec
Sample Horizon			Vadose	Vadose	Vadose	Vadose	Vadose	Vadose	Vadose	Saturated	Saturated	Saturated	Vadose
Bromomethane	0.06	0.0038	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	0.005	0.001	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	2.5	0.15	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	95.47	5.64	--	--	--	--	--	--	--	--	--	--	--
Chloroform	0.0064	0.001	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	0.73	0.045	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethene	160	160	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	0.024	0.002	--	--	--	--	--	--	--	--	--	--	--
Dibromomethane	800	800	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane (CFC 12)	0.17	0.0019	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (EDB)	0.002	0.001	--	--	--	--	--	--	--	--	--	--	--
Methyl Iodide	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl t-Butyl Ether (MTBE)	2.59	0.18	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	4.36	0.3	--	--	--	--	--	--	--	--	--	--	--
n-Hexane	0.27	0.01	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene (PCE)	0.094	0.0049	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	21.7	1.3	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene (TCE)	0.01	0.001	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane (CFC 11)	1.4	0.04	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	0.006	0.001	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs; mg/kg)													
1-Methylnaphthalene	34.48	34.48	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	0.77	0.04	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	0.32	0.02	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	0.068	--	--	--	--	--	--	--	--	--	--	--
Anthracene	4.41	0.2	--	--	--	--	--	--	--	--	--	--	--
Benzo[g,h,i]perylene	--	1.95	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	3.2	0.16	--	--	--	--	--	--	--	--	--	--	--
Fluorene	0.5	0.02	--	--	--	--	--	--	--	--	--	--	--
Naphthalenes	0.25	0.01	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	0.1	--	--	--	--	--	--	--	--	--	--	--
Pyrene	20	1.00	--	--	--	--	--	--	--	--	--	--	--
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs; mg/kg)													
Benzo[a]anthracene	0.07	0.007	--	--	--	--	--	--	--	--	--	--	--
Benzo[a]pyrene	0.14	0.010	--	--	--	--	--	--	--	--	--	--	--
Benzo[b]fluoranthene	0.25	0.012	--	--	--	--	--	--	--	--	--	--	--
Benzo[k]fluoranthene	0.32	0.016	--	--	--	--	--	--	--	--	--	--	--
Chrysene	0.25	0.012	--	--	--	--	--	--	--	--	--	--	--
Dibenz[a,h]anthracene	0.14	0.018	--	--	--	--	--	--	--	--	--	--	--
Indeno[1,2,3-c,d]pyrene	0.69	0.035	--	--	--	--	--	--	--	--	--	--	--
cPAHs TEQ ³	0.22	0.011	--	--	--	--	--	--	--	--	--	--	--

Sample Location ¹	Soil Screening Level		HA-1	HA-2	HA-4	HA-10	HA-11	HA-12	HA-13	B1	B1	B2	B3
Sample Identification			HA-1	HA-2	HA-4	HA-10	HA-11	HA-12	HA-13	B1-6	B1-8	B2-4	B3-2
Sample Date			04/05/00	04/05/00	04/05/00	04/05/00	04/05/00	04/05/00	04/05/00	04/05/00	04/06/00	04/06/00	04/06/00
Sample Depth (feet bgs)	Vadose Zone	Saturated Zone	1.8	2.3	1.8	1.3	1.3	1.3	1.3	6-8 feet	8-10 feet	4-6 feet	2-4 feet
Sampled By			ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec
Sample Horizon			Vadose	Vadose	Vadose	Vadose	Vadose	Vadose	Vadose	Vadose	Saturated	Saturated	Saturated
Polychlorinated Biphenyls (PCBs; mg/kg)													
Total PCBs (sum of Aroclors)	0.062	0.050	--	--	--	--	--	--	--	--	--	--	--
Dioxins and Furans (ng/kg)													
Total dioxins/furans - human health TEQ	5.27	5.27	--	--	--	--	--	--	--	--	--	--	--

Notes:

- ¹ Sample locations are shown on Figure 4.
- ² Screening level for gasoline-range petroleum hydrocarbons is 30 mg/kg if benzene is present and 100 mg/kg if not present.
- ³Total carcinogenic Polycyclic Aromatic Hydrocarbon (cPAH) calculated using toxic equivalent (TEQ) methodology relative to benzo(a)pyrene. cPAHs that were not detected were assigned a value of one half of the detection limit for these calculations.
- mg/kg = milligrams per kilogram
- ng/kg = nanograms per kilogram
- T = total concentration
- U = not detected above the laboratory reporting limit
- Bold** font indicates compound was detected.
- Blue shading indicates that the compound was not detected with a reporting limit greater than the soil screening level.
- Green shading indicates that the compound was detected at concentrations greater than the soil screening level.

Sample Location ¹	Soil Screening Level		B3	B4	B5	B5	B6	GEI-1		GEI-2			GEI-3
Sample Identification			B3-10	B4-6	B5-4	B5-8	B6-10	GEI-1-3-033114	GEI-1-5-033114	GEI-2-1-033114	GEI-2-3-033114	GEI-2-5-033114	GEI-3-3-033114
Sample Date			04/06/00	04/06/00	04/06/00	04/06/00	04/06/00	03/31/14	03/31/14	03/31/14	03/31/14	03/31/14	03/31/14
Sample Depth (feet bgs)			10-12 feet	6-8 feet	4-5 feet	8-10 feet	10-12 feet	4-6 feet	8-10 feet	0-2 feet	4-6 feet	8-10 feet	4-6 feet
Sampled By	Vadose Zone	Saturated Zone	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers
Sample Horizon			Saturated	Saturated	Saturated	Saturated	Saturated	Saturated	Saturated	Saturated	Vadose	Saturated	Saturated
Metals (mg/kg)													
Arsenic	20	20	--	--	--	--	--	--	--	--	--	--	--
Cadmium	1.2	1	--	--	--	--	--	--	--	--	--	--	--
Chromium (total)	1,000	50	--	--	--	--	--	--	--	--	--	--	--
Lead	250	24	--	--	--	--	--	--	--	--	--	--	--
Mercury	0.07	0.07	--	--	--	--	--	--	--	--	--	--	--
Petroleum Hydrocarbons (mg/kg)													
Gasoline-Range2	30/100	30/100	5 U	5 U	12	81	5 U	7.4 U	7.8 U	3.4 U	7.7 U	3.8 U	7.6 U
Diesel-Range	2,000	2,000	10 U	16	2,110	668	10 U	5,800	540	48	2,400	510	750
Heavy Oil-Range	2,000	2,000	25 U	39	881	207	25 U	940	97	210	440	77	73
BETX Compounds (mg/kg)													
Benzene	0.05	0.05	0.05 U	0.05 U	0.05 U	0.1 U	0.05 U	0.02 U	0.02 U	0.055	0.02 U	0.02 U	0.02 U
Ethylbenzene	1.12	0.06	0.05 U	0.05 U	0.05 U	0.1 U	0.05 U	0.074 U	0.078 U	0.039	0.077 U	0.038 U	0.076 U
Toluene	3.78	0.22	0.05 U	0.05 U	0.05 U	0.16 U	0.05 U	0.24	0.078 U	0.21	0.077 U	0.038 U	0.30
Xylenes	2.83	0.16	0.1 U	0.1 U	0.1 U	0.2 U	0.1 U	0.64	0.078 U	0.31	0.077 U	0.038 U	0.91
Volatile Organic Compounds (VOCs; mg/kg)													
1,1,1,2-Tetrachloroethane	0.044	0.003	--	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	41.50	2.209	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	0.017	0.002	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	0.0251	0.002	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	0.061	0.0038	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	0.023	0.0011	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichloropropane	0.033	0.033	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	0.019	0.005	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-chloropropane	1.250	1.250	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	30.12	1.71	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane (EDC)	0.020	0.001	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	0.020	0.001	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	0.08	0.067	--	--	--	--	--	--	--	--	--	--	--
2,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloroethyl Vinyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorotoluene	1,600.00	1,600.00	--	--	--	--	--	--	--	--	--	--	--
4-Chlorotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	0.787	0.0495	--	--	--	--	--	--	--	--	--	--	--

Sample Location ¹	Soil Screening Level		B3	B4	B5	B5	B6	GEI-1		GEI-2			GEI-3
Sample Identification			B3-10	B4-6	B5-4	B5-8	B6-10	GEI-1-3-033114	GEI-1-5-033114	GEI-2-1-033114	GEI-2-3-033114	GEI-2-5-033114	GEI-3-3-033114
Sample Date			04/06/00	04/06/00	04/06/00	04/06/00	04/06/00	03/31/14	03/31/14	03/31/14	03/31/14	03/31/14	03/31/14
Sample Depth (feet bgs)			10-12 feet	6-8 feet	4-5 feet	8-10 feet	10-12 feet	4-6 feet	8-10 feet	0-2 feet	4-6 feet	8-10 feet	4-6 feet
Sampled By			ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers
Sample Horizon	Vadose Zone	Saturated Zone	Saturated	Saturated	Saturated	Saturated	Saturated	Saturated	Saturated	Vadose	Saturated	Saturated	Saturated
Bromomethane	0.060	0.0038	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	0.0050	0.001	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	2.5	0.146	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	95.47	5.64	--	--	--	--	--	--	--	--	--	--	--
Chloroform	0.0064	0.001	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	0.725	0.045	--	--	--	--	--	--	--	--	--	--	--
Cis-1,2-Dichloroethene	160.00	160.000	--	--	--	--	--	--	--	--	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	0.0241	0.002	--	--	--	--	--	--	--	--	--	--	--
Dibromomethane	800.00	800.000	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane (CFC 12)	0.17	0.00	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (EDB)	0.002	0.001	--	--	--	--	--	--	--	--	--	--	--
Methyl Iodide	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl t-Butyl Ether (MTBE)	2.592	0.182	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	4.356	0.297	--	--	--	--	--	--	--	--	--	--	--
n-Hexane	0.27	0.01	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene (PCE)	0.094	0.0049	--	--	--	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethene	21.71	1.299	--	--	--	--	--	--	--	--	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene (TCE)	0.0103	0.001	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane (CFC 11)	1.4	0.04	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	0.006	0.001	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs; mg/kg)													
1-Methylnaphthalene	34.483	34.483	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	0.775	0.040	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	0.32	0.02	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	0.068	--	--	--	--	--	--	--	--	--	--	--
Anthracene	4	0.2	--	--	--	--	--	--	--	--	--	--	--
Benzo[g,h,i]perylene	--	1.951	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	3.2	0.16	--	--	--	--	--	--	--	--	--	--	--
Fluorene	0.5	0.02	--	--	--	--	--	--	--	--	--	--	--
Naphthalenes	0.25	0.01	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	0.101	--	--	--	--	--	--	--	--	--	--	--
Pyrene	20	1.00	--	--	--	--	--	--	--	--	--	--	--
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs; mg/kg)													
Benzo[a]anthracene	0.07	0.007	--	--	--	--	--	--	--	--	--	--	--
Benzo[a]pyrene	0.14	0.010	--	--	--	--	--	--	--	--	--	--	--
Benzo[b]fluoranthene	0.25	0.012	--	--	--	--	--	--	--	--	--	--	--
Benzo[k]fluoranthene	0.32	0.016	--	--	--	--	--	--	--	--	--	--	--
Chrysene	0.25	0.0124	--	--	--	--	--	--	--	--	--	--	--
Dibenz[a,h]anthracene	0.14	0.018	--	--	--	--	--	--	--	--	--	--	--
Indeno[1,2,3-c,d]pyrene	0.69	0.035	--	--	--	--	--	--	--	--	--	--	--
cPAHs TEQ3	0.22	0.011	--	--	--	--	--	--	--	--	--	--	--

Sample Location ¹	Soil Screening Level		B3	B4	B5	B5	B6	GEI-1		GEI-2			GEI-3
Sample Identification			B3-10	B4-6	B5-4	B5-8	B6-10	GEI-1-3-033114	GEI-1-5-033114	GEI-2-1-033114	GEI-2-3-033114	GEI-2-5-033114	GEI-3-3-033114
Sample Date			04/06/00	04/06/00	04/06/00	04/06/00	04/06/00	03/31/14	03/31/14	03/31/14	03/31/14	03/31/14	03/31/14
Sample Depth (feet bgs)	Vadose Zone	Saturated Zone	10-12 feet	6-8 feet	4-5 feet	8-10 feet	10-12 feet	4-6 feet	8-10 feet	0-2 feet	4-6 feet	8-10 feet	4-6 feet
Sampled By			ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	ThermoRetec	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers
Sample Horizon			Saturated	Saturated	Saturated	Saturated	Saturated	Saturated	Saturated	Saturated	Vadose	Saturated	Saturated
Polychlorinated Biphenyls (PCBs; mg/kg)													
Total PCBs (sum of Aroclors)	0.062	0.050	--	--	--	--	--	--	--	--	--	--	--
Dioxins and Furans (ng/kg)													
Total dioxins/furans - human health TEQ	5.2	5.2	--	--	--	--	--	--	--	--	--	--	--

Notes:

- ¹ Sample locations are shown on Figure 4.
- ² Screening level for gasoline-range petroleum hydrocarbons is 30 mg/kg if benzene is present and 100 mg/kg if not present.
- ³ Total carcinogenic Polycyclic Aromatic Hydrocarbon (cPAH) calculated using toxic equivalent (TEQ) methodology relative to benzo(a)pyrene. cPAHs that were not detected were assigned a value of one half of the detection limit for these calculations.
- mg/kg = milligrams per kilogram
- ng/kg = nanograms per kilogram
- T = total concentration
- U = not detected above the laboratory reporting limit
- Bold** font indicates compound was detected.
- Blue shading indicates that the compound was not detected with a reporting limit greater than the soil screening level.
- Green shading indicates that the compound was detected at concentrations greater than the soil screening level.

Sample Location ¹	Soil Screening Level		GEI-4			GEI-8		GEI-9		GEI-10			GEI-12			
Sample Identification			GEI-4-1-040114	GEI-4-2-040114	GEI-4-3-040114	GEI-8-3-033114	GEI-8-5-033114	GEI-9-3-040114	GEI-9-5-040114	GEI-10-1-033114	GEI-10-3-033114	GEI-10-6-033114	GEI-12-3-040114			
			Sample Date		04/01/14	04/01/14	04/01/14	03/31/14	03/31/14	04/01/14	04/01/14	03/31/14	03/31/14	03/31/14	04/01/14	
					Sample Depth (feet bgs)		0-2 feet	2-3 feet	4-6 feet	4-6 feet	8-10 feet	5-7 feet	8-10 feet	0-2 feet	4-6 feet	8-10 feet
Sampled By		Vadose Zone	Saturated Zone	GeoEngineers			GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	
Sample Horizon						Vadose	Vadose	Saturated	Saturated	Saturated	Saturated	Saturated	Vadose	Saturated	Saturated	Saturated
Metals (mg/kg)																
Arsenic	20	20	--	14 U	--	--	--	--	--	--	12 U	--	--			
Cadmium	1.2	1	--	2.4	--	--	--	--	--	--	0.59 U	--	--			
Chromium (total)	1,000	50	--	13	--	--	--	--	--	--	34	--	--			
Lead	250	24	--	79	--	--	--	--	--	--	13	--	--			
Mercury	0.07	0.07	--	0.34 U	--	--	--	--	--	--	0.29 U	--	--			
Petroleum Hydrocarbons (mg/kg)																
Gasoline-Range2	30/100	30/100	3.3 U	6.9 U	9.3 U	260	3.3 U	5.0 U	4.8 U	3.3 U	420	6.3 U	3.5 U			
Diesel-Range	2,000	2,000	170	18,000	730	1,200	29 U	30 U	29 U	1,800	5,600	30 U	29 U			
Heavy Oil-Range	2,000	2,000	1,200	21,000	940	810	58 U	60 U	59 U	3,500	8,100	60 U	58 U			
BETX Compounds (mg/kg)																
Benzene	0.05	0.05	0.02 U	0.02 U	0.02 U	0.048	0.02 U	0.02 U	0.02 U	0.02 U	0.043	0.02 U	0.02 U			
Ethylbenzene	1.12	0.06	0.033 U	0.069 U	0.093 U	0.11 U	0.033 U	0.05 U	0.048 U	0.033 U	0.083 U	0.063 U	0.035 U			
Toluene	3.78	0.22	0.033 U	0.069 U	0.093 U	0.14	0.033 U	0.05 U	0.048 U	0.033 U	0.21	0.063 U	0.035 U			
Xylenes	2.83	0.16	0.033 U	0.069 U	0.093 U	0.28	0.033 U	0.05 U	0.048 U	0.033 U	0.65	0.063 U	0.035 U			
Volatile Organic Compounds (VOCs; mg/kg)																
1,1,1,2-Tetrachloroethane	0.044	0.003	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
1,1,1-Trichloroethane	41.50	2.209	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
1,1,2,2-Tetrachloroethane	0.017	0.002	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
1,1,2-Trichloroethane	0.0251	0.002	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
1,1-Dichloroethane	0.061	0.0038	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
1,1-Dichloroethene	0.023	0.0011	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
1,1-Dichloropropene	--	--	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
1,2,3-Trichlorobenzene	--	--	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
1,2,3-Trichloropropane	0.033	0.033	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
1,2,4-Trichlorobenzene	0.019	0.005	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
1,2-Dibromo-3-chloropropane	1.250	1.250	--	0.330 U	--	--	--	--	--	--	0.230 U	--	--			
1,2-Dichlorobenzene	30.12	1.71	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
1,2-Dichloroethane (EDC)	0.020	0.001	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
1,2-Dichloropropane	0.020	0.001	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
1,3-Dichlorobenzene	--	--	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
1,3-Dichloropropane	--	--	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
1,4-Dichlorobenzene	0.08	0.067	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
2,2-Dichloropropane	--	--	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
2-Chloroethyl Vinyl Ether	--	--	--	0.520 U	--	--	--	--	--	--	0.360 U	--	--			
2-Chlorotoluene	1,600.00	1,600.00	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
4-Chlorotoluene	--	--	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
Bromobenzene	--	--	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
Bromochloromethane	--	--	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			
Bromoform	0.787	0.0495	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--			

Sample Location ¹	Soil Screening Level		GEI-4			GEI-8		GEI-9		GEI-10			GEI-12
Sample Identification			GEI-4-1-040114	GEI-4-2-040114	GEI-4-3-040114	GEI-8-3-033114	GEI-8-5-033114	GEI-9-3-040114	GEI-9-5-040114	GEI-10-1-033114	GEI-10-3-033114	GEI-10-6-033114	GEI-12-3-040114
Sample Date			04/01/14	04/01/14	04/01/14	03/31/14	03/31/14	04/01/14	04/01/14	03/31/14	03/31/14	03/31/14	04/01/14
Sample Depth (feet bgs)			0-2 feet	2-3 feet	4-6 feet	4-6 feet	8-10 feet	5-7 feet	8-10 feet	0-2 feet	4-6 feet	8-10 feet	5-7 feet
Sampled By	Vadose Zone	Saturated Zone	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers
Sample Horizon			Vadose	Vadose	Saturated	Saturated	Saturated	Saturated	Saturated	Vadose	Saturated	Saturated	Saturated
Bromomethane	0.060	0.0038	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--
Carbon Tetrachloride	0.0050	0.001	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--
Chlorobenzene	2.5	0.146	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--
Chloroethane	95.47	5.64	--	0.330 U	--	--	--	--	--	--	0.230 U	--	--
Chloroform	0.0064	0.001	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--
Chloromethane	0.725	0.045	--	0.420 U	--	--	--	--	--	--	0.290 U	--	--
Cis-1,2-Dichloroethene	160.00	160.000	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--
Cis-1,3-Dichloropropene	--	--	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--
Dibromochloromethane	0.0241	0.002	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--
Dibromomethane	800.00	800.000	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--
Dichlorodifluoromethane (CFC 12)	0.17	0.00	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--
1,2-Dibromoethane (EDB)	0.002	0.001	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--
Methyl Iodide	--	--	--	0.330 U	--	--	--	--	--	--	0.230 U	--	--
Methyl t-Butyl Ether (MTBE)	2.592	0.182	--	0.085 U	--	--	--	--	--	--	0.059 U	--	--
Methylene Chloride	4.356	0.297	--	0.330 U	--	--	--	--	--	--	0.230 U	--	--
n-Hexane	0.27	0.01	--	0.069 U	--	--	--	--	--	--	0.083 U	--	--
Tetrachloroethene (PCE)	0.094	0.0049	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--
Trans-1,2-Dichloroethene	21.71	1.299	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--
Trans-1,3-Dichloropropene	--	--	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--
Trichloroethene (TCE)	0.0103	0.001	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--
Trichlorofluoromethane (CFC 11)	1.4	0.04	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--
Vinyl Chloride	0.006	0.001	--	0.065 U	--	--	--	--	--	--	0.045 U	--	--
Polycyclic Aromatic Hydrocarbons (PAHs; mg/kg)													
1-Methylnaphthalene	34.483	34.483	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	0.775	0.040	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	0.32	0.02	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	0.068	--	--	--	--	--	--	--	--	--	--	--
Anthracene	4	0.2	--	--	--	--	--	--	--	--	--	--	--
Benzo[g,h,i]perylene	--	1.951	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	3.2	0.16	--	--	--	--	--	--	--	--	--	--	--
Fluorene	0.5	0.02	--	--	--	--	--	--	--	--	--	--	--
Naphthalenes	0.25	0.01	--	27.4 T	--	--	--	--	--	--	18.5 T	--	--
Phenanthrene	--	0.101	--	--	--	--	--	--	--	--	--	--	--
Pyrene	20	1.00	--	--	--	--	--	--	--	--	--	--	--
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs; mg/kg)													
Benzo[a]anthracene	0.07	0.007	--	0.77	--	--	--	--	--	--	3.90	--	--
Benzo[a]pyrene	0.14	0.010	--	0.18	--	--	--	--	--	--	3.00	--	--
Benzo[b]fluoranthene	0.25	0.012	--	0.22	--	--	--	--	--	--	2.40	--	--
Benzo[k]fluoranthene	0.32	0.016	--	0.18 U	--	--	--	--	--	--	1.10	--	--
Chrysene	0.25	0.0124	--	1.2	--	--	--	--	--	--	2.80	--	--
Dibenz[a,h]anthracene	0.14	0.018	--	0.18 U	--	--	--	--	--	--	0.68	--	--
Indeno[1,2,3-c,d]pyrene	0.69	0.035	--	0.18 U	--	--	--	--	--	--	1.30	--	--
cPAHs TEQ3	0.22	0.011	--	0.32 T	--	--	--	--	--	--	3.97 T	--	--

Sample Location ¹	Soil Screening Level		GEI-4			GEI-8		GEI-9		GEI-10			GEI-12
Sample Identification			GEI-4-1-040114	GEI-4-2-040114	GEI-4-3-040114	GEI-8-3-033114	GEI-8-5-033114	GEI-9-3-040114	GEI-9-5-040114	GEI-10-1-033114	GEI-10-3-033114	GEI-10-6-033114	GEI-12-3-040114
Sample Date			04/01/14	04/01/14	04/01/14	03/31/14	03/31/14	04/01/14	04/01/14	03/31/14	03/31/14	03/31/14	04/01/14
Sample Depth (feet bgs)	Vadose Zone	Saturated Zone	0-2 feet	2-3 feet	4-6 feet	4-6 feet	8-10 feet	5-7 feet	8-10 feet	0-2 feet	4-6 feet	8-10 feet	5-7 feet
Sampled By			GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers
Sample Horizon			Vadose	Vadose	Saturated	Saturated	Saturated	Saturated	Saturated	Saturated	Vadose	Saturated	Saturated
Polychlorinated Biphenyls (PCBs; mg/kg)													
Total PCBs (sum of Aroclors)	0.062	0.050	--	0.068 UT	--	--	--	--	--	--	0.059 UT	--	--
Dioxins and Furans (ng/kg)													
Total dioxins/furans - human health TEQ	5.2	5.2	--	--	--	--	--	--	--	--	--	--	--

Notes:

- ¹ Sample locations are shown on Figure 4.
- ² Screening level for gasoline-range petroleum hydrocarbons is 30 mg/kg if benzene is present and 100 mg/kg if not present.
- ³ Total carcinogenic Polycyclic Aromatic Hydrocarbon (cPAH) calculated using toxic equivalent (TEQ) methodology relative to benzo(a)pyrene. cPAHs that were not detected were assigned a value of one half of the detection limit for these calculations.
- mg/kg = milligrams per kilogram
- ng/kg = nanograms per kilogram
- T = total concentration
- U = not detected above the laboratory reporting limit
- Bold** font indicates compound was detected.
- Blue shading indicates that the compound was not detected with a reporting limit greater than the soil screening level.
- Green shading indicates that the compound was detected at concentrations greater than the soil screening level.

Sample Location ¹	Soil Screening Level		GEI-13		GEI-14	GEI-16		GEI-17	GEI-18			GEI-19	
Sample Identification			GEI-13-2-040114	GEI-13-4-040114	GEI-14-3-040114	GEI-16-3-033114	GEI-16-5-033114	GEI-17-3-033114	GEI-18-1-033114	GEI-18-3-033114	GEI-18-5-033114	GEI-19-1-040114	GEI-19-3-040114
Sample Date			04/01/14	04/01/14	04/01/14	03/31/14	03/31/14	03/31/14	03/31/14	03/31/14	03/31/14	04/01/14	04/01/14
Sample Depth (feet bgs)			2-3 feet	6-8 feet	4-6 feet	4-6 feet	8-10 feet	4-6 feet	0-2 feet	4-6 feet	8-10 feet	0-2 feet	4-6 feet
Sampled By			GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers
Sample Horizon	Vadose Zone	Saturated Zone	Vadose	Saturated	Saturated	Saturated	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated
Metals (mg/kg)													
Arsenic	20	20	--	--	--	--	--	--	--	--	--	--	--
Cadmium	1.2	1	--	--	--	--	--	--	--	--	--	--	--
Chromium (total)	1,000	50	--	--	--	--	--	--	--	--	--	--	--
Lead	250	24	--	--	--	--	--	--	--	--	--	--	--
Mercury	0.07	0.07	--	--	--	--	--	--	--	--	--	--	--
Petroleum Hydrocarbons (mg/kg)													
Gasoline-Range2	30/100	30/100	9.4 U	3.7 U	5.2 U	150	5.4 U	9,400	3.2 U	4.0 U	3.8 U	4.0 U	3.6 U
Diesel-Range	2,000	2,000	1,900	30 U	34 U	1,600	30 U	14,000	270	2,200	71	29 U	29 U
Heavy Oil-Range	2,000	2,000	80	60 U	68 U	440	60 U	2,900	1,300	2,300	61 U	58 U	58 U
BETX Compounds (mg/kg)													
Benzene	0.05	0.05	0.023	0.02 U	0.02 U	0.11	0.02 U	62	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Ethylbenzene	1.12	0.06	0.094 U	0.037 U	0.052 U	0.43 U	0.054 U	16	0.032 U	0.04 U	0.038 U	0.04 U	0.036 U
Toluene	3.78	0.22	0.99	0.037 U	0.052 U	0.85	0.054 U	180	0.032 U	0.11	0.038 U	0.04 U	0.036 U
Xylenes	2.83	0.16	0.71	0.037 U	0.052 U	0.56	0.054 U	361	0.032 U	0.23	0.038 U	0.04 U	0.036 U
Volatile Organic Compounds (VOCs; mg/kg)													
1,1,1,2-Tetrachloroethane	0.044	0.003	--	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	41.50	2.209	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	0.017	0.002	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	0.0251	0.002	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	0.061	0.0038	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	0.023	0.0011	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichloropropane	0.033	0.033	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	0.019	0.005	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-chloropropane	1.250	1.250	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	30.12	1.71	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane (EDC)	0.020	0.001	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	0.020	0.001	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	0.08	0.067	--	--	--	--	--	--	--	--	--	--	--
2,2-Dichloropropane	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloroethyl Vinyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chlorotoluene	1,600.00	1,600.00	--	--	--	--	--	--	--	--	--	--	--
4-Chlorotoluene	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromochloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	0.787	0.0495	--	--	--	--	--	--	--	--	--	--	--

Sample Location ¹	Soil Screening Level		GEI-13		GEI-14	GEI-16		GEI-17	GEI-18			GEI-19		
Sample Identification			GEI-13-2-040114	GEI-13-4-040114	GEI-14-3-040114	GEI-16-3-033114	GEI-16-5-033114	GEI-17-3-033114	GEI-18-1-033114	GEI-18-3-033114	GEI-18-5-033114	GEI-19-1-040114	GEI-19-3-040114	
Sample Date			04/01/14	04/01/14	04/01/14	03/31/14	03/31/14	03/31/14	03/31/14	03/31/14	03/31/14	03/31/14	04/01/14	04/01/14
Sample Depth (feet bgs)			2-3 feet	6-8 feet	4-6 feet	4-6 feet	8-10 feet	4-6 feet	0-2 feet	4-6 feet	8-10 feet	0-2 feet	4-6 feet	
Sampled By	Vadose Zone	Saturated Zone	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	
Sample Horizon			Vadose	Saturated	Saturated	Saturated	Saturated	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose	Saturated
Bromomethane	0.060	0.0038	--	--	--	--	--	--	--	--	--	--	--	
Carbon Tetrachloride	0.0050	0.001	--	--	--	--	--	--	--	--	--	--	--	
Chlorobenzene	2.5	0.146	--	--	--	--	--	--	--	--	--	--	--	
Chloroethane	95.47	5.64	--	--	--	--	--	--	--	--	--	--	--	
Chloroform	0.0064	0.001	--	--	--	--	--	--	--	--	--	--	--	
Chloromethane	0.725	0.045	--	--	--	--	--	--	--	--	--	--	--	
Cis-1,2-Dichloroethene	160.00	160.000	--	--	--	--	--	--	--	--	--	--	--	
Cis-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	
Dibromochloromethane	0.0241	0.002	--	--	--	--	--	--	--	--	--	--	--	
Dibromomethane	800.00	800.000	--	--	--	--	--	--	--	--	--	--	--	
Dichlorodifluoromethane (CFC 12)	0.17	0.00	--	--	--	--	--	--	--	--	--	--	--	
1,2-Dibromoethane (EDB)	0.002	0.001	--	--	--	--	--	--	--	--	--	--	--	
Methyl Iodide	--	--	--	--	--	--	--	--	--	--	--	--	--	
Methyl t-Butyl Ether (MTBE)	2.592	0.182	--	--	--	--	--	--	--	--	--	--	--	
Methylene Chloride	4.356	0.297	--	--	--	--	--	--	--	--	--	--	--	
n-Hexane	0.27	0.01	--	--	--	--	--	--	--	--	--	--	--	
Tetrachloroethene (PCE)	0.094	0.0049	--	--	--	--	--	--	--	--	--	--	--	
Trans-1,2-Dichloroethene	21.71	1.299	--	--	--	--	--	--	--	--	--	--	--	
Trans-1,3-Dichloropropene	--	--	--	--	--	--	--	--	--	--	--	--	--	
Trichloroethene (TCE)	0.0103	0.001	--	--	--	--	--	--	--	--	--	--	--	
Trichlorofluoromethane (CFC 11)	1.4	0.04	--	--	--	--	--	--	--	--	--	--	--	
Vinyl Chloride	0.006	0.001	--	--	--	--	--	--	--	--	--	--	--	
Polycyclic Aromatic Hydrocarbons (PAHs; mg/kg)														
1-Methylnaphthalene	34.483	34.483	--	--	--	--	--	--	--	--	--	--	--	
2-Methylnaphthalene	0.775	0.040	--	--	--	--	--	--	--	--	--	--	--	
Acenaphthene	0.32	0.02	--	--	--	--	--	--	--	--	--	--	--	
Acenaphthylene	--	0.068	--	--	--	--	--	--	--	--	--	--	--	
Anthracene	4	0.2	--	--	--	--	--	--	--	--	--	--	--	
Benzo[g,h,i]perylene	--	1.951	--	--	--	--	--	--	--	--	--	--	--	
Fluoranthene	3.2	0.16	--	--	--	--	--	--	--	--	--	--	--	
Fluorene	0.5	0.02	--	--	--	--	--	--	--	--	--	--	--	
Naphthalenes	0.25	0.01	--	--	--	--	--	--	--	--	--	--	--	
Phenanthrene	--	0.101	--	--	--	--	--	--	--	--	--	--	--	
Pyrene	20	1.00	--	--	--	--	--	--	--	--	--	--	--	
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs; mg/kg)														
Benzo[a]anthracene	0.07	0.007	--	--	--	--	--	--	--	--	--	--	--	
Benzo[a]pyrene	0.14	0.010	--	--	--	--	--	--	--	--	--	--	--	
Benzo[b]fluoranthene	0.25	0.012	--	--	--	--	--	--	--	--	--	--	--	
Benzo[k]fluoranthene	0.32	0.016	--	--	--	--	--	--	--	--	--	--	--	
Chrysene	0.25	0.0124	--	--	--	--	--	--	--	--	--	--	--	
Dibenz[a,h]anthracene	0.14	0.018	--	--	--	--	--	--	--	--	--	--	--	
Indeno[1,2,3-c,d]pyrene	0.69	0.035	--	--	--	--	--	--	--	--	--	--	--	
cPAHs TEQ3	0.22	0.011	--	--	--	--	--	--	--	--	--	--	--	

Sample Location ¹	Soil Screening Level		GEI-13		GEI-14	GEI-16		GEI-17	GEI-18			GEI-19	
Sample Identification			GEI-13-2-040114	GEI-13-4-040114	GEI-14-3-040114	GEI-16-3-033114	GEI-16-5-033114	GEI-17-3-033114	GEI-18-1-033114	GEI-18-3-033114	GEI-18-5-033114	GEI-19-1-040114	GEI-19-3-040114
Sample Date			04/01/14	04/01/14	04/01/14	03/31/14	03/31/14	03/31/14	03/31/14	03/31/14	03/31/14	03/31/14	04/01/14
Sample Depth (feet bgs)	Vadose Zone	Saturated Zone	2-3 feet	6-8 feet	4-6 feet	4-6 feet	8-10 feet	4-6 feet	0-2 feet	4-6 feet	8-10 feet	0-2 feet	4-6 feet
Sampled By			GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers
Sample Horizon			Vadose	Saturated	Saturated	Saturated	Saturated	Saturated	Saturated	Vadose	Saturated	Saturated	Vadose
Polychlorinated Biphenyls (PCBs; mg/kg)													
Total PCBs (sum of Aroclors)	0.062	0.050	--	--	--	--	--	--	--	--	--	--	--
Dioxins and Furans (ng/kg)													
Total dioxins/furans - human health TEQ	5.2	5.2	--	--	--	--	--	--	--	--	--	--	--

Notes:

- ¹ Sample locations are shown on Figure 4.
- ² Screening level for gasoline-range petroleum hydrocarbons is 30 mg/kg if benzene is present and 100 mg/kg if not present.
- ³ Total carcinogenic Polycyclic Aromatic Hydrocarbon (cPAH) calculated using toxic equivalent (TEQ) methodology relative to benzo(a)pyrene. cPAHs that were not detected were assigned a value of one half of the detection limit for these calculations.
- mg/kg = milligrams per kilogram
- ng/kg = nanograms per kilogram
- T = total concentration
- U = not detected above the laboratory reporting limit
- Bold** font indicates compound was detected.
- Blue shading indicates that the compound was not detected with a reporting limit greater than the soil screening level.
- Green shading indicates that the compound was detected at concentrations greater than the soil screening level.

Sample Location ¹	Soil Screening Level		GEI-20	GEI-21	GEI-25			GEI-27	GEI-28
Sample Identification			GEI-20-3-040114	GEI-21-3-040114	GEI-25-1-040114	GEI-25-3-040114	GEI-25-5-040114	GEI-27-3-040214	GEI-28-4-040214
Sample Date			04/01/14	04/01/14	04/01/14	04/01/14	04/01/14	04/02/14	04/02/14
Sample Depth (feet bgs)	Vadose Zone	Saturated Zone	4-6 feet	4-6 feet	0-2 feet	4-6 feet	8-10 feet	6-7.5 feet	6-8 feet
Sampled By			GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers
Sample Horizon			Saturated	Saturated	Vadose	Saturated	Saturated	Saturated	Saturated
Metals (mg/kg)									
Arsenic	20	20	--	--	--	12 U	--	--	--
Cadmium	1.2	1	--	--	--	0.62 U	--	--	--
Chromium (total)	1,000	50	--	--	--	52	--	--	--
Lead	250	24	--	--	--	17	--	--	--
Mercury	0.07	0.07	--	--	--	0.31 U	--	--	--
Petroleum Hydrocarbons (mg/kg)									
Gasoline-Range2	30/100	30/100	3.9 U	5.8 U	3.3 U	3.9 U	17 U	4.9 U	4.0 U
Diesel-Range	2,000	2,000	29 U	29 U	250	4,300	76	32 U	29 U
Heavy Oil-Range	2,000	2,000	59 U	59 U	1,100	1,200	580	64 U	58 U
BETX Compounds (mg/kg)									
Benzene	0.05	0.05	0.02 U	0.02 U	0.02 U	0.02 U	0.033 U	0.02 U	0.02 U
Ethylbenzene	1.12	0.06	0.039 U	0.058 U	0.033 U	0.039 U	0.17 U	0.049 U	0.04 U
Toluene	3.78	0.22	0.039 U	0.058 U	0.033 U	0.26	0.17 U	0.049 U	0.04 U
Xylenes	2.83	0.16	0.039 U	0.058 U	0.042	0.16	0.17 U	0.049 U	0.04 U
Volatile Organic Compounds (VOCs; mg/kg)									
1,1,1,2-Tetrachloroethane	0.044	0.003	--	--	--	0.037 U	--	--	--
1,1,1-Trichloroethane	41.50	2.209	--	--	--	0.037 U	--	--	--
1,1,2,2-Tetrachloroethane	0.017	0.002	--	--	--	0.037 U	--	--	--
1,1,2-Trichloroethane	0.0251	0.002	--	--	--	0.037 U	--	--	--
1,1-Dichloroethane	0.061	0.0038	--	--	--	0.037 U	--	--	--
1,1-Dichloroethene	0.023	0.0011	--	--	--	0.037 U	--	--	--
1,1-Dichloropropene	--	--	--	--	--	0.037 U	--	--	--
1,2,3-Trichlorobenzene	--	--	--	--	--	0.037 U	--	--	--
1,2,3-Trichloropropane	0.033	0.033	--	--	--	0.037 U	--	--	--
1,2,4-Trichlorobenzene	0.019	0.005	--	--	--	0.037 U	--	--	--
1,2-Dibromo-3-chloropropane	1.250	1.250	--	--	--	0.190 U	--	--	--
1,2-Dichlorobenzene	30.12	1.71	--	--	--	0.037 U	--	--	--
1,2-Dichloroethane (EDC)	0.020	0.001	--	--	--	0.037 U	--	--	--
1,2-Dichloropropane	0.020	0.001	--	--	--	0.037 U	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	0.037 U	--	--	--
1,3-Dichloropropane	--	--	--	--	--	0.037 U	--	--	--
1,4-Dichlorobenzene	0.08	0.067	--	--	--	0.037 U	--	--	--
2,2-Dichloropropane	--	--	--	--	--	0.037 U	--	--	--
2-Chloroethyl Vinyl Ether	--	--	--	--	--	0.290 U	--	--	--
2-Chlorotoluene	1,600.00	1,600.00	--	--	--	0.037 U	--	--	--
4-Chlorotoluene	--	--	--	--	--	0.037 U	--	--	--
Bromobenzene	--	--	--	--	--	0.037 U	--	--	--
Bromochloromethane	--	--	--	--	--	0.037 U	--	--	--
Bromoform	0.787	0.0495	--	--	--	0.037 U	--	--	--

Sample Location ¹	Soil Screening Level		GEI-20	GEI-21	GEI-25			GEI-27	GEI-28
Sample Identification			GEI-20-3-040114	GEI-21-3-040114	GEI-25-1-040114	GEI-25-3-040114	GEI-25-5-040114	GEI-27-3-040214	GEI-28-4-040214
Sample Date			04/01/14	04/01/14	04/01/14	04/01/14	04/01/14	04/02/14	04/02/14
Sample Depth (feet bgs)			4-6 feet	4-6 feet	0-2 feet	4-6 feet	8-10 feet	6-7.5 feet	6-8 feet
Sampled By	Vadose Zone	Saturated Zone	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers
Sample Horizon			Saturated	Saturated	Vadose	Saturated	Saturated	Saturated	Saturated
Bromomethane	0.060	0.0038	--	--	--	0.037 U	--	--	--
Carbon Tetrachloride	0.0050	0.001	--	--	--	0.037 U	--	--	--
Chlorobenzene	2.5	0.146	--	--	--	0.037 U	--	--	--
Chloroethane	95.47	5.64	--	--	--	0.190 U	--	--	--
Chloroform	0.0064	0.001	--	--	--	0.037 U	--	--	--
Chloromethane	0.725	0.045	--	--	--	0.240 U	--	--	--
Cis-1,2-Dichloroethene	160.00	160.000	--	--	--	0.037 U	--	--	--
Cis-1,3-Dichloropropene	--	--	--	--	--	0.037 U	--	--	--
Dibromochloromethane	0.0241	0.002	--	--	--	0.037 U	--	--	--
Dibromomethane	800.00	800.000	--	--	--	0.037 U	--	--	--
Dichlorodifluoromethane (CFC 12)	0.17	0.00	--	--	--	0.037 U	--	--	--
1,2-Dibromoethane (EDB)	0.002	0.001	--	--	--	0.037 U	--	--	--
Methyl Iodide	--	--	--	--	--	0.190 U	--	--	--
Methyl t-Butyl Ether (MTBE)	2.592	0.182	--	--	--	0.048 U	--	--	--
Methylene Chloride	4.356	0.297	--	--	--	0.190 U	--	--	--
n-Hexane	0.27	0.01	--	--	--	0.074	--	--	--
Tetrachloroethene (PCE)	0.094	0.0049	--	--	--	0.037 U	--	--	--
Trans-1,2-Dichloroethene	21.71	1.299	--	--	--	0.037 U	--	--	--
Trans-1,3-Dichloropropene	--	--	--	--	--	0.037 U	--	--	--
Trichloroethene (TCE)	0.0103	0.001	--	--	--	0.037 U	--	--	--
Trichlorofluoromethane (CFC 11)	1.4	0.04	--	--	--	0.037 U	--	--	--
Vinyl Chloride	0.006	0.001	--	--	--	0.037 U	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs; mg/kg)									
1-Methylnaphthalene	34.483	34.483	--	--	--	--	--	--	--
2-Methylnaphthalene	0.775	0.040	--	--	--	--	--	--	--
Acenaphthene	0.32	0.02	--	--	--	--	--	--	--
Acenaphthylene	--	0.068	--	--	--	--	--	--	--
Anthracene	4	0.2	--	--	--	--	--	--	--
Benzo[g,h,i]perylene	--	1.951	--	--	--	--	--	--	--
Fluoranthene	3.2	0.16	--	--	--	--	--	--	--
Fluorene	0.5	0.02	--	--	--	--	--	--	--
Naphthalenes	0.25	0.01	--	--	--	9.3 T	--	--	--
Phenanthrene	--	0.101	--	--	--	--	--	--	--
Pyrene	20	1.00	--	--	--	--	--	--	--
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs; mg/kg)									
Benzo[a]anthracene	0.07	0.007	--	--	--	0.19	--	--	--
Benzo[a]pyrene	0.14	0.010	--	--	--	0.11	--	--	--
Benzo[b]fluoranthene	0.25	0.012	--	--	--	0.08	--	--	--
Benzo[k]fluoranthene	0.32	0.016	--	--	--	0.05	--	--	--
Chrysene	0.25	0.0124	--	--	--	0.20	--	--	--
Dibenz[a,h]anthracene	0.14	0.018	--	--	--	0.039 U	--	--	--
Indeno[1,2,3-c,d]pyrene	0.69	0.035	--	--	--	0.05	--	--	--
cPAHs TEQ3	0.22	0.011	--	--	--	0.15 T	--	--	--

Sample Location ¹	Soil Screening Level		GEI-20	GEI-21	GEI-25			GEI-27	GEI-28
Sample Identification			GEI-20-3-040114	GEI-21-3-040114	GEI-25-1-040114	GEI-25-3-040114	GEI-25-5-040114	GEI-27-3-040214	GEI-28-4-040214
Sample Date			04/01/14	04/01/14	04/01/14	04/01/14	04/01/14	04/02/14	04/02/14
Sample Depth (feet bgs)	Vadose Zone	Saturated Zone	4-6 feet	4-6 feet	0-2 feet	4-6 feet	8-10 feet	6-7.5 feet	6-8 feet
Sampled By			GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers
Sample Horizon			Saturated	Saturated	Vadose	Saturated	Saturated	Saturated	Saturated
Polychlorinated Biphenyls (PCBs; mg/kg)									
Total PCBs (sum of Aroclors)	0.062	0.050	–	–	–	0.062 UT	–	–	–
Dioxins and Furans (ng/kg)									
Total dioxins/furans - human health TEQ	5.2	5.2	–	–	–	–	–	–	–

Notes:

- ¹ Sample locations are shown on Figure 4.
- ² Screening level for gasoline-range petroleum hydrocarbons is 30 mg/kg if benzene is present and 100 mg/kg if not present.
- ³ Total carcinogenic Polycyclic Aromatic Hydrocarbon (cPAH) calculated using toxic equivalent (TEQ) methodology relative to benzo(a)pyrene. cPAHs that were not detected were assigned a value of one half of the detection limit for these calculations.
- mg/kg = milligrams per kilogram
- ng/kg = nanograms per kilogram
- T = total concentration
- U = not detected above the laboratory reporting limit
- Bold** font indicates compound was detected.
-  Blue shading indicates that the compound was not detected with a reporting limit greater than the soil screening level.
-  Green shading indicates that the compound was detected at concentrations greater than the soil screening level.

Table 7
Summary of Existing Groundwater Chemical Analytical Data
Quiet Cove Property
Anacortes, Washington

Sample Location ¹	Groundwater Screening Level	B1	B2	B3	MW-1	MW-2	MW-3	MW-3 (Duplicate)	MW-4	MW-5
Sample Identification		B1-8	B2-7.5	B3-6	QC-MW-1-1-7.1.14	QC-MW-2-1-7.1.14	QC-MW-3-1-7.1.14	QC-MW-3-DUP- 1-7.1.14	QC-MW-4-1-7.1.14	QC-MW-5-1-7.1.14
Sample Date		04/06/00	04/06/00	04/06/00	07/01/14	07/01/14	07/01/14	07/01/14	07/01/14	07/01/14
Depth to Groundwater (feet bgs)		10	6	6	5	6	6	6	10.5	7.5
Sampled By		ThermoRetec	ThermoRetec	ThermoRetec	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers
Total Metals (µg/L)										
Arsenic	5	--	--	--	--	--	4.9	--	--	10
Cadmium	9	--	--	--	--	--	4.4 U	--	--	4.4 U
Chromium (total)	50	--	--	--	--	--	11	--	--	46
Lead	2.1	--	--	--	--	--	1.1 U	--	--	7.1
Mercury	0.025	--	--	--	--	--	0.5 U	--	--	0.5 U
Dissolved Metals (µg/L)										
Arsenic	5	--	--	--	--	--	4.5	--	--	6.6
Cadmium	9	--	--	--	--	--	4 U	--	--	4 U
Chromium (total)	50	--	--	--	--	--	10 U	--	--	10 U
Lead	2	--	--	--	--	--	1 U	--	--	1 U
Mercury	0.025	--	--	--	--	--	0.5 U	--	--	0.5 U
Petroleum Hydrocarbons (µg/L)										
Gasoline-Range ²	800/10009	237	1,460	970	100 U	110	480	530	510	440
Diesel-Range	500	1,980	4,560	4,840	860	2,100	2,600 J	2,400 J	1,300 J	1,500 J
Heavy Oil-Range	500	750 U	1510 U	750 U	410 U	980	700	640	410 U	450 U
BETX Compounds (µg/L)										
Benzene	2.4	10	45	67	1 U	1 U	0.2 U	1 U	1 U	0.2 U
Ethylbenzene	130	0.5 U	6.9 U	33.9	1 U	1 U	0.49	1 U	1 U	0.2 U
Toluene	520	0.5 U	1.5 U	4.6	1 U	1 U	1 U	1 U	1 U	1 U
Xylenes	310	2.4 U	7.2 U	5.5	1 U	1 U	1.56	1.8	1 U	0.22
Halogenated Volatile Organic Compounds (HVOCs; µg/L)										
1,1,1,2-Tetrachloroethane	7.4	--	--	--	--	--	0.2 U	--	--	0.2 U
1,1,1-Trichloroethane	5,238	--	--	--	--	--	0.2 U	--	--	0.2 U
1,1,2,2-Tetrachloroethane	3	--	--	--	--	--	0.2 U	--	--	0.2 U
1,1,2-Trichloroethane	4.51	--	--	--	--	--	0.2 U	--	--	0.2 U
1,1-Dichloroethane	11.23	--	--	--	--	--	0.2 U	--	--	0.2 U
1,1-Dichloroethene	3.2	--	--	--	--	--	0.2 U	--	--	0.2 U
1,1-Dichloropropene	--	--	--	--	--	--	0.2 U	--	--	0.2 U
1,2,3-Trichlorobenzene	--	--	--	--	--	--	0.2 U	--	--	0.2 U
1,2,3-Trichloropropane	--	--	--	--	--	--	0.2 U	--	--	0.2 U
1,2,4-Trichlorobenzene	0.5	--	--	--	--	--	0.2 U	--	--	0.2 U
1,2-Dibromo-3-chloropropane	--	--	--	--	--	--	1 U	--	--	1 U
1,2-Dichlorobenzene	2,571	--	--	--	--	--	0.2 U	--	--	0.2 U
1,2-Dichloroethane (EDC)	4.2	--	--	--	--	--	0.2 U	--	--	0.2 U
1,2-Dichloropropane	3.89	--	--	--	--	--	0.2 U	--	--	0.2 U
1,3-Dichlorobenzene	10	--	--	--	--	--	0.2 U	--	--	0.2 U
1,3-Dichloropropane	--	--	--	--	--	--	0.2 U	--	--	0.2 U
1,4-Dichlorobenzene	4.85	--	--	--	--	--	0.2 U	--	--	0.2 U
2,2-Dichloropropane	--	--	--	--	--	--	0.2 U	--	--	0.2 U

Sample Location ¹	Groundwater Screening Level	B1	B2	B3	MW-1	MW-2	MW-3	MW-3 (Duplicate)	MW-4	MW-5
Sample Identification		B1-8	B2-7.5	B3-6	QC-MW-1-1-7.1.14	QC-MW-2-1-7.1.14	QC-MW-3-1-7.1.14	QC-MW-3-DUP-1-7.1.14	QC-MW-4-1-7.1.14	QC-MW-5-1-7.1.14
Sample Date		04/06/00	04/06/00	04/06/00	07/01/14	07/01/14	07/01/14	07/01/14	07/01/14	07/01/14
Depth to Groundwater (feet bgs)		10	6	6	5	6	6	6	10.5	7.5
Sampled By		ThermoRetec	ThermoRetec	ThermoRetec	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers
2-Chloroethyl Vinyl Ether	--	--	--	--	--	--	0.2 U	--	--	0.2 U
2-Chlorotoluene	--	--	--	--	--	--	1 U	--	--	1 U
4-Chlorotoluene	--	--	--	--	--	--	0.2 U	--	--	0.2 U
Bromobenzene	--	--	--	--	--	--	0.2 U	--	--	0.2 U
Bromochloromethane	--	--	--	--	--	--	0.2 U	--	--	0.2 U
Bromoform	120	--	--	--	--	--	0.2 U	--	--	0.2 U
Bromomethane	13	--	--	--	--	--	0.2 U	--	--	0.2 U
Carbon Tetrachloride	0.54	--	--	--	--	--	1 U	--	--	1 U
Chlorobenzene	286	--	--	--	--	--	0.2 U	--	--	0.2 U
Chloroethane	18,286	--	--	--	--	--	0.2 U	--	--	0.2 U
Chloroform	1.20	--	--	--	--	--	0.2 U	--	--	0.2 U
Chloromethane	152.8	--	--	--	--	--	1 U	--	--	1 U
Cis-1,2-Dichloroethene	--	--	--	--	--	--	0.2 U	--	--	0.2 U
Cis-1,3-Dichloropropene	--	--	--	--	--	--	1 U	--	--	1 U
Dibromochloromethane	4.53	--	--	--	--	--	0.2 U	--	--	0.2 U
Dibromomethane	--	--	--	--	--	--	0.2 U	--	--	0.2 U
Dichlorodifluoromethane (CFC 12)	5.66	--	--	--	--	--	0.2 U	--	--	0.2 U
1,2-Dibromoethane (EDB)	0.28	--	--	--	--	--	0.2 U	--	--	0.2 U
Methyl Iodide	--	--	--	--	--	--	0.26 U	--	--	0.26 U
Methyl t-Butyl Ether (MTBE)	610	--	--	--	--	--	1 U	--	--	1 U
Methylene Chloride	1,000	--	--	--	--	--	1 U	--	--	1 U
n-Hexane	7.8	--	--	--	--	--	0.2 U	--	--	0.2 U
Tetrachloroethene (PCE)	9	--	--	--	--	--	0.2 U	--	--	0.2 U
Trans-1,2-Dichloroethene	4,000	--	--	--	--	--	0.2 U	--	--	0.2 U
Trans-1,3-Dichloropropene	--	--	--	--	--	--	0.2 U	--	--	0.2 U
Trichloroethene (TCE)	1.55	--	--	--	--	--	0.2 U	--	--	0.2 U
Trichlorofluoromethane (CFC 11)	120	--	--	--	--	--	0.2 U	--	--	0.2 U
Vinyl Chloride	1	--	--	--	--	--	0.2 U	--	--	0.2 U
Non-carcinogenic Polycyclic Aromatic Hydrocarbons (PAHs; µg/L)										
1-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	14.5	--	--	--	--	--	--	--	--	--
Acenaphthene	3.2	--	--	--	--	--	--	--	--	--
Acenaphthylene	12.7	--	--	--	--	--	--	--	--	--
Anthracene	9.3	--	--	--	--	--	--	--	--	--
Benzo[g,h,i]perylene	1.0	--	--	--	--	--	--	--	--	--
Fluoranthene	3.2	--	--	--	--	--	--	--	--	--
Fluorene	2.9	--	--	--	--	--	--	--	--	--
Naphthalene	8.9	--	--	--	--	--	56	--	--	18.8
Phenanthrene	5.9	--	--	--	--	--	--	--	--	--
Pyrene	14.7	--	--	--	--	--	--	--	--	--
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs; µg/L)										
Benzo[a]anthracene	0.01	--	--	--	--	--	0.015	--	--	0.0095 U
Benzo[a]pyrene	0.01	--	--	--	--	--	0.0094 U	--	--	0.0095 U
Benzo[b]fluoranthene	0.01	--	--	--	--	--	0.0094 U	--	--	0.0095 U
Benzo[k]fluoranthene	0.013	--	--	--	--	--	0.0094 U	--	--	0.0095 U

Sample Location ¹	Groundwater Screening Level	B1	B2	B3	MW-1	MW-2	MW-3	MW-3 (Duplicate)	MW-4	MW-5
Sample Identification		B1-8	B2-7.5	B3-6	QC-MW-1-1-7.1.14	QC-MW-2-1-7.1.14	QC-MW-3-1-7.1.14	QC-MW-3-DUP- 1-7.1.14	QC-MW-4-1-7.1.14	QC-MW-5-1-7.1.14
Sample Date		04/06/00	04/06/00	04/06/00	07/01/14	07/01/14	07/01/14	07/01/14	07/01/14	07/01/14
Depth to Groundwater (feet bgs)		10	6	6	5	6	6	6	10.5	7.5
Sampled By		ThermoRetec	ThermoRetec	ThermoRetec	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers
Chrysene	0.031	--	--	--	--	--	0.017	--	--	0.0095 U
Dibenz[a,h]anthracene	0.01	--	--	--	--	--	0.0094 U	--	--	0.0095 U
Indeno[1,2,3-c,d]pyrene	0.01	--	--	--	--	--	0.0094 U	--	--	0.0095 U
cPAHs TEQ ³	0.011	--	--	--	--	--	0.0083 T	--	--	0.0072 UT
Polychlorinated Biphenyls (PCBs; (µg/L)										
Total PCBs (sum of Aroclors)	0.01	--	--	--	--	--	--	--	--	--
Dioxins and Furans (ng/L)										
Total dioxins/furans - human health TEQ	0.016	--	--	--	--	--	--	--	--	--

Notes:

- ¹ Sample locations are shown on Figure 5.
- ² Screening level for gasoline-range petroleum hydrocarbons is 800 µg/L if benzene is present and 1000 µg/L if not present.
- ³ Total carcinogenic Polycyclic Aromatic Hydrocarbon (cPAH) calculated using toxic equivalent (TEQ) methodology relative to benzo(a)pyrene. cPAHs that were not detected were assigned a value of one half of the detection limit for these calculations.
- bgs = below ground surface
- µg/L = milligrams per kilogram
- ng/L = nanograms per kilogram
- T = total concentration
- J = estimated result
- U = not detected above the laboratory reporting limit
- Bold** font indicates compound was detected.
- Blue shading indicates that the compound was not detected with a reporting limit greater than the groundwater screening level.
- Green shading indicates that the compound was detected at concentrations greater than the groundwater screening level.

Table 8
Proposed Remedial Investigation/Feasibility Study Work Plan – Approach and Rationale
Quiet Cove Property
Anacortes, Washington

Media of Concern	Data Gap	Proposed RI/FS Investigation Locations ¹	Boring Depth/ Soil Sampling	Well Screen Interval/ Groundwater Sampling	Proposed Sample Analysis Priority	Proposed Analysis
Soil	Characterization of Site Geology/ Stratigraphy: ■ Characterization of stratigraphy in portions of the Site not previously investigated. ■ Characterization of the soil fill and native soil horizon in portions of the Site not previously investigated.	Direct-Push Boring: ■ GEI-29 through GEI-45 Hollow-Stem Auger Boring: ■ MW-6 through MW-11	■ Advance boring at least three feet into the native soil or to approximately 15 feet bgs, whichever occurs first. ■ If evidence of petroleum contamination is observed, advance the boring to at least three feet below the observed depth of contamination, or until refusal.	■ N/A	Tier 1 Sample Analysis: ■ Submit selected soil samples from GEI-29 through GEI-32 and GEI-38 through GEI-44 for chemical analysis. Tier 2 Sample Analysis: ■ Submit selected archived samples for chemical analysis to improve delineation of soil contamination.	Contaminants of potential concern in soil based on previous study results and historical operations: ■ Diesel and Heavy Oil (NWTPH-Dx) ■ Gasoline/BTEX (NWTPH-Gx/EPA 8260) ■ MTCA Metals2 (EPA 6000/7000) ■ PAHs (EPA 8270D/SIM) ■ Fuel additives including EDB, EDC, MTBE, and n-Hexane (EPA 8260)
	Characterization of the Nature and Extent of Contamination: ■ Evaluation of potential soil contamination associated with historical Site operations and use. ■ Characterization of the horizontal and vertical extent of contaminants in the fill and native soil associated with historical Site operations and use.		■ Collect samples from the fill soil horizon, native soil horizon, and from the approximate surface of the water table for potential chemical analysis. ■ Archive additional samples for potential follow-up analysis.			
Groundwater	Characterization of Site Hydrogeology: ■ Characterization of groundwater gradients/ flow direction at the Site. ■ Characterization of hydraulic conductivity/ transmissivity. ■ Characterization of tidal influence on groundwater gradients, and flow direction. ■ Characterization of the effect of Curtis Wharf bulkhead on groundwater gradients/flow direction at the Site.	Existing Monitoring Wells: ■ MW-2 and MW-4 New Monitoring Wells: ■ MW-6 through MW-9 and MW11	■ N/A	■ Utilize existing monitoring wells. ■ Install 10-foot well screen across water table observed on day of drilling at proposed new monitoring well locations. Screen interval will be adjusted to account for potential tidal fluctuation.	■ N/A	Tidal Study: ■ Record changes in water level every 15 minutes over a 72-hour period using a combination of pressure transducers with internal data loggers corrected for atmospheric pressure.
	Characterization of the Nature and Extent of Contamination: ■ Characterization of the horizontal extent of contaminants in groundwater in portions of the Site not previously investigated.	Existing Monitoring Wells: ■ MW-1 through MW-5 New Monitoring Wells: ■ MW-6 through MW-11 ■ Additional locations as necessary to determine nature and extent as required/ approved by Ecology.				Hydraulic Conductivity Test: ■ Record changes in water level while performing drawdown test to identify the range of hydraulic conductivities present. Contaminants of potential concern in groundwater based on previous study results and historical operations include: ■ Diesel and Heavy Oil (NWTPH-Dx) ■ Gasoline/BTEX (NWTPH-Gx/EPA 8260) ■ Total and Dissolved MTCA Metals² (EPA 6000/7000/200.8) ■ PAHs (EPA 8270D/SIM) ■ Fuel additives including EDB, EDC, MTBE, and n-Hexane (EPA 8260)) Additional groundwater analysis may be performed for contaminants are detected in sediment or for potential fingerprint analysis to distinguish between site and off-site contamination source(s), including, but not limited to, any combination of the following: ■ PCBs (EPA 1668C) ■ SMS Metals³ (EPA 6000/7000/200.8) ■ SMS SVOCs (EPA 8270/SIM) ■ EPH and VPH

Media of Concern	Data Gap	Proposed RI/FS Investigation Locations	Boring Depth/ Soil Sampling	Well Screen Interval/ Groundwater Sampling	Proposed Sample Analysis Priority	Proposed Laboratory Analysis
Sediment	Characterization of Site Geology/ Stratigraphy: ■ Characterization of stratigraphy in portions of the Site not previously investigated. ■ Characterization of the soil fill and native soil horizon in portions of the Site not previously investigated.	Composite Surface (0 to 10 cm) Grab Sample: ■ SED-1-COMP ▪ SED-1A ▪ SED-1B ▪ SED-1C	■ Advance boring at least three feet into the native soil or to approximately 15 feet bgs, whichever occurs first. ■ If evidence of petroleum contamination is observed, advance the boring to at least three feet below the observed depth of contamination, or until refusal.	■ N/A	Tier 1A Sample Analysis: ■ Submit a composite surface sediment sample SED-1-COMP (surface composite from locations SED-1A through SED-1C) for analysis to evaluate soil/groundwater to sediment pathway. ■ Submit sediment samples collected at location SED-1B from the fill sediment horizon, native sediment horizon, and from the approximate surface of the water table for chemical analysis to evaluate soil/groundwater to sediment pathway. Tier 1B Sample Analysis: ■ Submit sample SED-1-COMP for additional chemical analysis to evaluate soil/groundwater to sediment exposure pathway or potential off-site contamination source(s), if elected by the Port or required by Ecology. ■ Submit selected archived samples collected from discrete boring location SED-1B for chemical analysis to evaluate soil/groundwater to sediment pathway, evaluate potential off-site contamination source(s) if elected by the Port or required by Ecology. Tier 2A Sample Analysis: ■ Submit sediment samples collected at locations SED-2 through SED-4 from the approximate groundwater to surface water discharge point for chemical analysis based on up-gradient soil sample and Tier 1 sediment sample results. ■ Submit sediment samples collected at locations SED-5 through SED-7 from the fill sediment horizon, native sediment horizon, and from the approximate surface of the water table for chemical analysis based on up-gradient soil sample and Tier 1 sediment sample results. Tier 2B Sample Analysis: ■ Submit sediment samples collected at locations SED-2 through SED-4 from the approximate groundwater to surface water discharge point for chemical analysis for additional chemical analysis to evaluate soil/groundwater to sediment exposure pathway or potential off-site contamination source(s), if elected by the Port or required by Ecology. ■ Submit sediment samples collected at locations SED-5 through SED-7 from the fill sediment horizon, native sediment horizon, and from the approximate surface of the water table for additional chemical analysis to evaluate soil/groundwater to sediment exposure pathway or potential off-site contamination source(s), if elected by the Port or required by Ecology. ■ Submit selected archived samples collected from SED-1A through SED-1C and SED-2 through SED-7 for chemical analysis to evaluate soil/groundwater to sediment pathway and/or improve delineation of sediment contamination, if elected by the Port or required by Ecology.	Contaminants of potential concern in sediment based on previous study results for upland media include: ■ Diesel and Heavy Oil (NWTPH-Dx) ■ Gasoline/BTEX (NWTPH-Gx/EPA 8260) ■ Fuel additives including EDB, EDC, MTBE, and n-Hexane (EPA 8260). ■ Grain Size (PSEP 1986 or ASTM-Mod) ■ TOC (PSEP 1981) ■ TVS (PSEP 1986/ASTM D2974) ■ TS (SM2540G) ■ SMS Metals⁴ (EPA 6000/7000) ■ SMS SVOCs/PAHs (EPA 8270/SIM) ■ Bulk/Porewater Ammonia (EPA 350.1/SM 4500-NH3) ■ Bulk/Porewater Sulfides (PSEP 1986/SM 4500-S2) Additional sediment sample analysis may be performed in consultation with Ecology for potential contaminants of concern, including, but not limited to, any combination of the following: ■ Dioxins/Furans (EPA 1613) ■ PCB Congeners (EPA 1668C)
	Characterization of Nature and Extent of Contamination: ■ Characterization of sediment in and adjacent to the beach area located west of the Quiet Cove Property. ■ Characterization of sediment in beach area located adjacent to former/current outfalls.	Direct-Push Boring: ■ SED-1A through SED-1C and SED-2 through SED-7	■ Collect surface (0 to 10 cm) samples for potential chemical analysis. Sufficient sample volume will be collected for potential follow-up analysis of additional chemical parameters. ■ Collect samples from the fill sediment horizon, native sediment horizon, and from the approximate surface of the water table for potential chemical analysis. Sufficient sample volume will be collected for potential follow-up analysis of additional chemical parameters. ■ Archive additional samples for potential follow-up analysis.			

Media of Concern	Data Gap	Proposed RI/FS Investigation Locations	Boring Depth/ Soil Sampling	Well Screen Interval/ Groundwater Sampling	Proposed Sample Analysis Priority	Proposed Laboratory Analysis
Sediment	Evaluation of potential biological effects in surface sediment to evaluate compliance with SMS biological criteria: Evaluation of potential biological effects where chemical concentrations and/or visual measures of wood debris exceed screening levels.	TBD	TBD	N/A	Tier 3 Sample Analysis: TBD	To be determined based on results of SMS chemical analyses and visual measures of wood debris. Sample collection for bioassay testing to be performed in a subsequent phase of sampling and testing, if elected by the Port, or required by Ecology.

Notes:

¹Proposed RI/FS investigation locations are shown on Figures 7 and 8.

²Metals include arsenic, cadmium, chromium, lead, and mercury.

³Metals include arsenic, cadmium, chromium [total], copper, lead, mercury, silver and zinc.

bgs = below ground surface

NWTPH-G = Gasoline-Range Petroleum Hydrocarbons

NWTPH-Dx = Diesel- and Heavy Oil-Range Petroleum Hydrocarbons

BTEX = Benzene, Toluene, Ethylbenzene, Xylenes

EPA = Environmental Protection Agency

PAH = Polycyclic Aromatic Hydrocarbons

VOCs = Volatile Organic Compounds

SVOCs = Semi-Volatile Organic Compounds

PID = Photoionization Detector

SIM = Selected Ion Mode

PCBs = Polychlorinated Biphenyls

SMS = Sediment Management Standards

PSEP = Puget Sound Estuarine Protocols

TOC = Total Organic Carbon

TVS = Total Volatile Solids

TS = Total Solids

Table 9
Soil Sampling and Analysis Plan
Quiet Cove Property
Anacortes, Washington

Sample Location ¹	Sample Analysis Priority		Target Sample Interval ⁴ (feet bgs)	Anticipated Sample Horizon ⁵			Petroleum Hydrocarbons (TPH)		Volatile Organic Compounds (VOCs)		MTCA Metals ⁶ (EPA 6000/7000)	Polycyclic Aromatic Hydrocarbons (PAHs)		Archive
	Tier 1 ²	Tier 2 ³		Fill	Water Table	Native	Gasoline-Range (NWTPH-Gx)	Diesel- and Heavy Oil-Range (NWTPH-Dx)	BETX (EPA 8260)	EDB, EDC, MTBE and n-Hexane (EPA 8260)		Carcinogenic PAHs (EPA 8270-SIM)	Naphthalenes (EPA 8270-SIM)	
Direct-Push (DP) Sample Location														
GEI-29	X		0-2	■			X	X	X	X	X	X	X	A
			2-4	■										
			4-6	■	■		X	X	X	X	X	X	X	
			6-8	■										
			8-10			■	X	X	X	X	X	X	X	
GEI-30	X		0-2	■			X	X	X	X	X	X	X	A
			2-4	■										
			4-6	■	■		X	X	X	X	X	X	X	
			6-8	■										
			8-10			■	X	X	X	X	X	X	X	
GEI-31	X		0-2	■			X	X	X	X	X	X	X	A
			2-4	■										
			4-6	■	■		X	X	X	X	X	X	X	
			6-8	■										
			8-10			■	X	X	X	X	X	X	X	
GEI-32	X		0-2	■			X	X	X	X	X	X	X	A
			2-4	■										
			4-6	■	■		X	X	X	X	X	X	X	
			6-8	■										
			8-10			■	X	X	X	X	X	X	X	
GEI-33		X	0-2	■										A
			2-4	■										A
			4-6	■	■									A
			6-8	■										A
			8-10			■								A
GEI-34		X	0-2	■										A
			2-4	■										A
			4-6	■	■									A
			6-8	■										A
			8-10			■								A
GEI-35		X	0-2	■										A
			2-4	■										A
			4-6	■	■									A
			6-8	■										A
			8-10			■								A
GEI-36		X	0-2	■										A
			2-4	■										A
			4-6	■	■									A
			6-8	■										A
			8-10			■								A
GEI-37		X	0-2	■										A
			2-4	■										A
			4-6	■	■									A
			6-8	■										A
			8-10			■								A

Sample Location ¹	Sample Analysis Priority		Target Sample Interval ⁴ (feet bgs)	Anticipated Sample Horizon ⁵			Petroleum Hydrocarbons (TPH)		Volatile Organic Compounds (VOCs)		MTCA Metals ⁶ (EPA 6000/7000)	Polycyclic Aromatic Hydrocarbons (PAHs)		Archive
	Tier 1 ²	Tier 2 ³		Fill	Water Table	Native	Gasoline-Range (NWTPH-Gx)	Diesel- and Heavy Oil-Range (NWTPH-Dx)	BETX (EPA 8260)	EDB, EDC, MTBE and n-Hexane (EPA 8260)		Carcinogenic PAHs (EPA 8270-SIM)	Naphthalenes (EPA 8270-SIM)	
GEI-38	X		0-2	■			X	X	X	X	X	X	X	
			2-4	■										A
			4-6	■	■		X	X	X	X	X	X	X	
			6-8	■										A
			8-10	■										A
			10-12			■	X	X	X	X	X	X	X	
			12-14			■								A
			14-16			■								A
GEI-39	X		0-2	■			X	X	X	X	X	X	X	
			2-4	■										A
			4-6	■	■		X	X	X	X	X	X	X	
			6-8	■										A
			8-10	■										A
			10-12			■	X	X	X	X	X	X	X	
			12-14			■								A
			14-16			■								A
GEI-40	X		0-2	■			X	X	X	X	X	X	X	
			2-4	■										A
			4-6	■	■		X	X	X	X	X	X	X	
			6-8	■										A
			8-10	■										A
			10-12			■	X	X	X	X	X	X	X	
			12-14			■								A
			14-16			■								A
GEI-41	X		0-2	■										A
			2-4		■	■	X	X	X	X	X	X	X	
			4-6			■	X	X	X	X	X	X	X	
GEI-42	X		0-2	■										A
			2-4		■	■	X	X	X	X	X	X	X	
			4-6			■	X	X	X	X	X	X	X	
GEI-43	X		0-2	■										A
			2-4		■	■	X	X	X	X	X	X	X	
			4-6			■	X	X	X	X	X	X	X	
GEI-44	X		0-2	■			X	X	X	X	X	X	X	
			2-4	■										A
			4-6	■	■		X	X	X	X	X	X	X	
			6-8	■										A
			8-10	■										A
			10-12			■	X	X	X	X	X	X	X	
			12-14			■								A
GEI-45		X	0-2	■										A
			2-4	■										A
			4-6	■	■									A
			6-8	■										A
			8-10	■										A
			10-12			■								A
			12-14			■								A

Sample Location ¹	Sample Analysis Priority		Target Sample Interval ⁴ (feet bgs)	Anticipated Sample Horizon ⁵			Petroleum Hydrocarbons (TPH)		Volatile Organic Compounds (VOCs)		MTCA Metals ⁶ (EPA 6000/7000)	Polycyclic Aromatic Hydrocarbons (PAHs)		Archive
	Tier 1 ²	Tier 2 ³		Fill	Water Table	Native	Gasoline-Range (NWTPH-Gx)	Diesel- and Heavy Oil-Range (NWTPH-Dx)	BETX (EPA 8260)	EDB, EDC, MTBE and n-Hexane (EPA 8260)		Carcinogenic PAHs (EPA 8270-SIM)	Naphthalenes (EPA 8270-SIM)	
Hollow-Stem Auger (HSA) Sample Location														
MW-6		X	0-2	■										A
			2-4	■										A
			4-6	■										A
			6-8	■	■									A
			8-10			■								A
			10-12			■								A
			12-14			■								A
			14-16			■								A
MW-7		X	0-2	■										A
			2-4	■										A
			4-6	■										A
			6-8	■	■									A
			8-10	■										A
			10-12			■								A
			12-14			■								A
			14-16			■								A
MW-8		X	0-2	■										A
			2-4	■										A
			4-6	■	■									A
			6-8	■										A
			8-10	■										A
			10-12			■								A
			12-14			■								A
			14-16			■								A
MW-9		X	0-2	■										A
			2-4	■										A
			4-6	■	■									A
			6-8	■										A
			8-10	■										A
			10-12			■								A
			12-14			■								A
			14-16			■								A
MW-10		X	0-2	■										A
			2-4	■										A
			4-6	■	■									A
			6-8	■										A
			8-10			■								A
			10-12			■								A
			12-14			■								A
			14-16			■								A
MW-11		X	0-2	■										A
			2-4	■										A
			4-6	■										A
			6-8	■	■									A
			8-10			■								A
			10-12			■								A
			12-14			■								A
			14-16			■								A

Notes:

- ¹ The approximate sample locations are shown on Figure 7.
- ² Tier 1 sample analysis will be completed as part of the initial soil investigation to evaluate nature and extent of Site contamination.
- ³ Tier 2 sample analysis will be performed on archived samples based on a review of the initial soil investigation results to evaluate soil/groundwater to sediment pathway, evaluate potential off-site contamination source(s) and/or improve delineation of sediment contamination, if elected by the Port or required by Ecology.
- ⁴ Sample intervals may be adjusted based on observed field conditions to collect samples representative to the fill and native soil horizon, and interface between the saturate and vadose zone. The exploration will be advanced to at least three feet into native soil or to approximately fifteen feet below ground surface (bgs), whichever occurs first. If field screening evidence of contamination is observed, the exploration will be advanced to at least three feet below the observed depth of contamination, or until refusal.
- ⁵ Anticipated sample horizon is based on existing information. Actual field conditions may differ.
- ⁶ MTCA metals include arsenic, cadmium, chromium (total), lead and mercury.
- bgs = below ground surface
- BETX = Benzene, Ethylbenzene, Toluene and Xylenes
- EDB = 1,2-Dichloroethane
- EDC = 1,2-Dichloroethane
- EPA = Environmental Protection Agency
- MTBE = Methyl t-Butyl Ether
- MTCA = Model Toxics Control Act
- A = Sample for archive analysis.
- X = Selected sample for initial chemical analysis .

Table 10

Groundwater Sampling and Analysis Plan

Quiet Cove Property

Anacortes, Washington

Sample Location ¹	Sample Analysis Priority		Petroleum Hydrocarbons (TPH)				Volatile Organic Compounds (VOCs)		MTCA Metals ⁵		Polycyclic Aromatic Hydrocarbons (PAHs)		SMS Metals ⁶		SMS Semi-Volatile Organic Compounds (SVOCs) (EPA 8270D/SIM)	Polychlorinated Biphenyl's (PCBs) (EPA 1668C)
	Tier 1 ²	Tier 2 ³	Gasoline-Range (NWTPH-Gx)	Diesel- and Heavy Oil-Range (NWTPH-Dx)	Extractable Petroleum Hydrocarbons ⁴ (EPH)	Volatile Petroleum Hydrocarbons ⁴ (VPH)	BETX (EPA 8260)	EDB, EDC, MTBE and n-Hexane (EPA 8260)	Total Metals (EPA 6000/7000/200.8)	Dissolved Metals (EPA 6000/7000/200.8)	Carcinogenic PAHs (EPA 8270-SIM)	Naphthalenes (EPA 8270-SIM)	Total Metals (EPA 6000/7000/200.8)	Dissolved Metals (EPA 6000/7000/200.8)		
Existing Monitoring Well																
MW-1	X		X	X			X	X	X	X	X	X				
		X											0	0	0	0
MW-2	X		X	X			X	X	X	X	X	X				
		X											0	0	0	0
MW-3	X		X	X			X	X	X	X	X	X				
		X											0	0	0	0
MW-4	X		X	X			X	X	X	X	X	X				
		X											0	0	0	0
MW-5	X		X	X			X	X	X	X	X	X				
		X											0	0	0	0
New Monitoring Well																
MW-6	X		X	X			X	X	X	X	X	X				
		X											0	0	0	0
MW-7	X		X	X			X	X	X	X	X	X				
		X											0	0	0	0
MW-8	X		X	X			X	X	X	X	X	X				
		X			0	0							0	0	0	0
MW-9	X		X	X			X	X	X	X	X	X				
		X											0	0	0	0
MW-10	X		X	X			X	X	X	X	X	X				
		X			0	0							0	0	0	0
MW-11	X															
		X			0	0							0	0	0	0

Notes:

- ¹The approximate sample locations are shown on Figure 8.
- ²Tier 1 sample analysis will be completed as part of the initial groundwater investigation to evaluate nature and extent of Site contamination.
- ³Tier 2 sample analysis will be completed under separate mobilization to evaluate soil/groundwater to sediment pathway, evaluate potential off-site contamination source(s) and/or improve delineation of sediment contamination, if elected by the Port or required by Ecology.
- ⁴Analysis may be performed based on the results of the initial groundwater investigation to evaluate potential off-site contaminant source(s).
- ⁵MTCA metals include arsenic, cadmium, chromium (total), lead and mercury.
- ⁶SMS metals include arsenic, cadmium, chromium [total], copper, lead, mercury, silver and zinc.
- BETX = Benzene, Ethylbenzene, Toluene and Xylenes
- EDB = 1,2-Dichloroethane
- EDC = 1,2-Dichloroethane
- EPA = Environmental Protection Agency
- MTBE = Methyl t-Butyl Ether
- MTCA = Model Toxics Control Act
- O = Sample for potential follow-up analysis under a separate mobilization based on a review of Tier 1 sample results.
- X = Selected sample for initial chemical analysis.

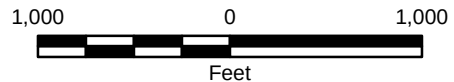
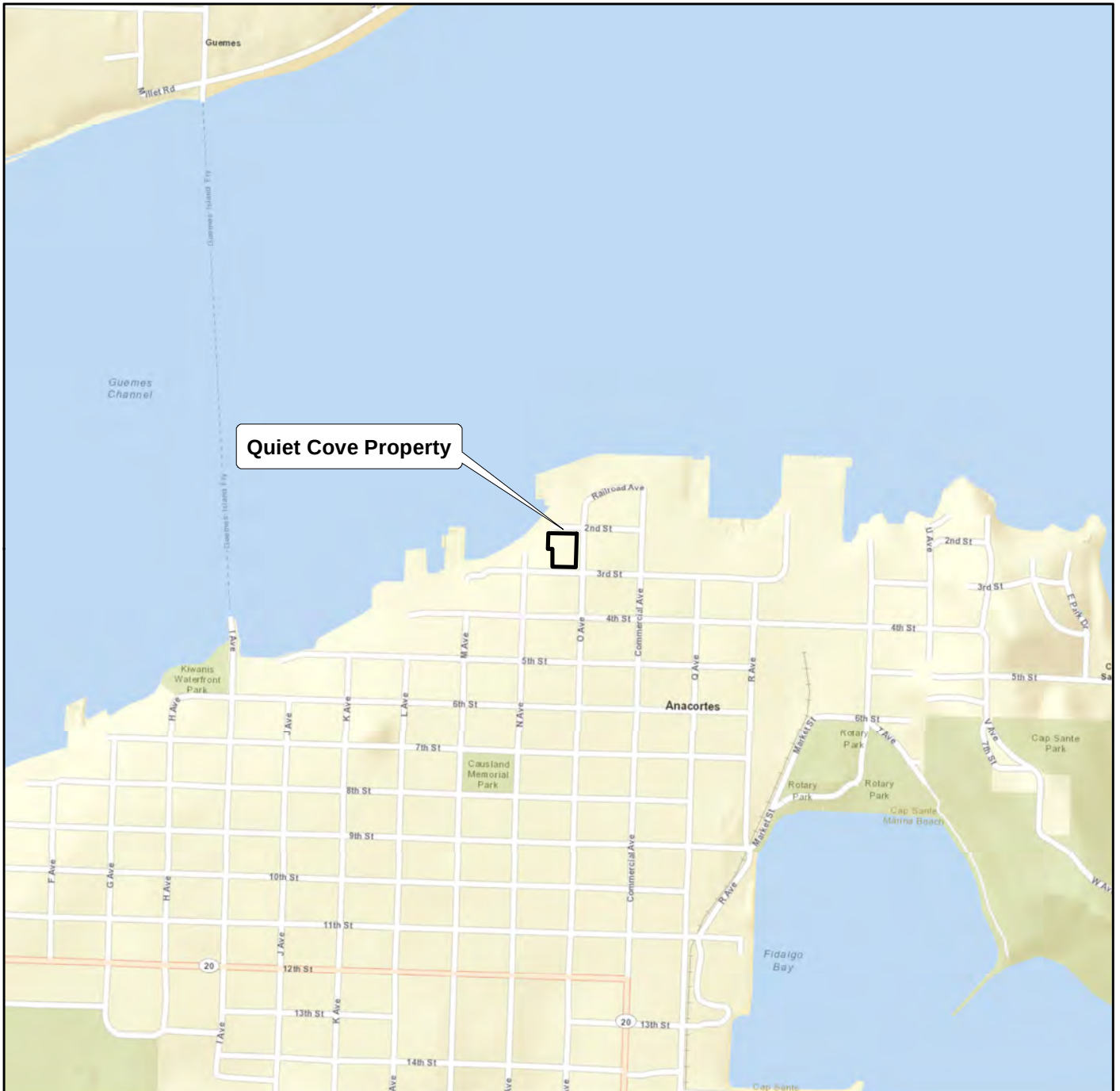
Table 11
Sediment Sampling and Analysis Plan
Quiet Cove Property
Anacortes, Washington

Sample Location ¹	Sample Analysis Priority ²				Target Sample Interval ³ (feet bgs)	Anticipated Sample Horizon ⁴			Petroleum Hydrocarbons (TPH)		Volatile Organic Compounds (VOCs)		Metals	Conventionals TOC, TVS, TS (PSEP 1981/1986/ASTM D2974/SM2540G)			SMS Metals ⁵ (EPA 6000/7000)	SMS SVOCs (EPA 8270D/SIM)	Polychlorinated Biphenyl's (PCBs) (EPA 1668C)	Dioxins/ Furans (EPA 1613)	Archive	
	Tier 1		Tier 2			Fill	Water Table	Native	Gasoline-Range (NWTPH-Gx)	Diesel- and Heavy Oil-Range (NWTPH-Dx)	BETX (EPA 8260)	EDB, EDC, MTBE and n-Hexane (EPA 8260)	Arsenic and Cadmium (EPA 6000/7000)	Grain Size (PSEP 1986 or ASTM-Mod)	Sulfides and Ammonia (SM4500-S2/SM4500-NH3)							
	A	B	A	B																		
Surface Sample Location																						
SED-1-COMP	X				0-10 cm	■			X	X	X	X	X	X	X	X	X	X	0	0		
		X																				
SED-2			X		0-10 cm			■	X	X	X	X	X	X	X	X	X	X	0	0		
				X																		
SED-3			X		0-10 cm			■	X	X	X	X	X	X	X	X	X	X	0	0		
				X																		
SED-4			X		0-10 cm			■	X	X	X	X	X	X	X	X	X	X	0	0		
				X																		
Subsurface Sample Location																						
SED-1A				X	0-2	■															A	
					2-4	■																A
					4-6	■																A
					6-8	■	■															A
					8-10			■														A
					10-12			■														A
SED-1B	X				0-2	■															A	
					2-4	■			X	X	X	X	X	X	X	X	X					
					4-6	■	■		X	X	X	X	X	X	X	X	X					
					6-8			■	X	X	X	X	X	X	X	X	X					
					8-10			■														A
		X				0-2	■												0	0	A	
						2-4	■													0	0	
						4-6	■	■												0	0	
						6-8			■											0	0	
						8-10			■													A
SED-1C				X	0-2	■														A		
					2-4	■	■													A		
					4-6			■												A		
					6-8			■											A			
SED-2				X	0-2			■												A		
					2-4			■												A		
SED-3				X	0-2			■												A		
					2-4			■												A		
SED-4				X	0-2			■												A		
					2-4			■												A		

Sample Location ¹	Sample Analysis Priority ²				Target Sample Interval ³ (feet bgs)	Anticipated Sample Horizon ⁴			Petroleum Hydrocarbons (TPH)		Volatile Organic Compounds (VOCs)		Metals	Conventionals TOC, TVS, TS (PSEP 1986 or ASTM-Mod)			SMS Metals ⁵ (EPA 6000/7000)	SMS SVOCs (EPA 8270D/SIM)	Polychlorinated Biphenyl's (PCBs) (EPA 1668C)	Dioxins/ Furans (EPA 1613)	Archive	
	Tier 1		Tier 2			Gasoline-Range (NWTPH-Gx)	Diesel- and Heavy Oil-Range (NWTPH-Dx)	BETX (EPA 8260)	EDB, EDC, MTBE and n-Hexane (EPA 8260)	Arsenic and Cadmium (EPA 6000/7000)	Grain Size (PSEP 1986 or ASTM-Mod)	Sulfides and Ammonia (SM4500-S2/SM4500-NH3)										
	A	B	A	B																		
SED-5			X		0-2	■															A	
					2-4	■			X	X	X	X	X	X	X	X	X	X				
					4-6	■																A
					6-8	■	■		X	X	X	X	X	X	X	X	X	X	X			
					8-10			■	X	X	X	X	X	X	X	X	X	X				
					10-12			■														A
				X	0-2	■															A	
					2-4	■														O	O	
					4-6	■																A
					6-8	■	■													O	O	
					8-10			■												O	O	
					10-12			■														A
SED-6			X		0-2	■														A		
					2-4	■			X	X	X	X	X	X	X	X	X	X				
					4-6	■																A
					6-8	■	■		X	X	X	X	X	X	X	X	X	X				
					8-10			■	X	X	X	X	X	X	X	X	X	X				
					10-12			■														A
				X	0-2	■														O	O	
					2-4	■																A
					4-6	■																
					6-8	■	■													O	O	
					8-10			■												O	O	
					10-12			■														A
SED-7			X		0-2	■														A		
					2-4	■			X	X	X	X	X	X	X	X	X	X				
					4-6	■																A
					6-8	■	■		X	X	X	X	X	X	X	X	X	X				
					8-10			■	X	X	X	X	X	X	X	X	X	X				
					10-12			■														A
				X	0-2	■														O	O	
					2-4	■																
					4-6	■																A
					6-8	■	■													O	O	
					8-10			■												O	O	
					10-12			■														A

Notes:

- ¹The approximate sample locations are shown on Figure 7.
- ² A three point surface composite sample (Tier 1 sample) will be collected west of the Curtis Wharf Bulkhead to evaluate sediment quality for upland COPC. Further characterization of the composite sample may be conducted using archived sediment to evaluate SMS parameters in consultation with Ecology following a review of initial sample results. Sediment samples from Tier 2 locations will be submitted for chemical analysis of contaminants found to be exceeding screening levels at Tier 1 sediment and/or upland shoreline soil or groundwater samples. Sufficient material will be collected from the Tier 2 sediment sample locations for potential follow-up analysis of SMS parameter. A third tier of sampling and analysis (Tier 3) may be performed following review of Tier 2 sediment sample results and identification of contaminant exceedances. Determination of the follow-up laboratory analyses from Tier 2 and potential Tier 3 locations will be in consultation with Ecology.
- ³ Sample intervals may be adjusted in the field based on observed conditions to characterize sediment in the fill and native horizon, and at the water table. The exploration will be advanced to at least three feet into native soil or to approximately fifteen feet below ground surface (bgs), whichever occurs first. If field screening evidence of contamination is observed, the exploration will be advanced to at least three below the observed depth of contamination, or until refusal.
- ⁴ Anticipated sample horizon is based on existing information. The sample horizon may differ based on observed conditions.
- ⁵ MTCA metals include arsenic, cadmium, chromium (total), lead and mercury.
- bgs = below ground surface
- BETX = Benzene, Ethylbenzene, Toluene and Xylenes
- EDB = 1,2-Dichloroethane
- EDC = 1,2-Dichloroethane
- EPA = Environmental Protection Agency
- MTBE = Methyl t-Butyl Ether
- MTCA = Model Toxics Control Act
- O = Sample for follow-up analysis to evaluate soil/groundwater to sediment pathway, evaluate potential off-site contamination source(s) and/or improve delineation of sediment contamination, if elected by the Port or required by Ecology.
- X = Selected sample for initial chemical analysis to evaluate nature and extent of Site contamination.
- A = Sample for archive analysis.



Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

Data Sources: ESRI Data & Maps, Street Data 2013.

Transverse Mercator, Zone 10 N North, North American Datum 1983
North arrow oriented to grid north

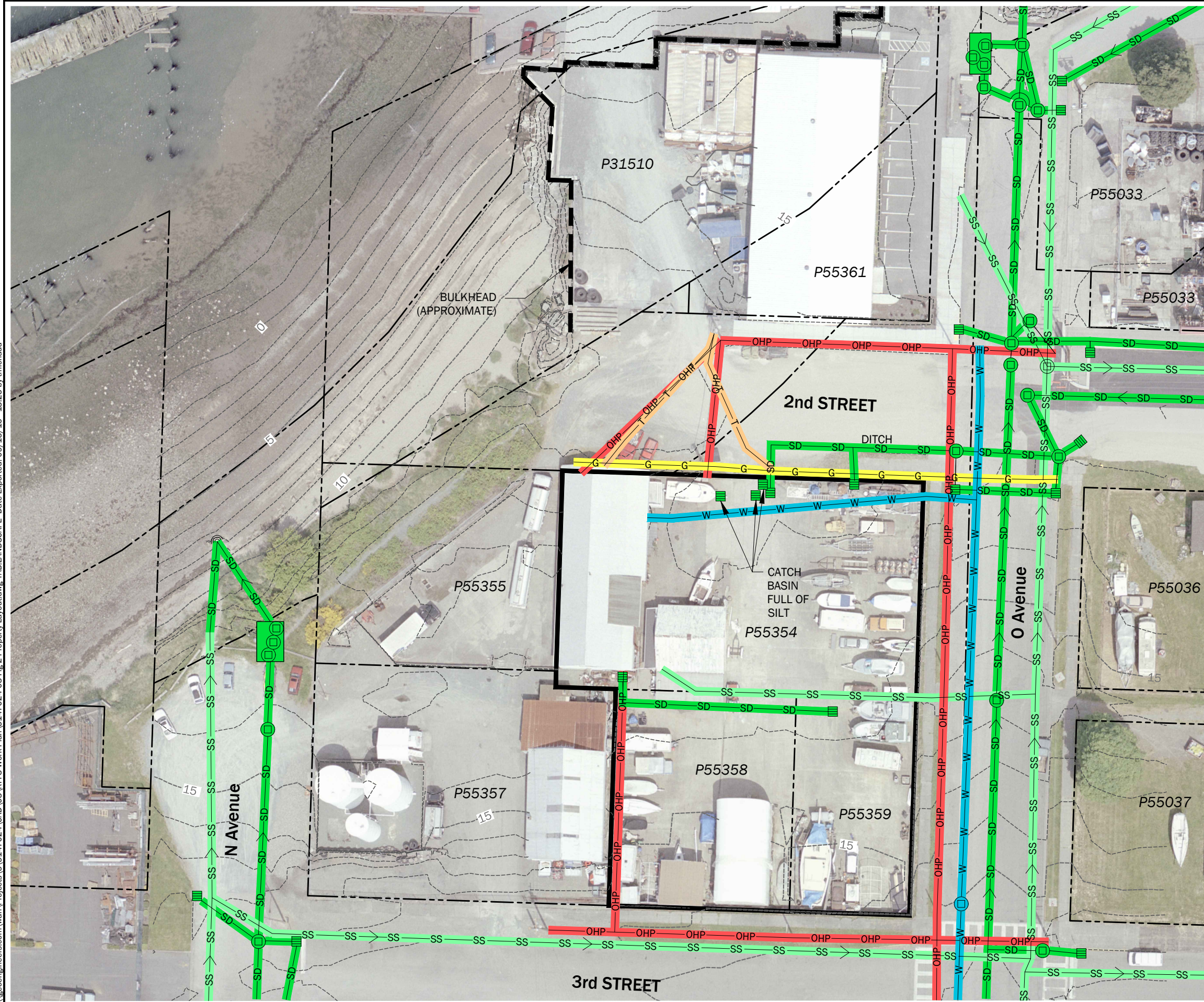
Vicinity Map

Quiet Cove Property
Anacortes, Washington



Figure 1

\\geoengineers.com\wan\Projects\5147024\CAD\03\RIFS Work Plan\5147024-03 Fig 2 Property Layout.dwg TABLANDSCAPE Date Exported: 09/15/16 - 13:25 by tmichaud



Legend

Quiet Cove Property Boundary

Skagit County Parcel Boundary

G

Natural Gas

OHP

Overhead Power

T

Telephone

SS

Sanitary Sewer (SS) and Flow Direction

SD

Storm Drain (SD) and Flow Direction

W

Water

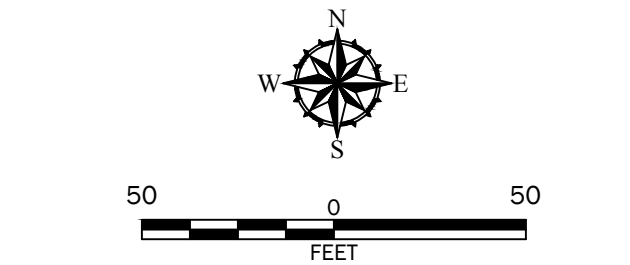
Manhole

Catch Basin

Outfall

10

Topographic Contour



- Notes:**
1.

The locations of all features shown are approximate.
2.

This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication

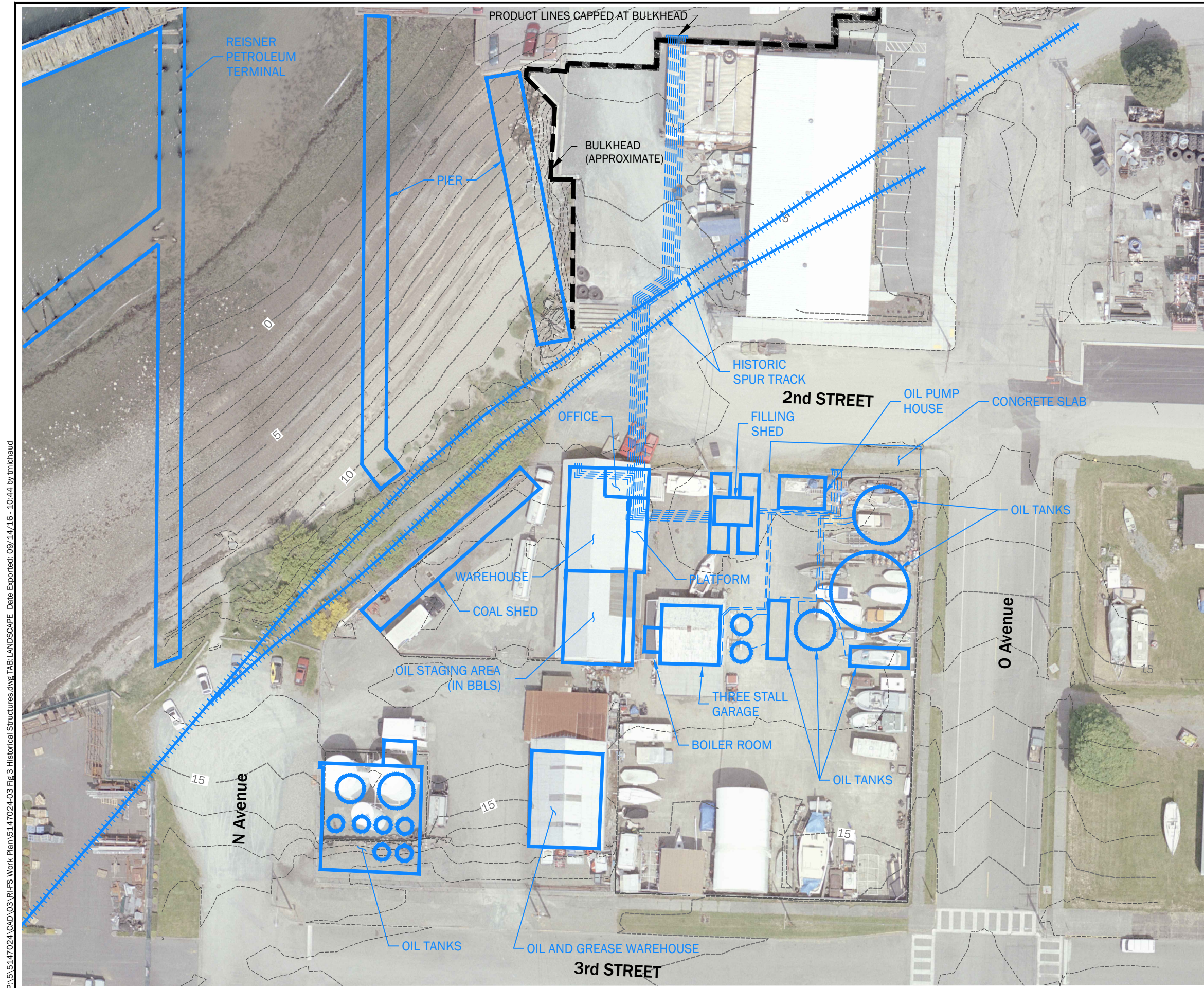
Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Utility and topography provided by Port of Anacortes on 4/8/2016. Historical features are based on Sanborn Maps dated October 1925.

Current Property Layout and Utilities

Quiet Cove Property
Anacortes, Washington

GEOENGINEERS

Figure 2



Legend

- Quiet Cove Property Boundary
- Historical Features
- ≡≡≡≡≡≡ Product Supply Line
- - - - -10- - - - - Topographic Contour

Notes:

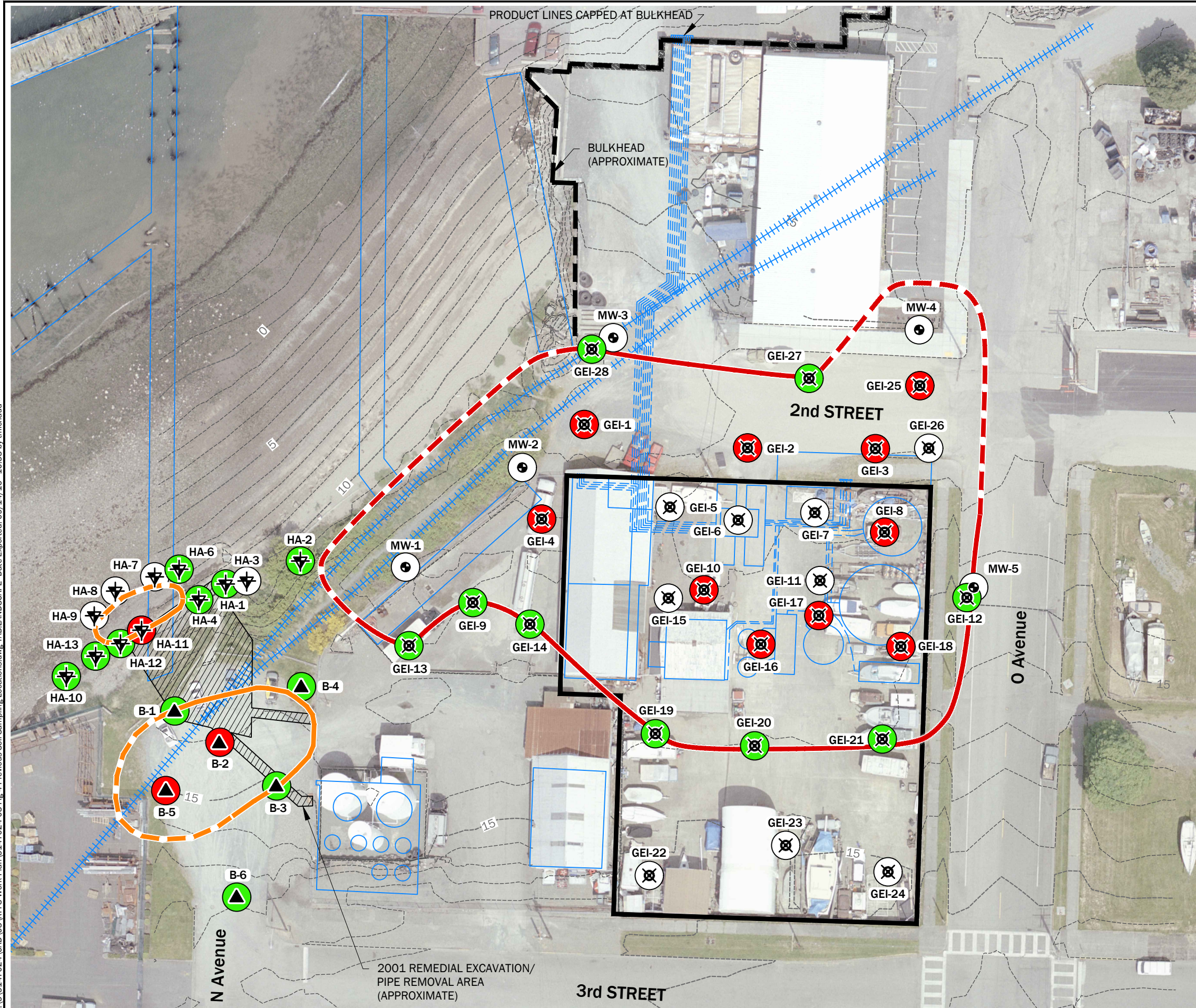
1. The locations of all features shown are approximate. A detailed layout of the Property and Bulk Fuel facilities is shown on the May 31, 1921 Standard Oil Engineers drawing presented in Appendix A.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Utility and topography provided by Port of Anacortes on 4/8/2016. Historical features are based on Sanborn Maps dated October 1925.

Historical Features	
Quiet Cove Property Anacortes, Washington	
	Figure 3

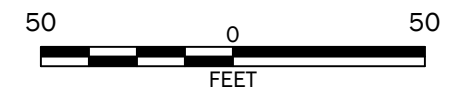
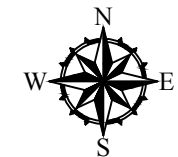
P:\5147024\CAD\03\RI-FS Work Plan\5147024-03 Fig 3 Historical Structures.dwg TAB:LANDSCAPE Date Exported: 09/14/16 - 10:44 by tmchaud

P:\5147024\CAD\03\RI-FS Work Plan\5147024-03 Fig 4 Previous Soil Sampling Locations.dwg TAB:LANDSCAPE Date Exported: 09/14/16 - 10:53 by tmdiaud



Legend

- Quiet Cove Property Boundary
- Historical Features
- Topographic Contour
- B-1 ▲ Boring Location (Thermo Retec, 2000)
- HA-1 ✕ Hand Auger Boring Location (Thermo Retec, 2000)
- GEI-1 ✕ Boring Location (GeoEngineers, 2014)
- MW-4 ● Monitoring Well Location (GeoEngineers, 2014)
- Exceedance of Screening Level(s) in Soil
- No Exceedance Screening Level(s) in Soil
- No Soil Data
- Quiet Cove Site
Approximate Extent of Contaminated Soil (Defined by Existing Data)
- Approximate Extent of Contaminated Soil (Inferred from Existing Data)
- Off-Property Contaminant Sources
Approximate Extent of Contaminated Soil (Defined by Existing Data)
- Approximate Extent of Contaminated Soil (Inferred from Existing Data)



Notes:

1. The locations of all features shown are approximate. A detailed layout of the Property and Bulk Fuel facilities is shown on the May 31, 1921 Standard Oil Engineers drawing presented in Appendix A.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Utility and topography provided by Port of Anacortes on 4/8/2016. Historical features are based on Sanborn Maps dated October 1925.

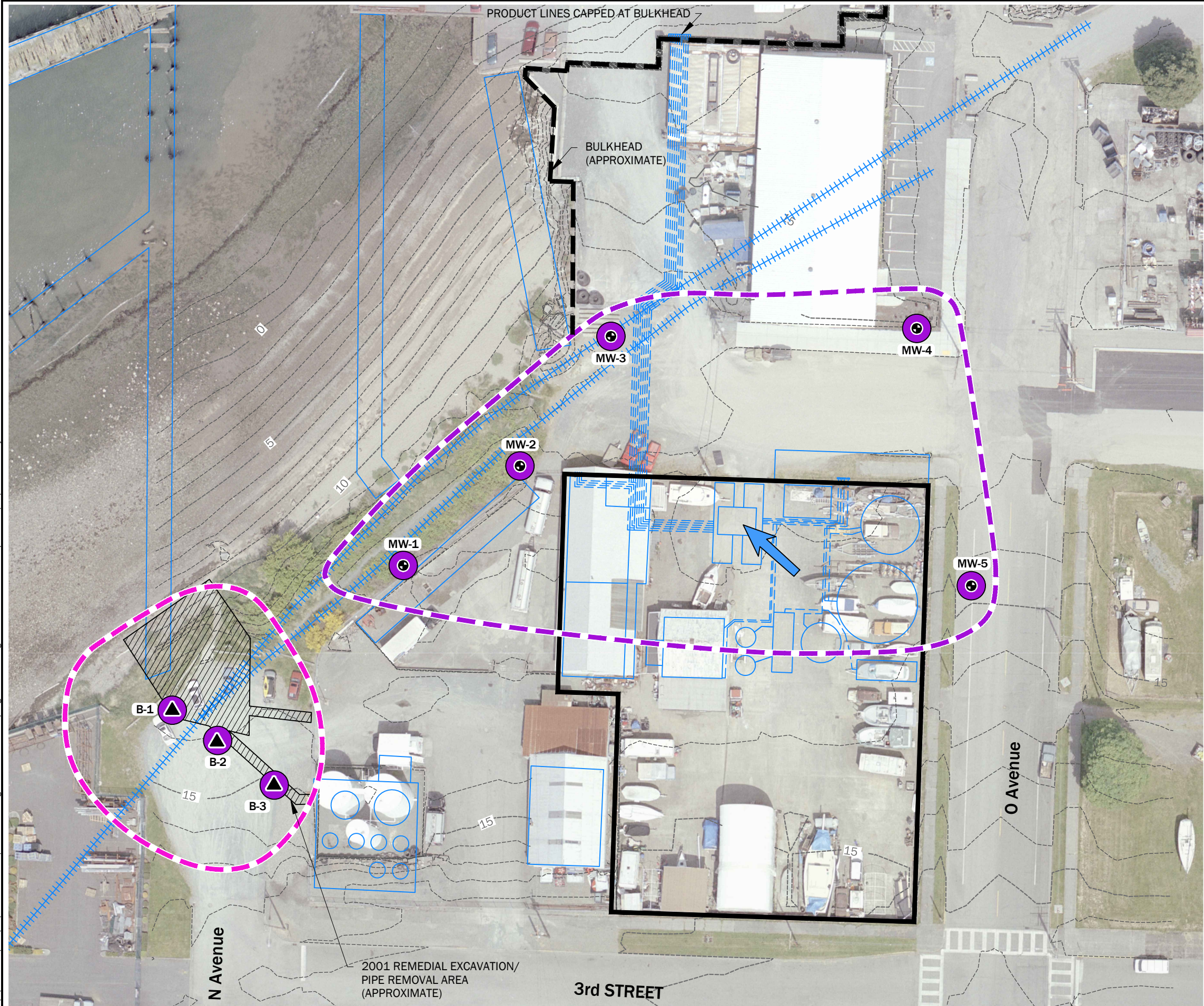
Previous Soil Sample Locations and Summary of Existing Data

Quiet Cove Property
Anacortes, Washington



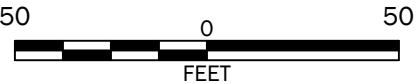
Figure 4

P:\5147024\CAD\03\RI-FS Work Plan\5147024-03 Fig 5 Previous GW Sampling Locations.dwg TAB:LANDSCAPE Date Exported: 09/14/16 - 10:57 by tmichaud



Legend

- Quiet Cove Property Boundary
- Historical Features
- 10 Topographic Contour
- B-1 ▲ Grab Sample Location (Thermo Retec, 2000)
- MW-4 ● Monitoring Well Location (GeoEngineers, 2014)
- Exceedance of Screening Level(s) in Groundwater
- No Exceedance Screening Level(s) in Groundwater
- Inferred Groundwater Flow Direction
- Quiet Cove Site
Approximate Extent of Contaminated Groundwater
(Inferred from Existing Data)
- Off-Property Contaminant Sources
Approximate Extent of Contaminated Groundwater
(Inferred from Existing Data)



Notes:

- The locations of all features shown are approximate. A detailed layout of the Property and Bulk Fuel facilities is shown on the May 31, 1921 Standard Oil Engineers drawing presented in Appendix A.
- This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Utility and topography provided by Port of Anacortes on 4/8/2016. Historical features are based on Sanborn Maps dated October 1925.

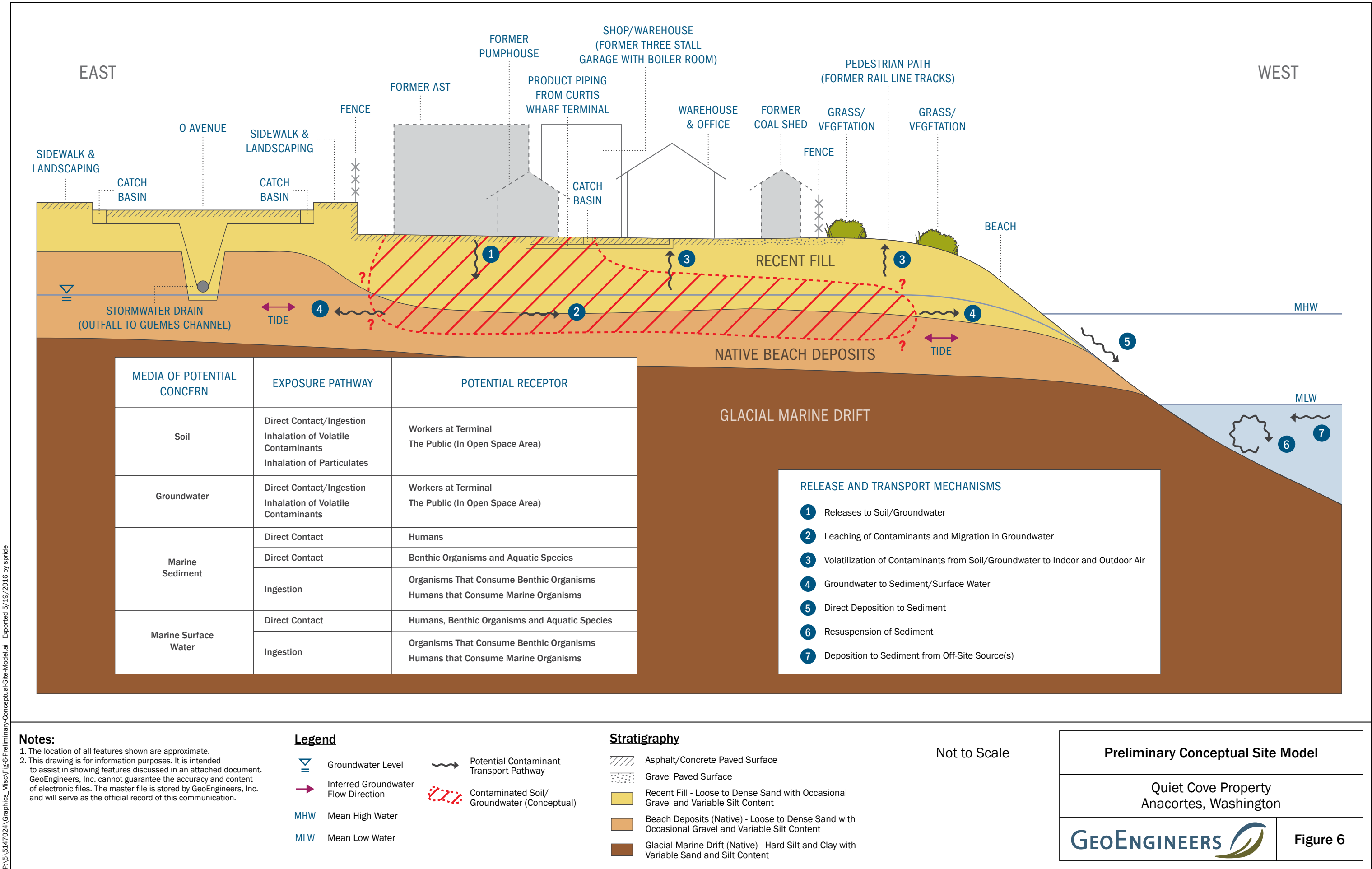
Previous Groundwater Sample Locations
and Summary of Existing Data

Quiet Cove Property
Anacortes, Washington

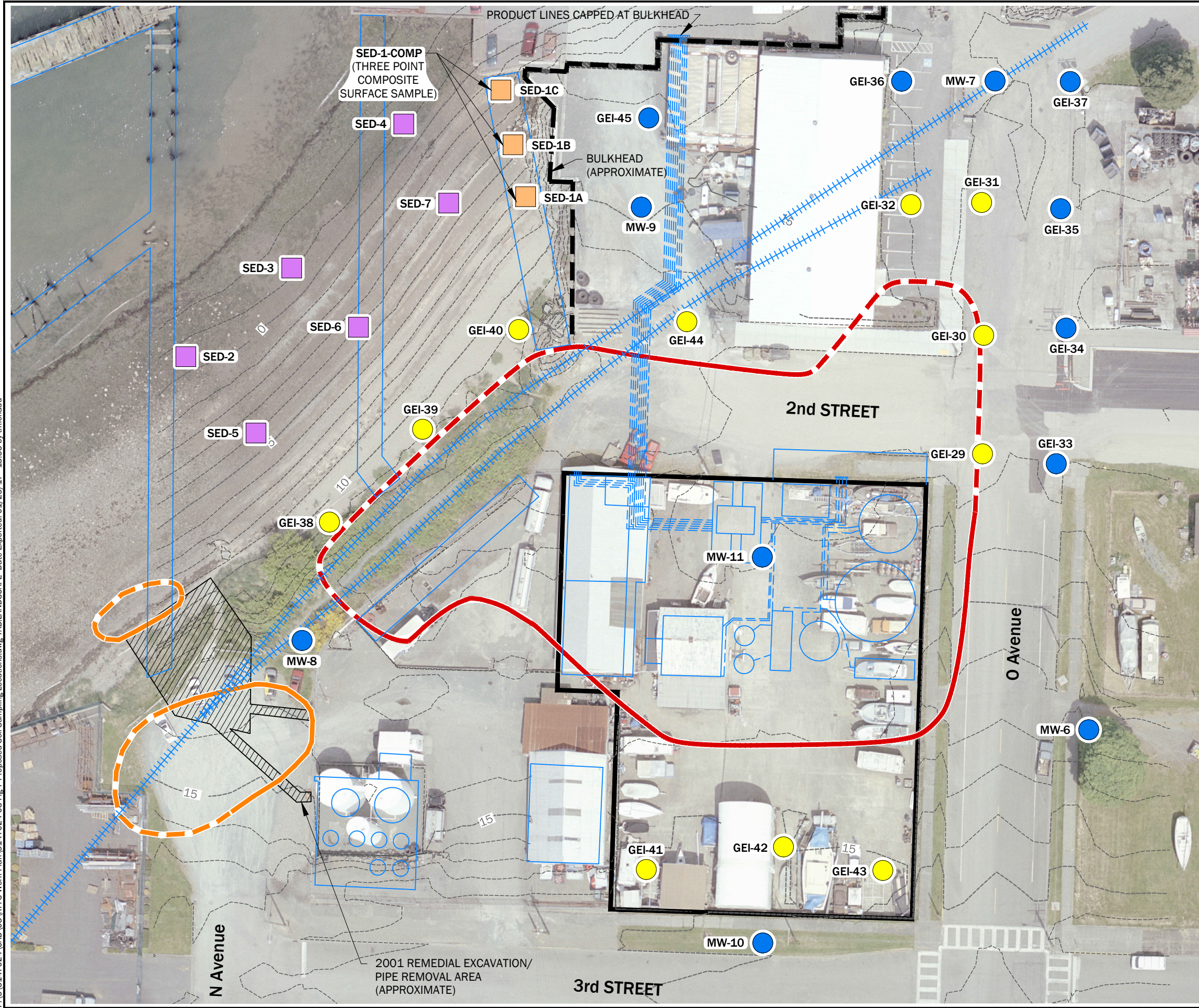


Figure 5

P:\5147024\Graphics_Misc\Fig-6-Preliminary-Conceptual-Site-Model.ai Exported 5/19/2016 by spride



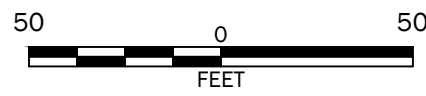
P:\5147024\CAD\03\RI-FS Work Plan\5147024-03 Fig 7 Proposed Soil Sampling Locations.dwg TAB:LANDSCAPE Date Exported: 01/25/17 - 13:55 by tmichaud



Legend

- Quiet Cove Property Boundary
- Historical Features
- Topographic Contour
- Quiet Cove Site
- Approximate Extent of Contaminated Soil (Defined by Existing Data)
- Approximate Extent of Contaminated Soil (Inferred from Existing Data)
- Off-Property Contaminant Sources
- Approximate Extent of Contaminated Soil (Defined by Existing Data)
- Approximate Extent of Contaminated Soil (Inferred from Existing Data)
- Proposed RI Sampling and Analysis*
- Proposed Location for Tier 1 Soil Analysis
- Proposed Location for Tier 2 Soil Analysis
- Proposed Location for Tier 1 Sediment Analysis
- Proposed Location for Tier 2 Sediment Analysis

*Refer to Table 8 for Sample Approach and Rationale. Refer to Tables 9 and 11 for Sample and Analysis Plan. Unless otherwise noted, borings will be advanced to at least three feet into native or fifteen feet below ground surface, whichever occurs first.



Notes:

- The locations of all features shown are approximate. A detailed layout of the Property and Bulk Fuel facilities is shown on the May 31, 1921 Standard Oil Engineers drawing presented in Appendix A.
- This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Utility and topography provided by Port of Anacortes on 4/8/2016. Historical features are based on Sanborn Maps dated October 1925.

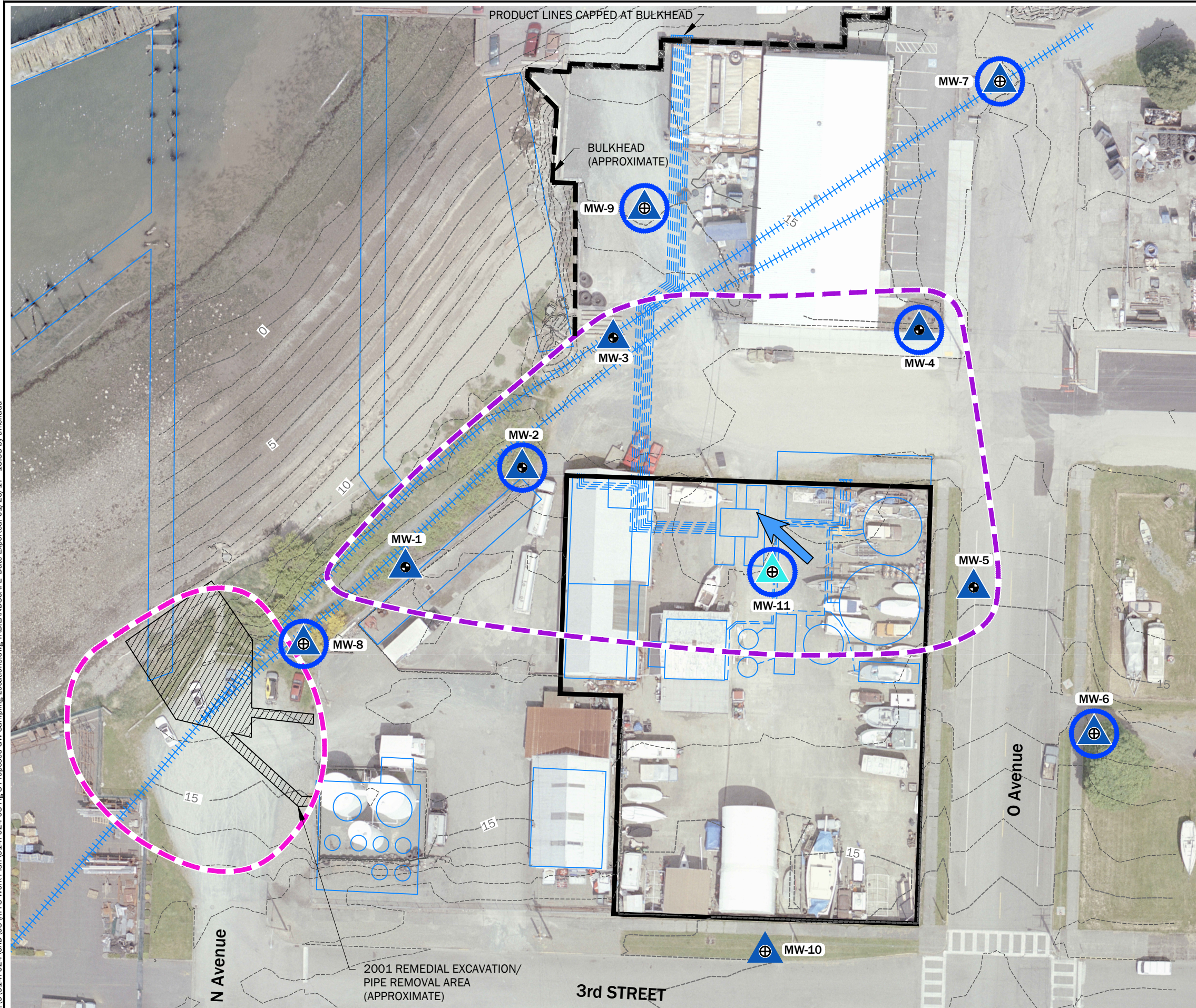
**Proposed Soil and Sediment
Remedial Investigation Sample Locations**

Quiet Cove Property
Anacortes, Washington

GEOENGINEERS

Figure 7

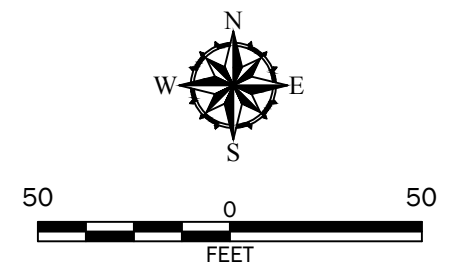
P:\5147024\CAD\03\RI-FS Work Plan\5147024-03 Fig 8 Proposed GW Sampling Locations.dwg TAB: LANDSCAPE Date Exported: 01/25/17 - 13:58 by tmichaud



Legend

- Quiet Cove Property Boundary
- Historical Features
- Topographic Contour
- Existing Monitoring Well Location
- Proposed Monitoring Well Location
- Inferred Groundwater Flow Direction
- Quiet Cove Site
Approximate Extent of Contaminated Groundwater
(Inferred from Existing Data)
- Off-Property Contaminant Sources
Approximate Extent of Contaminated Groundwater
(Inferred from Existing Data)
- Proposed RI Sampling and Analysis*
Proposed Location for Tier 1/Tier 2 Groundwater Analysis
- Proposed Location for Tier 2 Groundwater Analysis
- Proposed Location for Hydraulic Conductivity/Tidal Study

*Refer to Table 8 for Sample Approach and Rationale. Refer to Table 10 for Sample and Analysis Plan.



Notes:

1. The locations of all features shown are approximate. A detailed layout of the Property and Bulk Fuel facilities is shown on the May 31, 1921 Standard Oil Engineers drawing presented in Appendix A.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Base Aerial taken by David C. Smith & Associates, Inc. on 6/17/2009. Utility and topography provided by Port of Anacortes on 4/8/2016. Historical features are based on Sanborn Maps dated October 1925.

Proposed Groundwater Remedial Investigation Sample Locations

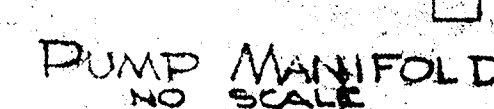
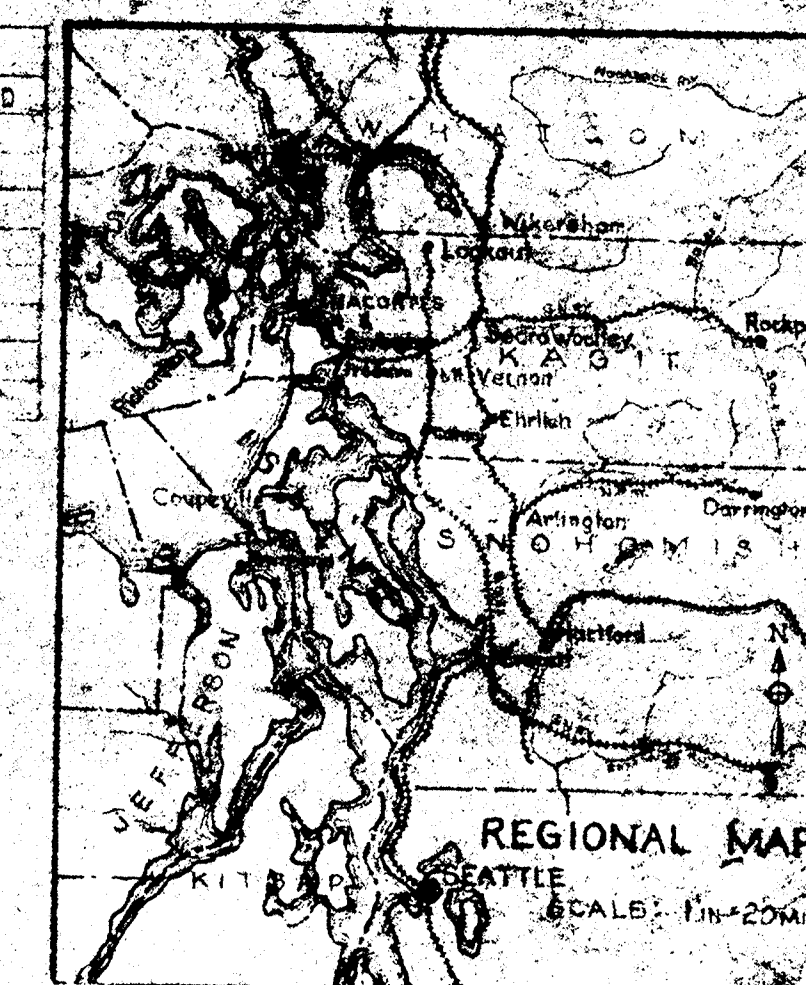
Quiet Cove Property
Anacortes, Washington



Figure 8

APPENDIX A

Standard Oil Engineering Drawing



STANDARD OIL CO. OF CALIF.
SAN FRANCISCO
ANACORTES, W.N.
GROUND PLAN

SCALE 1"=20' DATE 5-31-21
DRAWN A.L.H. TRACED A.L.H.
CHECKED D.C.C. APPROVED

APPENDIX B

Historical Photographs



Photocopy of photograph (Original print, Anacortes Museum.) Photographer unknown. Early view, c. 1905, looking north and east, before the construction of the Cement and Plaster Warehouse and the expansion of the wharf itself to the west. - Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA

Photo from Survey HABS WA-198-13

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

**Historical Photograph - Circa 1905
Quiet Cove and Surrounding Area**

Quiet Cove Site
Anacortes, Washington



Figure B-1



Photocopy of photograph (Original print, Anacortes Museum.) Published in the Anacortes American, April 1907. Tacoma Engineering Company, Photographer. View to the north. On the right; early ticket office, south facade; behind it, a warehouse, east section of the present building; on the left, the original freight warehouse, the west section of the present building. Note wharf configuration in front of Ticket Office. - Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA

Photo from Survey HABS WA-198-14

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

Historical Photograph - Circa 1907 Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-2



Photocopy of photograph (Original print, Anacortes Museum.) The Standard Oil complex is forefront in this image with tanks, a Red Crown gasoline facility (part of Standard Oil) and Standard Oil Company offices in the lower right. Anacortes Iron Works (1019 3rd Street) is located behind the tanks at 3rd Street and O Avenue.

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Anacortes Museum & Maritime Heritage Center

Historical Photograph – Circa 1909 Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-2



Photocopy of photograph (Original print, Wallie V. Funk Collection.) Photographer unknown. Published in the Anacortes American, 12 October 1911; 'Plant of the Anacortes Ice Company and Curtis Dock.' Photograph probably earlier. View looking northwest, left to right; Cement and Plaster Warehouse; Ice Plant (with towers); Cold Storage Warehouse; Freight Warehouse; a warehouse; and early ticket office. - Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA

Photo from Survey HABS WA-198-15

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

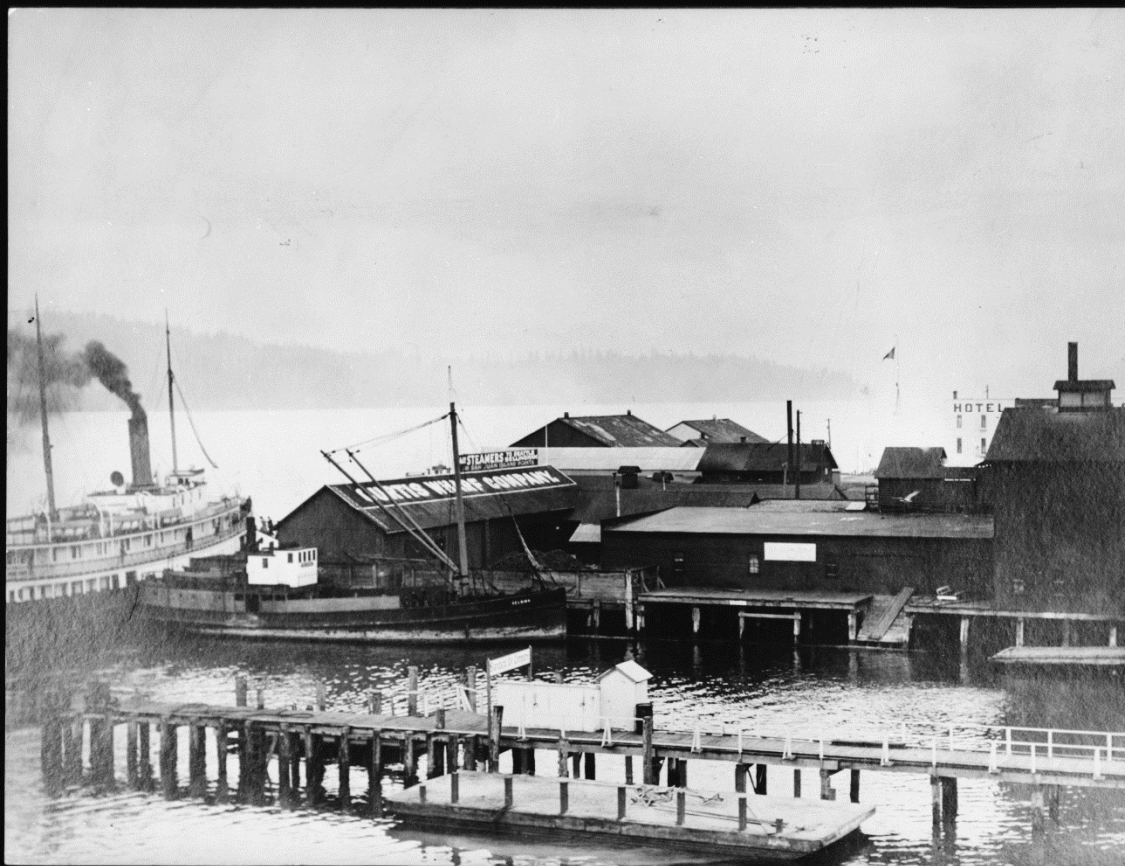
Data Source: Library of Congress

Historical Photograph - Circa 1911 Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-3



HABS NO. WA-198-16

Photocopy of photograph (Original print, Wallie V. Funk Collection.) Photographer unknown. Published in the Anacortes American, 19 March 1914, 'Curtis Wharf Company Handles City's Extensive Maritime Traffic.' View looking northeast. In the foreground, the Standard Oil Dock; behind it, the west side of the main dock. In the center, west facade, Hay and Grain Warehouse (Bottling Works not yet built.) To the right, Feed Mill. Note coal bin at northwest corner of the Hay and Grain Warehouse. - Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA

Photo from Survey HABS WA-198-16

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

Historical Photograph - Circa 1914 Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-4



Photocopy of photograph (Original print, Anacortes Museum.) Photographer unknown, c. 1915. View to the northeast, west side of main wharf in the background. Right to left: Cement and Plaster Warehouse (labelled 'Curtis Wharf Warehouse #2'); Feed Mill; and Bottling Works, with the Sand and Gravel Wharf across from it, to the left. - Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA

Photo from Survey HABS WA-198-17

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

Historical Photograph - Circa 1915
Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-5



Photocopy of photograph (Original print, Wallie V. Funk Collection.) Photographer unknown, c. 1920. View looking north, ferry slip in the center; to the right is the main wharf. Buildings on the main wharf, right to left: 'Ferry Cigar Stand,' no longer extant; Feed Mill; Bottling Works (with dormer). On the left, the Sand and Gravel Wharf. - Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA

Photo from Survey HABS WA-198-18

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

Historical Photograph - Circa 1920
Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-6



Photocopy of photograph (Original print, Wallie V. Funk Collection.) Photographer unknown, c. 1928. View looking north: ferry slip in the center. To the right is the south facade of the Feed Mill; to the left, the Sand and Gravel Wharf. - Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA

Photo from Survey HABS WA-198-19

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

Historical Photograph – Circa 1928 Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-7

HABS NO. WA-198-20



Photocopy of photograph (Original print, Wallie V. Funk Collection.) Photographer unknown, c. 1934. Northwest corner of the main dock, west facade of the Freight Warehouse to the right. Passengers embarking onto the twinstack single screw 'Tacoma,' travelling to Victoria on the Puget Sound Navigation Company's 'Black Ball' line. - Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA

Photo from Survey HABS WA-198-20

Historical Photograph – Circa 1934
Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-8

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress



Panoramic view, city of Anacortes, from the top of a tanker barge at the Port of Anacortes. View looking southwest. - Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA.

Photo from Survey HABS WA-198-01

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

**Historical Photograph – Circa 1970s
Quiet Cove and Surrounding Area**

Quiet Cove Site
Anacortes, Washington



Figure B-9



Panoramic view, Curtis Wharf, from the top of a tanker barge at the Port of Anacortes. View looking south. - Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA

Photo from Survey HABS WA-198-02

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

Historical Photograph – Circa 1970s Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-10



Panoramic view, Guemes Channel, from the top of a tanker barge at the Port of Anacortes. View looking southeast. - Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA

Photo from Survey HABS WA-198-03

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

**Historical Photograph – Circa 1970s
Quiet Cove and Surrounding Area**

Quiet Cove Site
Anacortes, Washington



Figure B-11



East side of Curtis Wharf, as seen from the pier at the Port of Anacortes. View looking south and west. - Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA

Photo from Survey HABS WA-198-04

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

Historical Photograph – Circa 1970s Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-12



Freight Warehouse, east facade, on the right; east facade and southeast corner of Ticket Office on the left.
- Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA

Photo from Survey HABS WA-198-05

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

Historical Photograph – Circa 1970s Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-13



Looking into the inner court. Left to right: Cold Storage Warehouse, east facade; Freight Warehouse, south facade; Ticket Office, southwest corner. - Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA

Photo from Survey HABS WA-198-06

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

Historical Photograph – Circa 1970s Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-14



View looking south and west along the railroad right-of-way. Cement and Plaster Warehouse on the left; Creamery on the right. - Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA

Photo from Survey HABS WA-198-07

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

Historical Photograph – Circa 1970s Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-15



"Rephotographic" of WA-198-18. Directly north, in the center, is the ferry slip; on the right, west side of main dock; on the left, the Sand and Gravel Wharf - Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA

Photo from Survey HABS WA-198-10

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

Historical Photograph – Circa 1970s Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-16



Panoramic view, Guemes Channel, from the top of a tanker barge at the Port of Anacortes. View looking southeast. - Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA

Photo from Survey HABS WA-198-03

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

Historical Photograph – Circa 1970s Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-17



View east into the inner court between the Freight Warehouse and the Cold Storage Warehouse from the Sand and Gravel Wharf. Ferry slip is in the foreground. - Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA

Photo from Survey HABS WA-198-11

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

**Historical Photograph – Circa 1970s
Quiet Cove and Surrounding Area**

Quiet Cove Site
Anacortes, Washington



Figure B-18



Photocopy of photograph (Original print, Port of Anacortes.) Brady's Anacortes Studio, Photographer, date unknown. Overview of Curtis Wharf. North section of main dock is intact; Sand and Gravel Wharf on the right. - Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA

Photo from Survey HABS WA-198-12

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

Historical Photograph – Circa 1970s Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-19



Photocopy of photograph (Original print, Port of Anacortes.) Brady's Anacortes Studio, Photographer, date unknown. Overview of Curtis Wharf and surrounding area. North section of main dock is intact; Sand and Gravel Wharf on the right. - Curtis Wharf, O & Second Streets, Anacortes, Skagit County, WA

Photo from Survey HABS WA-198-12

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

**Aerial Photograph - Circa 1920s
Quiet Cove and Surrounding Area**

Quiet Cove Site
Anacortes, Washington



Figure B-20



Overview of Quiet Cove and surrounding area. Reisner Petroleum Terminal to the south of Curtis Wharf is intact; Standard Oil Facility and railroad line in central portion of photograph. - O & Second Streets, Anacortes, Skagit County, WA

Photo from Anacortes Museum & Heritage Center

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Anacortes Museum & Heritage Center

**Aerial Photograph – Circa 1971
Quiet Cove and Surrounding Area**

Quiet Cove Site
Anacortes, Washington



Figure B-21



Overview of Quiet Cove and surrounding area. Reisner Petroleum Terminal to the southwest of Curtis Wharf is no longer intact; Standard Oil Facility and railroad line in central portion of photograph. - O & Second Streets, Anacortes, Skagit County, WA

Photo from Washington State Department of Ecology Coastal Atlas
<https://fortress.wa.gov/ecy/coastalatlas/tools/ShorePhotos.aspx>

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Washington State Department of Ecology Coastal Atlas

**Aerial Photograph – Circa 1977
 Quiet Cove and Surrounding Area**

Quiet Cove Site
 Anacortes, Washington



Figure B-22



Overview of Quiet Cove and surrounding area. Standard Oil Facility and railroad line is no longer intact. - O & Second Streets, Anacortes, Skagit County, WA

Photo from Washington State Department of Ecology Coastal Atlas
<https://fortress.wa.gov/ecy/coastalatlas/tools/ShorePhotos.aspx>

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Washington State Department of Ecology Coastal Atlas

**Aerial Photograph – Circa 1994
 Quiet Cove and Surrounding Area**

Quiet Cove Site
 Anacortes, Washington



Figure B-23



Overview of Quiet Cove and surrounding area - O & Second Streets, Anacortes, Skagit County, WA

Photo from Washington State Department of Ecology Coastal Atlas

<https://fortress.wa.gov/ecy/coastalatlasc/tools/ShorePhotos.aspx>

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Washington State Department of Ecology Coastal Atlas

Aerial Photograph – Circa 2001 Quiet Cove and Surrounding Area

Quiet Cove Site
Anacortes, Washington



Figure B-24



Overview of Quiet Cove and surrounding area - O & Second Streets, Anacortes, Skagit County, WA

Photo from Washington State Department of Ecology Coastal Atlas

<https://fortress.wa.gov/ecy/coastalatlantools/ShorePhotos.aspx>

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Washington State Department of Ecology Coastal Atlas

**Aerial Photograph – Circa 2006
Quiet Cove and Surrounding Area**

Quiet Cove Site
Anacortes, Washington



Figure B-25

APPENDIX C

Sampling and Analysis Plan

FINAL Sampling and Analysis Plan

Quiet Cove Property
Anacortes, Washington
Ecology Agreed Order No. DE 11346

for

**Washington State Department of Ecology
on Behalf of Port of Anacortes**

January 25, 2017



GEOENGINEERS 
Earth Science + Technology

FINAL Sampling and Analysis Plan

Quiet Cove Property
Anacortes, Washington
Ecology Agreed Order No. DE 11346

for

**Washington State Department of Ecology
on Behalf of Port of Anacortes**

January 25, 2017



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File No. 5147-024-03

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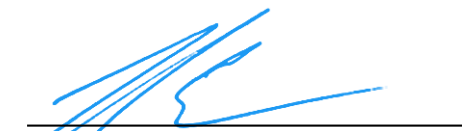
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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym/ Abbreviation	Description
AFDW	ash-free dry-weight
ARI	Analytical Resources, Inc.
ASTM	ASTM International
bgs	below ground surface
COC	chain-of-custody
COPC	contaminant of potential concern
cPAH	carcinogenic polycyclic aromatic hydrocarbons
DMMP	Dredged Material Management Program
DP	direct-push
DQO	data quality objective
Ecology	Washington State Department of Ecology
EDD	electronic data deliverable
EIM	Environmental Information Management system
EPA	United States Environmental Protection Agency
EPH	extractable petroleum hydrocarbon
eV	electron volt
Frontier	Frontier Analytical Laboratory
FS	feasibility study
GeoEngineers	GeoEngineers, Inc.
GPS	global positioning system
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HPAHs	high molecular weight polycyclic aromatic hydrocarbons
HR/MS	high-resolution mass spectrometry
HSA	hollow-stem auger
KM	Kaplan-Meier
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LPAHs	low molecular weight polycyclic aromatic hydrocarbons

MDL	method detection limit
mg/kg	milligrams per kilogram
MLLW	mean lower low water
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
MTCA	Model Toxics Control Act
NAD	North American Datum
NTU	nephelometric turbidity unit
Order	Ecology Agreed Order No. DE 11346
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PCB	polychlorinated biphenyl
PID	photoionization detector
Port	Port of Anacortes
PPE	personal protective equipment
ppm	part per million
%D	percent difference
%R	percent recovery
PQL	practical quantitation limit
psi	pounds per square inch
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RI	remedial investigation
RL	reporting limit
RPD	relative percent difference
SAP	Sampling and Analysis Plan
Site	Quiet Cove Site
SMS	Sediment Management Standards
SOP	standard operating procedure

SVOC	semi-volatile organic compound
TEF	toxicity equivalency factor
TEQ	toxicity equivalent (refers to concentration basis)
TOC	total organic carbon
TRL	target reporting limit
TS	total solids
TVS	total volatile solids
TWIC	Transportation Worker Identification Credential
USCGS	United States Coast and Geodetic Survey
VOC	volatile organic compound
VPC	volatile petroleum compound
VPH	volatile petroleum hydrocarbon
WAC	Washington Administrative Code
WHO	World Health Organization

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) has been prepared for sampling and analytical activities that will be completed as part of Remedial Investigation (RI) activities for the Quiet Cove Site (Site). The Site is a cleanup site included in the Washington State Department of Ecology's (Ecology) Puget Sound Initiative and is being addressed through an Ecology-issued Agreed Order No. DE 11346 (Order). This SAP has been prepared as required by the Agreed Order in accordance with sampling requirements in Washington Administrative Code (WAC) 173-340-820 and under the Sediment Management Standards (SMS; Chapter 173-204 WAC). This SAP supports the Remedial Investigation/Feasibility Study (RI/FS) Work Plan that details the historical property use, environmental and ecological setting, previous environmental investigations, and current Site conditions and the overall RI/FS approach and rationale to evaluate the Site contamination.

This SAP serves as the primary guide for the integration of quality assurance (QA) and quality control (QC) functions for soil, groundwater and sediment sampling completed as part of the RI for the Site. This SAP presents the objectives, procedures, organization, functions, activities, and specific quality assurance/quality control (QA/QC) activities designed to achieve the data quality objectives (DQOs) established for the project. Environmental measurements will be taken to produce data that are scientifically valid, of known and acceptable quality, and meet established objectives. QA/QC procedures will be implemented so that the precision, accuracy, representativeness, completeness, and comparability (PARCC) of the data generated meet the specified DQOs to the maximum extent possible.

The QA/QC portions of this SAP were prepared following the United States Environmental Protection Agency (EPA) Requirements for Quality Assurance Project Plans (EPA, 2001), Guidance for Quality Assurance Project Plans (EPA, 2002), EPAs Contract Laboratory Program (EPA, 2004) and Ecology's Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies (Ecology, 2004).

2.0 PROJECT AND TASK DESCRIPTION

2.1. Project Description and Objectives

Field investigations will be completed to characterize the nature and extent of hazardous substances in areas where historical uses may have resulted in a release to the environment. RI activities will include the following:

- Characterization of the geology/stratigraphy including: nature and extent of fill materials (i.e., soil fill, wood fill, construction debris such as concrete and brick, etc.) and nature and depth to native soil (i.e., depth to native materials underlying the fill);
- Characterize the groundwater gradient and flow direction, and evaluate the hydraulic connection between groundwater and adjacent marine surface water; and
- Characterization of the nature and extent of hazardous substances in media of concern.

Environmental data gathering for the RI will follow a tiered approach consisting of an initial investigation and follow-up analyses of archived samples or additional investigations as described in the RI/FS Work Plan. Sample locations and laboratory analyses that will be completed are detailed in the RI/FS Work Plan. The following sections describe the field procedures to be utilized during the RI.

2.1.1. Physical and Chemical Testing

Samples will be submitted for analysis of hazardous substances based on proximity to specific past Site activities and previous sample results. Selected samples obtained as part of the RI will be submitted to Analytical Resources, Inc. (ARI) of Tukwila, Washington, for all or a subset of the following analytes:

- Grain size;
- Total organic carbon (TOC);
- Total volatile solids (TVS);
- Total solids (TS)
- Bulk/porewater ammonia;
- Bulk/porewater sulfides;
- Metals;
- Gasoline-, diesel- and heavy oil-range petroleum hydrocarbons;
- Volatile petroleum compounds (VPCs)
- Volatile organic compounds (VOCs)
- Semi-volatile organic compounds (SVOCs);

In addition, samples to be analyzed by high-resolution mass spectrometry (HR/MS) will be submitted to Frontier Analytical Laboratory (Frontier) of El Dorado Hills, California, for any combination of the following:

- Polychlorinated biphenyl's (PCBs); and
- Dioxins and furans.

Samples not initially selected for analyses for hazardous substances from a specific location will be archived for potential future analysis to adequately characterize the nature and extent of contamination following review of the initial sample results. The extraction of porewater from sediment samples for analysis will be performed by the laboratory in accordance with Dredged Material Management Program (DMMP) procedures (DMMP, 1998). Porewater analysis will only be performed on Tier 1 samples (i.e., porewater will not be archived due to sample holding time constraints).

2.1.2. Biological Testing

Ecology may require, or the Port may choose to perform, biological testing on surface sediment samples to better define potential toxic effects of hazardous substances identified in sediment in accordance with SMS. Sample locations, timing, sampling procedures, laboratory protocol and performance criteria for bioassays to further evaluate site-specific toxicity will be presented in an addendum to the RI/FS Work Plan and submitted to Ecology for review and approval prior to sampling. A subsequent field effort will be performed to collect surface sediment samples for bioassay testing. The samples for bioassay testing will be collected at the previous sample locations to the extent practical so that the results from previous chemical analyses can be utilized to characterize the sediment that is to undergo bioassay testing.

2.1.3. Sediment/Tissue Study

A paired tissue/sediment study may be performed by the Port to provide data for a site-specific human health and ecological receptor risk evaluation on bioaccumulative chemicals exceeding sediment screening levels. The paired tissue/sediment study and subsequent evaluation would determine the risk from dioxins/furans, carcinogenic PAHs (cPAHs), PCBs, mercury, arsenic, cadmium and/or lead at this Site and will include congener data for dioxins/furans and PCBs. In addition, other bioaccumulative chemicals of concern may be identified and evaluated in human and/or ecological risk assessments based on data collected during the initial data results and following procedures outlined in WAC 173-204-564(2)(c)(iii).

The paired sediment/tissue study will consist of collecting sediment samples and tissue samples from selected organisms within the study area to evaluate bioaccumulation factors. A RI/FS Work Plan addendum will be prepared to describe the scope and approach of sampling and analysis to support the tissue/sediment study. The addendum would identify the objectives and data to be collected for the study and is subject to Ecology approval. On approval of the addendum by Ecology, a subsequent field effort would be performed to collect sediment and tissue samples to evaluate bioaccumulation factors at the Site.

3.0 DATA QUALITY OBJECTIVES

The primary DQO for this RI is to collect environmental sampling data of known, acceptable, and documentable quality. The specific objectives established for the project are:

- Implement the procedures outlined herein for field sampling, sample custody, equipment operation and calibration, laboratory analysis, and data reporting to ensure consistency and thoroughness of data generated.
- Achieve the level of QA/QC required to produce scientifically valid analytical data of known and documented quality. This will be accomplished by establishing criteria for data precision, accuracy, representativeness, completeness, and comparability, and by evaluating project data against these criteria.

3.1. Chemical Quality Objectives

The sampling design, field procedures, useable laboratory procedures, and QC procedures established for this project were developed to provide defensible data. Specific factors that may affect data usability include quantitative factors (precision, bias, accuracy, completeness, and reporting limits) and qualitative factors such as representativeness and comparability. The specific DQOs associated with these data quality factors are discussed below. Method-specific DQOs for chemical laboratory analyses are presented in Tables C-1 through C-3.

3.1.1. Analytical Detection Limits

Analytical methods have quantitative limitations at a given statistical level of confidence that are often expressed as the method detection limit (MDL). Although results reported near the MDL provide insight for sediment conditions, quality assurance dictates that analytical methods achieve a consistently reliable level of detection known as the practical quantitation limit (PQL), which is typically demonstrated with the lowest point of a linear calibration. The contract laboratory will provide numerical results for all analytes and report them as detected above the PQL or undetected at the PQL.

The PQLs for contaminants of potential concern (COPCs) provided by the Ecology-certified laboratory contract laboratory (ARI) are presented in Table C-4 for soil and groundwater, and Table C-5 for sediment. The PQLs presented in Tables C-4 and C-5 are considered target reporting limits (TRLs) because several factors may influence final reporting limits. First, moisture and other physical conditions of sediment affect detection limits. Second, analytical procedures may require sample dilutions or other practices to quantify a particular analyte at concentrations above the range of the instrument. The effect is that other analytes could be reported as undetected but at a value higher than a specified TRL. Data users must be aware that high non-detect values, although correctly reported, can bias statistical summaries and careful interpretation is required to correctly characterize subsurface conditions.

3.1.2. Precision

Precision is the measure of mutual agreement among replicate or duplicate measurements of an analyte from the same sample and applies to field duplicates (i.e., split samples), replicate analyses, and duplicate spiked environmental samples (matrix spike duplicates). The closer the measured values are to each other, the more precise the measurement process. Precision error may affect data usefulness. Good precision is indicative of relative consistency and comparability between different samples. Precision will be expressed as the relative percent difference (RPD) for spike sample and field duplicate comparisons of various matrices. The RPD is calculated as:

$$\text{Where } RPD(\%) = \frac{|D_1 - D_2|}{(D_1 + D_2)/2} \times 100,$$

D_1 = Concentration of analyte in primary sample.
 D_2 = Concentration of analyte in duplicate sample.

The calculation applies to split samples, replicate analyses, duplicate spiked environmental samples (matrix spike duplicates), and laboratory control duplicates. The RPD will be calculated for samples and compared to the applicable criteria. Precision can also be expressed as the percent difference (%D) between replicate analyses. Project RPD goals for all analyses are presented in Tables C-1 through C-3, unless the primary and duplicate sample results are less than 5 times the method reporting limit (MRL), in which case RPD goals will not apply for data quality assessment purposes.

3.1.3. Accuracy

Accuracy is a measure of bias in the analytical process. The closer the measurement value is to the true value, the greater the accuracy. Accuracy is typically evaluated by adding a known spike concentration of a target or surrogate compound to a sample prior to analysis. The detected concentration or percent recovery (%R) of the spiked compound reported in the sample provides a quantitative measure of analytical accuracy. Since most environmental data collected represent single points spatially and temporally rather than an average of values, accuracy is generally more important than precision in assessing the data. In general, if %R values are low, non-detect results may be reported for compounds of interest when in fact these compounds are present (i.e., false negative results), and results for detected compounds may be biased low. The reverse is true when %R values are high. In this case, non-detect values are considered accurate, whereas detected values may be higher than true values.

For this project, accuracy will be expressed as the %R of a known surrogate spike, matrix spike, or laboratory control sample (blank spike), concentration:

$$\text{Recovery (\%R)} = \frac{\text{Spiked Result} - \text{Unspiked Result}}{\text{Known Spike Concentration}} \times 100$$

Accuracy (%R) criteria for surrogate spikes, matrix spikes, and laboratory control samples (blank spikes) are presented in Tables C-1 through C-3.

3.1.4. Representativeness, Completeness, and Comparability

Representativeness expresses the degree to which data accurately and precisely represent the actual site conditions. Representativeness of the data will be evaluated by:

- Comparing actual sampling procedures to those specified in this document.
- Reviewing analytical results for field duplicates to determine the variability in the analytical results.
- Invalidating non-representative data or identifying data to be classified as questionable or qualitative in nature. Only representative data will be used in subsequent data reduction, validation, and reporting activities.

Completeness establishes whether a sufficient amount of valid measurements were obtained to meet project objectives. The number of samples and results expected establishes the comparative basis for completeness. The completeness goal is 90 percent useable data for the samples/analyses planned. If the completeness goal is not achieved, an evaluation will be performed to determine if the data are adequate to meet study objectives.

Comparability expresses the confidence with which one set of data can be compared to another. Although numeric goals do not exist for comparability, a statement on comparability will be prepared to assess overall usefulness of data sets generated during the project, following the evaluation of precision and accuracy.

3.1.5. Holding Times

Holding times are defined as the time between sample collection and extraction, sample collection and analysis, or sample extraction and analysis. Recommended holding times are presented in Tables C-6 through C-8. If the analysis of an archived sample is required but the sample exceeds the respective holding time, either discard the sample and collect a new representative sample for analysis and/or consult with Ecology to determine if the sample may still be used.

3.1.6. Quality Control Blank Samples

According to the National Functional Guidelines for Organic Data Review (EPA, 2008), “The purpose of laboratory (or field) blank analysis is to assess the existence and magnitude of contamination resulting from laboratory (or field) activities. The criteria for evaluation of blanks apply to any blank associated with the samples (e.g., method blanks, instrument blanks, trip blanks, and equipment blanks).” Trip blanks are placed with samples during shipment; method blanks are created during sample preparation and follow samples throughout the analysis process.

Analytical results for QC blanks will be interpreted in general accordance with EPA's National Functional Guidelines for Organic (EPA, 2008) and Inorganic Data (EPA, 2004) Review and professional judgment. QC blank samples are discussed further in Section 4.12.

4.0 DATA GENERATION AND ACQUISITION

The data generation and acquisition elements for the RI (as detailed below) address aspects of the project design and implementation including the appropriate methods for sampling, measurement and analysis, data collection or generation, data handling, and how QC activities are employed and properly documented.

The information presented herein applies directly to the selection of sampling locations and field sampling methodology. Sampling methods including field documentation, sampling, and decontamination procedures are also discussed below.

4.1. Sample Process Design

Details of the sampling activities (i.e., sample locations, frequency, laboratory analysis, and rationale) that will be used during the RI are presented in the RI/FS Work Plan.

4.2. Sampling Methods

The RI will characterize the nature and extent of contamination at the Site. RI activities will include soil, groundwater and sediment sample collection for potential laboratory analysis. The RI sampling locations, approach and rationale are described in RI/FS Work Plan. Sampling methods for soil, groundwater and sediment are presented in the following sections.

4.2.1. Soil Investigation

The soil investigation will consist of completing hollow-stem auger (HSA) and direct-push (DP) borings. Information obtained from previous investigations was used to support selection of the soil sample locations. Soil borings will be used to characterize Site stratigraphy and to collect soil samples for chemical analyses. Prior to the completion of any soil exploration, underground utilities will be located (public and private) in the area of the proposed exploration locations. An air knife (vacuum truck) may be used to clear soil from the surface to approximately 5 feet below ground surface (bgs) at selected exploration locations if utilities are not able to be clearly identified. If an air knife is used to clear drilling locations, a hand auger will be used to attempt to collect samples from the near-surface soils.

Soil boring and soil sample collection methods to be used during the RI investigation are described below. Soil cuttings from borings completed for the soil sampling activities will be placed in labeled and sealed 55-gallon drums. The drums will be stored temporarily at a secure location on Port of Anacortes (Port) property pending receipt of analytical results and off-site disposal at a permitted facility.

4.2.1.1. Hollow-stem Auger Borings

HSA borings for obtaining soil samples will be drilled using a truck-mounted HSA drilling rig. It is anticipated that the HSA borings at the Site will be advanced at least 3 feet into the native soil or to approximately 15 feet bgs, whichever occurs first. If evidence of petroleum contamination is observed, the boring will be advanced to at least 3 feet below the observed depth of contamination, or until refusal. HSA borings will be completed by a licensed driller in the State of Washington. A representative from GeoEngineers, Inc.'s

(GeoEngineers) staff will be present to examine and classify the soils encountered and prepare a detailed log of each exploration (i.e., boring log).

Soil samples will be obtained from the HSA borings on a 2.5-foot interval using a 2.5-inch-diameter split-barrel sampler or equivalent. The sampler will be advanced a maximum of 18 inches at each sample interval. The number of hammer blows to advance the sampler will be recorded on a boring log across 6-inch intervals. Soil recovered from each sample interval will be visually classified in general accordance with ASTM International (ASTM) D-2488 and screened in the field for the presence of contamination. The absence or presence of wood debris will also be recorded on a boring log. If wood debris is present, the type or types of wood debris (i.e., saw dust, bark, chips, chunks, twigs, fibers, etc.), the estimated quantity (i.e., observed percent by volume) of each wood type, and the depth interval where the wood is observed will be recorded on a boring log form. Field screening will consist of visual observation for the presence of contamination (i.e., staining, discoloration, etc.), water sheen testing (i.e., petroleum hydrocarbons), and organic vapor monitoring. Field screening procedures are discussed further in Section 4.3. Observations of soil and groundwater conditions and soil field screening results for each exploration will be included on the boring log.

4.2.1.2. Direct-Push Borings

DP borings for obtaining soil samples will be drilled using a truck-mounted direct-push drilling rig. It is anticipated that the DP borings at the Site will be advanced at least three feet into the native soil or to approximately 15 feet bgs, whichever occurs first. If evidence of petroleum contamination is observed, the boring will be advanced to at least three feet below the observed depth of contamination, or until refusal. DP borings will be completed by a licensed driller in the State of Washington. A representative from GeoEngineers' staff will be present to examine and classify the soils encountered and prepare a detailed boring log of each exploration.

Continuous soil samples in 2-foot intervals will be obtained from the DP borings using a "macrocore" sampler or equivalent in direct pushes up to 5 feet in length. Push length may be reduced if recovery is poor. Soil from each sample interval will be visually classified, field screened and logged in the same manner as described in Section 4.2.1.1 above.

4.2.1.3. Hand Auger Borings

A hand auger will be used at boring locations in which an air knife is used to clear utilities where they are not clearly identified. Soil from each sample interval will be visually classified, field screened and logged in the same manner as described in Section 4.2.1.1.

4.2.1.4. Soil Sample Collection and Chemical Analysis

Samples will be collected that are representative of contaminated or potentially contaminated materials and/or different material types. A minimum of three soil samples will be retained from each boring for laboratory analysis. Samples collected from the borings not submitted for chemical analysis will be archived for potential follow-up testing.

At least one soil sample will be collected from each location from the fill, vadose zone/saturated zone interface (i.e., from the water table) observed at the time of sampling, and native soil horizon. The native soil sample will be collected from a depth of at least 1 foot below the fill/native soil interface to ensure that the sample is representative of native material. If field screening (i.e., visual observation of staining, sheen, measurement of VOCs, etc.) indicates the presence of potentially contaminated soil, additional samples

may be collected for chemical analysis to characterize the nature and extent of contamination. Selected samples for chemical analysis will be based on a review of the boring logs, material type, and field screening results.

Sample intervals will be individually homogenized and placed into the appropriate laboratory-supplied sample containers. Samples for volatile analysis (i.e., gasoline, VPCs and/or VOCs) will be collected from the center of the sampling interval from undisturbed soil sample prior to homogenization using EPA Method 5035A sampling procedures consistent with Ecology guidance to reduce volatilization and biodegradation of the sample constituents. Immediately upon collection of the samples, the samples will be placed into a cooler with ice and logged on the chain-of-custody using quality assurance and control procedures described in Section 4.8.

To evaluate the presence of multiple sources of petroleum hydrocarbons, selected samples may be submitted for volatile petroleum hydrocarbon (VPH) or extractable petroleum hydrocarbon (EPH) analysis based on the initial soil investigation results. The petroleum hydrocarbon analysis results will be reviewed to identify samples with concentrations greater than 200 milligrams per kilogram (mg/kg) gasoline-range petroleum hydrocarbons and 2,000 mg/kg diesel- or heavy oil-range petroleum hydrocarbons. In addition, chromatograms for samples with elevated petroleum hydrocarbons will be reviewed to identify petroleum signatures (i.e., finger printing) for potential sources.

4.2.2. Groundwater Investigation

Groundwater samples will be collected from new and existing Site monitoring wells for chemical analysis of hazardous substances as identified in Table 8. Information obtained from previous investigations was used to support selection of the groundwater sample locations.

Procedures for monitoring well installation, well development, water level measurement and groundwater sample collection are described in the following sections.

4.2.2.1. Monitoring Well Construction

Drilling and construction of the monitoring wells will be conducted by a Washington State licensed driller in general accordance with the Minimum Standards for Construction and Maintenance of Wells (WAC 173-160). It is anticipated that the monitoring wells will be completed least 5 feet below the observed water level at the time of drilling. Installation of the monitoring wells will be observed by a GeoEngineers representative who will maintain a detailed log of the materials observed and depths of the wells. Monitoring well borings will be drilled using a truck mounted HSA drill rig or similar equipment. Soil cuttings from borings completed for the monitoring well installation will be placed in labeled and sealed 55-gallon drums. The drums will be stored temporarily at a secure location on Port property pending receipt of analytical results and off-site disposal at a permitted facility.

Wells will be constructed of 2-inch-diameter, flush-threaded, Schedule 40 polyvinyl chloride (PVC) casing with machine-slotted PVC screen (0.010-inch). The top of the well screens will be located approximately 5 feet above the observed groundwater level, or within 3 feet of the ground surface, whichever is deeper. The wells' location and the potential for influence on groundwater levels in the well from changes in water levels relative to adjacent marine surface water will be considered when placing the well screen. The well screen intervals may be modified based on field screening results or variations in soil type. Screened intervals of approximately 10 to 15 feet in length are anticipated.

Following placement of the well screen and casing in the borehole, a filter pack will be installed around the well screen. The filter pack will extend from the bottom of the well to approximately 2 feet above the top of the well screen. It is anticipated that filter pack material will consist of commercially prepared 10-20 silica sand. However, an alternate sand size/gradation may be used to minimize the turbidity of water entering the wells depending on the materials observed at the time of drilling.

A bentonite annular seal at least 1-foot thick will be placed above the sand pack to a depth of about 1 foot bgs. Each well will be completed with a concrete surface seal, and either a flush-mount or above-ground steel or aluminum monument. The monument will be cemented in place from the surface to a depth of about 1 foot bgs.

4.2.2.2. Monitoring Well Development

Each monitoring well will be developed to remove water introduced into the well during drilling (if any), stabilize the filter pack and formation materials surrounding the well screen, and restore the hydraulic connection between the well screen and the surrounding soil. The well screen interval will be gently surged with a decontaminated bailer or surge block and the well will be purged of water.

Development will continue until a minimum of five casing volumes of water have been removed and turbidity of the discharged water is relatively low. The goal of well development will be to reduce the turbidity content of the water to approximately 10 nephelometric turbidity unit (NTU) if practical. Up to 10 well volumes of water will be removed from the wells in an effort to attain the 10 NTU goal. The removal rate and volume of groundwater removed will be recorded during well development procedures. Water that is removed from the well during well development activities will be stored temporarily at a secure location on Port property in labeled 55-gallon drums, pending receipt of analytical results and off-site disposal at a permitted facility. Depths to water in the monitoring wells will be measured prior to development.

4.2.2.3. Water Level Measurements

Prior to groundwater sampling, a groundwater level “snapshot” will be performed by measuring water levels in all wells within an approximate one hour duration. Water levels will be measured using an electronic water level indicator and will be recorded to the nearest 0.01 foot. The measurement point will be the north rim of the top of the well casing. Well casing and ground surface elevations will be referenced from temporary or permanent benchmarks as described in Section 4.4.

4.2.2.4. Groundwater Sampling

Sampling of monitoring wells located adjacent to the shoreline (i.e., tidally influenced wells) will be performed within one hour before and three hours after the day-time low tide to the extent practicable. Wells nearest the shoreline will be sampled first. Groundwater samples will be obtained by field personnel using low-flow/low-turbidity sampling techniques (EPA, 2010) to minimize the suspension of sediment in the samples. The wells will be purged and groundwater samples will be obtained from the wells using a peristaltic or submersible pump and disposable polyethylene tubing. Groundwater will be purged from the wells at a rate not to exceed 0.5 liter per minute. A Horiba U-50 (or similar) water quality measuring system with a flow-through cell will be used to monitor the following water quality parameters during purging:

- Electrical conductivity;
- Dissolved oxygen;
- pH;

- Salinity;
- Turbidity;
- Total dissolved solids;
- Oxidation-reduction potential; and
- Temperature.

Samples will be collected from the wells after these parameters vary by less than 10 percent on three consecutive measurements or after five well volumes have been removed, whichever occurs first. The field measurements will be documented on the field log.

Groundwater samples will be collected in laboratory-supplied containers, placed into a cooler with ice and logged on the chain-of-custody using quality control and assurance procedures described in Section 4.8. Attempts will be made to fill containers for VOC analyses (“VOA” vials) with no head space remaining. The goal will be “no head space.” Note that the presence of several very small air bubbles (less than several millimeters in diameter) are occasionally unavoidable. Samples collected for dissolved metals analyses will be filtered in the field using a disposable inline 0.45 micron filter.

4.2.2.5. Tidal Study

Water levels in selected monitoring wells will be recorded using a combination of pressure transducers with internal data loggers and electronic water level indicators. The data collection will include continuous (every 15 minutes) transducer-based water level measurements in monitoring wells and in Guemes Channel from a temporary stilling well. The location of the stilling well will be determined based on identification of a location that will not be affected by Site operations or by excess turbulence/surges associated with boat traffic during the study to the extent possible. The data logger will be programmed to automatically convert pressure to water levels. A vented transducer will be used that internally corrects for fluctuations in atmospheric pressure. Procedures for conducting the 72-hour tidal study are summarized below:

1. At each monitoring well, a pressure transducer will be lowered into the well and securely fastened to the top of the well casing for the duration of the monitoring period. A transducer will also be established in an adjacent marine surface water stilling well at a secured location at the Site.
2. The transducers will be set to record the height of the water column above the transducer at 15-minute intervals.
3. Pressure transducers will be rated to a minimum 15 pounds per square inch (psi) range capable of measuring a water level change of 23 feet with a resolution of 0.01 foot.
4. Depth to water will also be measured from the top of the well casing to the nearest 0.01 foot with a manual electronic water level indicator. Depth-to-water level will be manually measured up to four times at each location during the monitoring period.
5. At the end of the monitoring period, the pressure transducers will be removed and the water level data will be uploaded to a computer.

Similar procedures will be used to monitor surface water levels in the stilling well located in Guemes Channel.

The mean hydraulic gradient will be estimated using the method described in Serfes (Serfes, 1991).

4.2.2.6. Hydraulic Conductivity Testing

Hydraulic conductivity at the Site will be estimated using slug tests and/or step drawdown tests. Hydraulic conductivity tests will be performed in selected monitoring wells to identify the range of hydraulic conductivities in subsurface material at the Site. The well location and tidal stage will be considered when performing and interpreting the hydraulic conductivity tests to minimize the interference of tidal fluctuations on the aquifer and the determination of the hydraulic conductivities.

Slug tests will be performed using a PVC slug rod, a down-hole pressure transducer as described above, and a water-level indicator in general accordance with ASTM D 4044-99. The general procedure for conducting the slug tests in monitoring wells is summarized below:

1. At each monitoring well, the static depth of groundwater will be measured prior to suspending the pressure transducer near the bottom of the well.
2. After stabilization of the groundwater level (from the displacement of the transducer) the slug rod will be quickly lowered into the well until it is submerged in the water column (falling-head test).
3. The recovery of the perturbed water level will be monitored until it has returned to within 95 percent of the initial head indicated by the transducer prior to the introduction of the slug rod.
4. Once the water level has re-equilibrated, the slug rod will be quickly removed from the water column and the groundwater level will be monitored for recovery (rising-head test).
5. After the water level has recovered to within approximately 95 percent of the initial head indicated by the transducer, the depth to groundwater will be manually measured again and the transducer will be removed and the well secured.

The slug test response data will be analyzed using the Bouwer and Rice Method (Bouwer and Rice 1976; Bouwer, 1989).

If hydraulic conductivities are such that slug tests do not yield useful information as determined by the geologist, hydrogeologist or engineer performing the test, then step-drawdown tests may also be performed to determine hydraulic conductivity. The general procedure for conducting the drawdown tests in monitoring wells is summarized below:

1. At each monitoring well, the static depth of groundwater will be measured prior to suspending the pressure transducer near the bottom of the well.
2. Insert a vented pressure transducer into the well and secure it near the bottom of the well. The vented pressure transducer shall be set to record water level measurements at approximately 0.1-second intervals during the tests. The vented pressure transducer will be connected to a laptop computer or equivalent data processor during the test.
3. Insert a decontaminated submersible groundwater pump into the well; the inlet of the pump (bottom of the pump) should be a minimum of approximately 1 foot above the top of the vented pressure transducer.
4. Allow the groundwater level to return to within 95 percent of the initial head indicated by the transducer prior to the introduction of the groundwater pump.

5. Turn the pump on and withdraw groundwater at a constant low-flow rate (approximately 0.5 to 5 gallons per minute) for up to 30 minutes. Contain the purge water for transfer to a disposal drum. Note that the flow rate could be too high (well runs dry), or too low (water level does not draw down enough to yield usable results). Turn the flow rate down if the well appears to be running dry (i.e., if the flow rate appears to be falling despite constant pump speed). Assuming the flow rate is not too high, check to see if the flow rate is too low by downloading the pressure transducer data approximately 15 minutes into the test; verify that the well is drawing down sufficiently to yield usable results.
6. After the pump is turned off, the groundwater level recovery response will be monitored until the level returns to within 95 percent of the initial head indicated by the transducer prior to the introduction of the groundwater pump. Once stabilization has occurred, a manual measurement using a manual electronic water level indicator will be done prior to removing the transducer and pump from the well.

4.2.3. Sediment Investigation

The sediment investigation will be completed using hand tools or land-based drilling equipment including HSA and DP drilling methods described in Section 4.2.1. Sediment sampling locations were selected based on previous soil and groundwater investigation data, proximity to stormwater outfalls, and accessibility.

Sediment sample collection methods to be used during the RI investigation are described in the following sections.

4.2.3.1. Surface Sediment Collection and Processing

Surface sediment samples will be obtained using hand tool (stainless steel trowel or spoon). Surface samples will be obtained from the upper 10 centimeters of sediment. Sampling equipment will be decontaminated and inspected before sampling. The procedures for collecting surface sediment samples are as follows:

1. Identify the sample location using a handheld global-positioning system (GPS).
2. Record the location of the sample.
3. Use a stainless steel spoon to collect the sediment from the top 10 cm and place in stainless steel bowl(s). An equal portion of material (i.e., 1/3 of the total sample volume) will be retained from sampling locations SED-1A through SED-1C to prepare the composite surface sample SED-1-COMP with the exception of samples collected for volatile analysis. Samples for volatile analysis will be collected from a discrete location prior to homogenization following the Ecology 5035A methodology
4. Sediment samples for porewater analysis (ammonia, sulfide and tributyltin ion) will be collected prior to any observation, testing, photography, classification or homogenization of the sample material, by carefully placing relatively undisturbed sediment directly into a sample jar. The sample jar will be filled completely to eliminate headspace. Porewater extraction will be conducted at the laboratory.
5. Visually classify sediment in accordance with ASTM International (ASTM) D 2488 methods and the Unified Soil Classification System (ASTM D 2487) and record on the field form. In addition to the visual classification, sediment samples shall be observed and field screened. Qualitative descriptive parameters including biota, debris, and presence of staining shall also be recorded.
6. The visual absence or presence of wood debris in the surface sediment sample will be recorded on the field form. If wood debris is present, the type or types of wood debris (i.e., saw dust, bark, chips, chunks, twigs, fibers, etc.), the estimated quantity (i.e., observed percent by volume) of each type of wood debris, and the depth interval where the wood is observed will be recorded on the field form.

7. Photograph the sediment sample. Include in the camera's field of view a sheet of paper or whiteboard with the sample name written in large print; use care not to touch the sediment with the paper/whiteboard or with hands contaminated with whiteboard ink.
8. To avoid cross-contamination, a clean hands/dirty hands approach to use of whiteboard pens and erasers and lab pens will be utilized during all sample collection activities where subsequent chemical analyses will be carried out on the samples collected. Gloves that have been in contact with lab pens and whiteboard pens will not be used for sample handling.
9. Homogenize the sediment to a uniform appearance (i.e., color and texture) to the extent practicable in accordance with SCUM II within a stainless steel mixing bowl using a stainless steel spoon and/or stainless steel mixing paddle attached to a power drill.
10. Distribute the sample to designated sample containers and ensure that the samples are properly labeled and tightly closed. Sample containers will be filled to minimize headspace.
11. Clean the exterior of the sample containers and store them in a cooler with ice.
12. Decontaminate all equipment as described in Section 4.5.
13. Double check that field collection forms are completely filled out.

4.2.3.2. Subsurface Sediment Sample Collection and Processing

Subsurface sediment samples will be obtained using HSA, DP or other drilling methods as determined to best meet the specific sampling objectives. Continuous cores will be advanced to at least three feet into the native material. Subsurface sediment samples will be collected continuously in 2-foot intervals and submitted to the laboratory for analysis or archive. If additional volume is needed than is available in the 2-foot interval then additional cores may be completed to obtain more volume or, if necessary, intervals may be combined to provide adequate sample volume. The procedures for collecting subsurface sediment samples are as follows:

1. Maneuver the drill rig to the sampling location using a handheld GPS.
2. Record the location of the sample.
3. Drive the sampler into the sediment surface to the target depth or until refusal.
4. Collect a continuous core to the specified target depth or until refusal.
5. For each core interval, record the penetration depth on the field form.
6. Extract the core barrel and open using a decontaminated core-opening device.
7. Visually classify sediment in accordance with ASTM D 2488 methods and the Unified Soil Classification System (ASTM D 2487) and record on the field form. In addition to the visual classification, sediment samples shall be observed and field screened. Qualitative descriptive parameters including biota, debris, and presence of product/staining shall also be recorded.
8. The visual absence or presence of wood debris in the subsurface sediment sample will be recorded on the field form. If wood debris is present, the type or types of wood debris (i.e., saw dust, bark, chips, chunks, twigs, fibers, etc.), the estimated quantity (i.e., observed percent by volume) of each type of wood debris, and the depth interval where the wood is observed will be recorded on the field form.
9. Photograph the sample. Include in the camera's field of view a sheet of paper or whiteboard with the sample name written in large black print; use care not to touch the sediment with the paper/whiteboard

or with gloved hands in contact with whiteboards, pens or with whiteboard ink. It is likely several photos will be necessary to record the entire length of the core sample. Include the depth interval on the paper/whiteboard.

10. Collect sediment from the liner using a decontaminated stainless steel spoon. Minimize collection of sediment that has been in contact with the sides of the core liner, or the core-opening device to the extent possible. Place the sediment into a decontaminated stainless steel homogenization bowl. Cover the container with a new sheet of aluminum foil and dispose after use.
11. Homogenize the sediment to a uniform appearance (i.e., color and texture) to the extent practicable in accordance with SCUM II within a stainless steel mixing bowl using a stainless steel spoon and/or stainless steel mixing paddle attached to a power drill.
12. Distribute the sample to appropriate sample containers and ensure that the samples are properly labeled and tightly closed.
13. Clean the exterior of the sample containers and store them in a cooler with ice.
14. Decontaminate all equipment as described in Section 4.5.
15. Double check that field collection forms are completely filled out.

If adequate sample volume cannot be obtained in a particular interval(s) in cores, additional cores will be attempted within a 10-foot radius of the original core location.

Drill cuttings from borings completed for the sediment sampling activities will be placed in labeled and sealed 55-gallon drums. The drums will be stored temporarily at a secure location on Port property pending receipt of analytical results and off-site disposal at a permitted facility.

4.3. Field Screening

Soil and sediment samples will be field screened for evidence of possible contamination. Field screening results will be recorded on the field forms and the results will be used as a general guideline to delineate areas of possible contamination. Screening results will also be used to aid in the selection of soil or sediment samples to be submitted for chemical analysis. The following screening methods will be used:

- Visual and olfactory screening;
- Water sheen screening; and
- Headspace vapor screening.

Field screening results are site- and location-specific. The results may vary with temperature, moisture content, soil/sediment type and chemical constituent. All field screening results will be documented on the field log.

4.3.1. Visual and Olfactory Screening

The soil/sediment will be observed for unusual color, consistency, and staining and/or odor indicative of possible contamination.

4.3.2. Water Sheen Screening

This is a qualitative field screening method that can help identify the presence or absence of petroleum hydrocarbons. A portion of the soil/sediment sample (about a tablespoon) will be placed in a small pan containing distilled water. The water surface will be observed for signs of sheen. The following sheen classifications will be used:

Classification	Identifier	Description
No Sheen	(NS)	No visible sheen on the water surface
Slight Sheen	(SS)	Light, colorless, dull sheen; spread is irregular, not rapid; sheen dissipates rapidly
Moderate Sheen	(MS)	Light to heavy sheen; may have some color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on the water surface
Heavy Sheen	(HS)	Heavy sheen with color/iridescence; spread is rapid; entire water surface may be covered with sheen

4.3.3. Headspace Vapor Screening

This is a semi-quantitative field screening method that can help identify the presence or absence of volatile chemicals (i.e. petroleum hydrocarbons or VOCs). A portion of the soil or sediment sample is placed into a resealable plastic bag for headspace vapor screening. Ambient air is captured in the bag; the bag is sealed and then shaken gently to expose the solids to the air trapped in the bag. Vapors present within the sample bag's headspace are measured by inserting the probe of a photoionization detector (PID) through a small opening in the bag making sure the probe doesn't come into contact with the soil/sediment.

A PID measures the concentration of organic vapors ionizable by a 10.6 electron volt (eV) lamp in parts per million (ppm) and quantifies organic vapor concentrations in the range between 0.1 ppm and 2,000 ppm (isobutylene equivalent) with an accuracy of 1 ppm between 0 ppm and 100 ppm. The maximum ppm value and the ambient air temperature will be recorded on the field form for each sample. The PID will be calibrated in accordance with the manufacturer's recommendation using a 100 ppm isobutylene standard. If operating in cold weather, the PID will be kept on (pumping), and moisture filters will be changed frequently for better cold-weather performance. A sufficient number of extra batteries and extra filters will be available to ensure continued operation of the PID. A "pump test," will be performed as necessary in the field using 100 ppm isobutylene gas to check that the PID has remained properly calibrated throughout the day. More frequent pump tests will occur during cold damp weather. The PID will be recalibrated if the pump test indicates the PID is off by more than 10 ppm.

4.4. Surveying

4.4.1. Vertical Controls

Monitoring well casing rim elevation and mudline surface elevation will be surveyed by GeoEngineers or subcontracted surveyor licensed in the State of Washington referencing temporary or permanent benchmarks. Elevations will be surveyed using a laser level or similar equipment, which has an accuracy of 0.01 feet. Elevations will be referenced to mean lower low water (MLLW).

The vertical datum for the Site will be derived from running levels to the United States Coast and Geodetic Survey (USCGS) 2-inch brass disk set in the vertical wall at the northeast corner of the Old Train Depot located at 7th Street and R Avenue (National Geodetic Survey designation – PID – TR0689; MLLW – Elevation 16.98 feet; NAVD 88 – Elevation 16.33 feet).

4.4.2. Horizontal Controls

Monitoring well, boring locations and other pertinent information (e.g., shoreline seep locations) will be surveyed by GeoEngineers or subcontracted surveyor licensed in the State of Washington. Station positions will be determined in latitude and longitude referenced to North American Datum of 1983 (NAD83) using a hand-held GPS unit (e.g., Trimble GeoXT) or other survey equipment.

4.5. Sampling Equipment and Decontamination Procedures

Soil samples will be collected using coring/drilling equipment (i.e., hollow-stem auger and/or direct-push) and hand tools including stainless steel spoons and stainless steel mixing bowls. Reusable sampling equipment that comes in contact with soil, groundwater or sediment will be decontaminated before each use. Decontamination procedures for this equipment will consist of the following:

1. Washing with a brush and non-phosphate detergent solution (e.g., Liqui-Nox and distilled water),
2. Rinsing with distilled water, and
3. Wrapping or covering the decontaminated equipment with aluminum foil. Field personnel will limit cross-contamination by changing gloves between sampling locations.

Drilling equipment (auger, soil sampler, direct-push barrel) that comes into contact with soil or sediment will be decontaminated before each use. Decontamination procedures for this equipment will consist of the following:

1. Washing with pressurized hot water,
2. Wash with brush and non-phosphate detergent solution, and
3. Rinse with potable water.

Wash water used to decontaminate the reusable sampling equipment will be collected and stored on-site in 55-gallon drums.

4.6. Disposal of Investigation-Derived Materials

4.6.1. Soil and Sediment

Soil and/or sediment cuttings from borings completed during investigation activities will be placed in labeled and sealed 55-gallon drums. The drums will be temporarily stored at a secure location on Port property pending receipt of analytical results and off-site disposal at a permitted facility. Each drum will be labeled with the following information:

- Non-classified Waste Material, Laboratory Analysis in Progress/media (e.g., soil, water) contained in the drum;
- Source of the material in the drum (i.e., investigation locations and depths where appropriate);
- Date material was generated; and
- Name and telephone number of GeoEngineers contact person.

4.6.2. Groundwater and Decontamination Water

Development and purge water removed from the monitoring wells, and decontamination water generated during all sampling activities will be placed in labeled and sealed 55-gallon drums. The drums will be temporarily stored at a secure location on Port property pending receipt of analytical results and off-site disposal at a permitted facility. Each drum will be labeled with the following information:

- Non-classified Waste Material, Laboratory Analysis in Progress/media (e.g., water) contained in the drum;
- Source of the material in the drum (i.e., investigation locations and depths where appropriate);
- Date material was generated; and
- Name and telephone number of GeoEngineers contact person.

4.6.3. Disposition of Incidental Waste

Incidental waste including disposable personal protective equipment (PPE) generated during sampling activities includes items such as gloves, plastic sheeting, aluminum foil, sample tubing, paper towels and similar expended and discarded field supplies. These materials are considered *de minimis* and will be disposed of in a local trash receptacle or county disposal facility.

4.7. Sample Containers and Labeling

The field coordinator will establish field protocol to manage field sample collection, handling, and documentation. Sediment samples will be placed in appropriate laboratory-prepared containers. Sample containers and preservatives are listed in Tables C-6 through C-8.

Sample containers will be labeled with the following information at the time of sample collection:

- Project name and number
- Type of sample preservative used (where applicable)
- Sample name, which will include a reference to date and sampling depth (if applicable)
- Date and time of collection

The sample collection activities will be noted in the field log books. The field coordinator will monitor consistency between sample containers/labels, field log books, and chain-of-custody (COC) forms.

4.8. Chain of Custody

The COC record will contain the same information as is contained on the sample labels and serve as documentation of sample handling during delivery or shipment. One copy of this custody record will remain with the shipped samples, and one copy will be retained by the field staff who originally sampled and relinquished the samples. The sampler's copy will be maintained in the project file.

The samples relinquished to the laboratory will be subject to transfer-of-custody and shipment procedures, as follows:

- The samples shipped to the laboratory will be accompanied by a COC record documenting which samples are present in the cooler. When transferring possession of samples, the individuals

relinquishing and receiving the samples will sign, date, and note the times of the sample transfer on the record. This custody record will document transfer of sample custody from the sampler to other persons, including the laboratory.

- The samples will be properly packed for shipment and dispatched to the laboratory for analysis, with a separate, signed COC enclosed in each sample cooler. If a GeoEngineers representative is not the person delivering the sample coolers to the laboratory, sample shipping containers will be custody-sealed before being delivered to the laboratory. The preferred procedure for custody sealing includes use of a custody signed seal placed across filament tape that is wrapped around the cooler at least twice. The custody seal should then be folded over and attached to itself in such a way as the package can only be accessed by cutting the filament tape or breaking the seal.
- Samples will be shipped and analyzed within the established hold times that are listed in Tables C-6 through C-8.

The laboratory will utilize an established system for sample check-in, sample tracking, laboratory analyses assignment and performance, and sample check-out. The system will allow management review of the laboratory data before the issuance of laboratory reports. The management review will be accomplished on two levels including 1) review of raw data for each analysis, and 2) review of the final results to check for consistency or agreement of the results between parameters. Computers are routinely used for this purpose to take advantage of fast retrieval of information.

Upon receipt of samples accompanied by a COC form identifying the analytical parameters to be performed, the laboratory coordinator or a delegate will conduct the following:

- Log in the samples and assign laboratory identification numbers. For each sample, a record will be generated containing the sample station number, sample description, analytical requirements, pricing information, and report format description.
- Enter these data into the laboratory computer system.
- Prepare an analysis assignment sheet, noting the analytical parameters to be run and providing spaces for resulting analytical data.
- Assign the samples a position in the laboratory workload backlog.
- Retain the COC form upon completion of data generation.

4.9. Field Documentation

The field staff will be responsible for documenting field sampling activities in an all-weather (e.g. “Rite-in-the-Rain”) field notebook and on field logs, and by producing a draft technical field report at the end of each day of sampling. The field staff will also be responsible for implementing field QA/QC procedures in accordance with the methods outlined in this document and general good practice sampling protocols. These procedures include recording and documenting relevant and appropriate information regarding project activities, sampling methods and data collected during performance of field activities at each sample location.

The following general guidelines should be followed in documenting fieldwork:

- Documentation will be maintained in a dedicated field notebook and on field forms.

- Notebook documentation will be completed in waterproof ink or permanent marker and written errors will be crossed out with a single line.

Field notebooks will include records of pertinent activities related to specific sampling tasks. They will be bound books with sequentially numbered pages. The books will remain in the custody of the Field Coordinator until project completion, after which, the books will be kept in the project files. The field notebook and forms will be maintained on a real-time basis and will include, where applicable and appropriate, the following information:

- Date, time of specific activities and weather conditions.
- Names of all personnel on the site, including visitors.
- Specific details regarding sampling activities, including sampling locations, type of sampling, depth, and sample numbers.
- Specific problems and resolutions.
- Identification numbers of monitoring instruments used that day.
- Chain-of-custody details, including sample identification numbers.

A draft field report will be prepared upon completion of field sampling activities each day. Field data that was recorded in the notebooks and field forms will be used to complete the field report. The field report will be used to document construction, sampling, and monitoring activities, sampling and Site personnel, and weather conditions, as well as decisions, corrective actions, and/or modifications to the project plans and procedures discussed in this report. The draft field report will be finalized following review by the Field Coordinator and/or Technical Project Manager and kept in the project files.

4.10. Sample Preservation, Container and Hold Times

Samples for fixed laboratory analysis will be prepared, containerized, and preserved in the field in accordance with the guidelines described in Tables C-6 through C-8. Samples will be kept on ice in coolers from the time of collection until delivery to the laboratory. The samples will be preserved and hand delivered by the Field Staff, Field Coordinator, Technical Project Manager or courier to the laboratory. Alternatively, samples may be packaged and shipped to the laboratory. Samples will be kept at 0° to 6°C during delivery to the laboratory and in refrigerated coolers while at the laboratory until analyzed.

4.11. Analytical Methods

Samples and QC samples shall be analyzed following the analytical methods listed in Tables C-4 and C-5, using laboratory instruments prescribed in the methods. The analytical methods must meet the technical acceptance criteria specified by the method prior to the analysis of environmental samples. Samples that are not analyzed initially (i.e., placed on “hold”) will be stored at the laboratory for at least 6 months, and will be disposed of by the laboratory following this period. Samples to be analyzed initially will be analyzed within proper holding times, which are listed in Tables C-6 through C-8.

The laboratory is required to comply with their current written standard operating procedures. All laboratory personnel will be responsible for reporting problems that may compromise the quality of the data to the laboratory project manager. A narrative describing the anomaly, the steps taken to identify and correct it and the treatment of the relevant sample batch (i.e., recalculation, reanalysis, re-extraction) will be submitted with the data package.

4.12. Quality Control

Quality control activities that will be implemented for each sampling, analysis or measurement technique are summarized in Tables C-9 through C-12. Formulas for calculating QC statistics are provided in Section 3.1.

The laboratory will maintain and implement documented QA/QC procedures. The laboratory QA/QC program will provide the following:

- Procedures that must be followed for certifying the precision and accuracy of the analytical data generated by the laboratory.
- Documentation of each phase of sample handling, data acquisition, data transfer, report preparation, and report review.
- Accurate and secure storage and retrieval of samples and data.
- Detailed instructions for performing analyses and other activities affecting the quality of analytical data generated by the laboratory.
- Appropriate management-level review and approval of procedures, revisions to procedures, and control of procedures in such a way so that laboratory personnel that require specific procedures have access to them.

4.12.1. Field Quality Control

Field QC samples serve as a control and check mechanism to monitor the consistency of sampling methods and the potential influence of off-Site factors on project samples. Examples of off-Site factors include airborne VOCs and contaminants that may be present in potable water used during drilling activities.

4.12.1.1. Field Duplicates

In addition to replicate analyses performed in the laboratory, field duplicates also serve as measures for precision. Field duplicates measure the precision and consistency of laboratory analytical procedures and methods, as well as the consistency of the sampling techniques used by field personnel. Under ideal field conditions, field duplicates are created by thoroughly mixing a volume of the sample matrix, placing aliquots of the mixed sample in separate containers, and identifying one of the aliquots as the primary sample and the other as the duplicate sample. One field duplicate will be collected for every twenty soil, groundwater and/or sediment samples.

4.12.1.2. Trip Blanks

Trip blanks consist of samples of reagent water that accompany samples to be analyzed for VOCs during sample storage in coolers and transport to the laboratory. They are used to assess potential contamination of samples during collection and transport due to the presence of VOCs in ambient air. Trip blanks will be analyzed on a one per cooler basis containing soil, groundwater and/or sediment sample for VOC analysis.

4.12.2. Laboratory Quality Control

Laboratory QC procedures will be evaluated through a formal data quality assessment process. The analytical laboratory will follow standard analytical method procedures that include specified QC monitoring requirements. These requirements will vary by method, but generally include:

- Method blanks
- Internal standards
- Instrument calibrations
- Matrix spike/matrix spike duplicates (MS/MSD)
- Laboratory control samples/laboratory control sample duplicates (LCS/LCSD)
- Laboratory replicates or duplicates
- Surrogate spikes

4.12.2.1. Laboratory Blanks

Laboratory procedures utilize several types of blanks, but the most commonly used blanks for QC monitoring are method blanks. Method blanks are laboratory QC samples that consist of either a soil-like material having undergone a contaminant destruction process, or reagent (contaminant-free) water. Method blanks are extracted and analyzed with each batch of environmental samples undergoing analysis. Method blanks are particularly useful during volatiles analysis since VOCs can be transported in the laboratory through the vapor phase. If a substance is detected in a method blank, then one (or more) of the following occurred:

- Sample containers, measurement equipment, and/or analytical instruments were not properly cleaned and contained contaminants.
- Reagents used in the process were contaminated with a substance(s) of interest.
- Volatile substances in ambient laboratory air with high solubility or affinities toward the sample matrix contaminated the samples during preparation or analysis.

It is difficult to determine which of the above scenarios took place if blank contamination occurs. However, it is assumed that the conditions that affected the blanks also likely affected the project samples. If target analytes are detected in method blanks, data validation guidelines assist in determining which substances in project samples are considered “real,” and which ones are attributable to the analytical process. Furthermore, the guidelines state, “...there may be instances where little or no contamination was present in the associated blank, but qualification of the sample is deemed necessary. Contamination introduced through dilution water is one example” (EPA, 2008).

For EPA Method 1668C, method blank contamination for individual PCB congeners is greater than two times the minimum level (Table 2 of the method) or one-third the regulatory compliance limit, whichever is greater; or if any potentially interfering compound is found in the blank at the minimum level for each PCB congener listed in Table 2 of the method (assuming a response factor of 1 relative to the quantitation listed at that level of chlorination for a potentially interfering compound; i.e., a compound not listed in this method), analysis of samples must be halted until the sample batch is re-extracted and the extracts re-analyzed, and the blank associated with the sample batch shows no evidence of contamination at these levels. All samples must be associated with an uncontaminated method blank before the results for those samples may be reported or used for permitting or regulatory compliance purposes. If re-analysis options have been exhausted, congeners within three times the blank congener concentration will be appropriately flagged and not included in the PCB total.

4.12.2.2. Calibrations

Several types of instrument calibrations are used, depending on the analytical method, to assess the linearity of the calibration curve and assure that the sample results reflect accurate and precise measurements. The main calibrations used are initial calibrations, daily calibrations, and continuing calibration verification.

4.12.2.3. Matrix Spike/Matrix Spike Duplicates (MS/MSD)

MS/MSD samples are used to assess influences or interferences caused by the physical or chemical properties of the sample itself. For example, extreme pH can affect the results for SVOCs. Or, the presence of a particular compound may interfere with accurate quantitation of another analyte. MS/MSD data is reviewed in combination with other QC monitoring data to determine matrix effects. In some cases, matrix effects cannot be determined due to dilution and/or high levels of related substances in the sample. A matrix spike is evaluated by spiking a project sample with a known amount of one or more of the target analytes, ideally at a concentration that is 5 to 10 times higher than the sample result. A percent recovery is then calculated by subtracting the un-spiked sample result from the spiked sample result, dividing by the known concentration of the spike, and multiplying by 100.

MS/MSD samples will be analyzed at a frequency of one MS/MSD per sample set or batch. The samples for the MS/MSD analyses should be collected from a boring or sampling location that is believed to have only low-level contamination. A sample from an area of low-level contamination is needed because the objective of MS/MSD analyses is to determine the presence of matrix interferences, which can best be achieved with low levels of contaminants. Additional sample volume will be collected for the MS/MSD analyses as required by the laboratory.

4.12.2.4. Laboratory Control Sample/ Laboratory Control Sample Duplicates (LCS/LCSD)

Also known as blank spikes, LCSs are similar to MS samples in that a known amount of one or more of the target analytes are spiked into a prepared sample medium, and a percent recovery of the spiked substances is calculated. The primary difference between LCS and MS samples is that the LCS uses a contaminant-free sample medium. For example, reagent water is typically used for LCS water analyses. The purpose of an LCS is to help assess the overall accuracy and precision of the analytical process including sample preparation, instrument performance, and analyst performance.

4.12.2.5. Laboratory Replicates/Duplicates

Laboratories utilize MS/MSDs, LCS/LCSDs, and/or replicates to assess precision. Replicates are a second analysis of a field-collected environmental sample. Replicates can be split at varying stages of the sample preparation and analysis process; they most commonly consist of a second analysis on the extracted media.

4.12.2.6. Surrogate Spikes

Surrogate spikes are used to verify proper extraction procedures and the accuracy of the analytical instrument. Surrogates are substances with characteristics similar to the target analytes. A known concentration of surrogate is added to the project sample and passed through the instrument, and percent recovery is calculated. Each surrogate used has acceptance limits (i.e., an acceptable range) for percent recovery. If a surrogate recovery is low, sample results may be biased low and depending on the recovery value, a possibility of false negatives may exist. Conversely, when recoveries are above the specified acceptance limits, a possibility of false positives exist, although non-detect results are considered accurate.

4.13. Instrument/Equipment Testing, Inspection, and Maintenance

4.13.1. Field Instrumentation

Field instruments are not expected to be necessary for sampling collection. If field instruments are used, calibration and calibration checks will be performed to facilitate accurate and reliable field measurements. The calibration of the instruments will be checked and adjusted as necessary in general accordance with manufacturers' recommendations. Methods and frequency of calibration checks and instrument maintenance will be based on the type of instrument, stability characteristics, required accuracy, intended use, and environmental conditions.

4.13.2. Laboratory Instrumentation

For chemical analytical testing, calibration procedures will be performed in general accordance with the analytical methods used and the laboratory's Standard Operating Procedures (SOPs). Calibration documentation will be retained at the laboratory for a period of 6 months.

4.14. Laboratory Data Reporting and Deliverables

Laboratories will report data in formatted hardcopy and electronic form to the technical project manager and QA leader. Upon completion of analyses, the laboratory will prepare electronic deliverables for data packages in accordance with the specifications in the agreed-upon *Special Conditions for Lab Analysis* document. The laboratory will provide electronic data deliverables (EDDs) within 2 business days after GeoEngineers' receipt of printed-copy analytical results, including the appropriate QC documentation. GeoEngineers will establish EDD requirements with the contract laboratory.

Analytical laboratory measurements will be recorded in standard formats that display, at a minimum, the client/field sample identification, the laboratory sample identification, reporting units, analytical methods, analytes tested, analytical results, extraction and analysis dates, quantitation limits, and data qualifiers. Each sample delivery group will be accompanied by sample receipt forms and a case narrative identifying data quality issues.

5.0 DATA REDUCTION AND ASSESSMENT PROCEDURES

The process for generating and checking data, as well as the process for producing reports for field and analytical laboratory data, are summarized in the following sections.

5.1. Data Reduction

Data reduction involves the conversion or transcription of field and analytical data to a useable format. The laboratory personnel will reduce the analytical data for review by the QA leader and technical project manager. This will involve both hard-copy forms and EDDs. Both forms of data will be compared with each other to verify that the data are reliable and error-free.

5.2. Review of Field Documentation and Laboratory Receipt Information

Documentation of field sampling data will be reviewed periodically for conformance with project QC requirements described in this document. At a minimum, field documentation will be checked for proper documentation of the following:

- Sample collection information (date, time, location, matrices, etc.);
- Field instruments used and calibration data;
- Sample collection protocol;
- Sample containers, preservation, and volume;
- Field QC samples collected at the frequency specified;
- Chain-of-custody protocols; and
- Sample shipment information.

Sample receipt forms provided by the laboratory will be reviewed for QC exceptions. The final laboratory data package will describe (in the case narrative) the effects that any identified QC exceptions have on data quality. The laboratory will review transcribed sample collection and receipt information for correctness prior to delivering the final data package.

5.3. Data Verification/Validation

Project decisions, conclusions, and recommendations will be based upon verified (validated) data. The purpose of data verification is to ensure that data used for subsequent evaluations and calculations are scientifically valid, of known and documented quality, and legally defensible. Field data verification will be used to eliminate data not collected or documented in accordance with the protocols specified in the RI/FS Work Plan and this document. Laboratory data verification will be used to eliminate data not obtained using prescribed laboratory procedures.

The QA leader will validate data collected during the supplemental investigation to ensure that the data are valid and usable. At a minimum, a Stage 2B validation will be performed on the RI data in general conformance with EPA functional guidelines for data validation (EPA, 2004 and EPA, 2008). At a minimum, the following items will be reviewed to verify the data as applicable:

- Documentation that a final review of the data was completed by the laboratory QA coordinator;
- Documentation of analytical and QC methodology;
- Documentation of sample preservation and transport;
- Sample receipt forms and case narratives; and
- The following QC parameters:
 - Holding times and sample preservation
 - Method blanks
 - MS/MSDs
 - LCS/LCSDs
 - Surrogate spikes
 - Duplicates/replicates

When sample analytical data are received from the analytical laboratory, they will undergo a QC review by the QA leader. The accuracy and precision achieved will be compared to the laboratory's analytical control limits. Example control limits are presented in Tables C-1 through C-3. Calculations of RPDs will follow standard statistical conventions and formulas as presented in in this document. Additional specifications

and professional judgment by the QA leader may be incorporated when appropriate data from specific matrices and field samples are available.

A data quality assessment will be prepared to document the overall quality of the data relative to the DQOs. The major components of the data quality assessment are as follows:

- **Data Validation Summary:** Summarizes the data validation results for all sample delivery groups by analytical method. The summary identifies any systematic problems, data generation trends, general conditions of the data, and reasons for any data qualification.
- **QC Sample Evaluation:** Evaluates the results of QC sample analyses, and presents conclusions based on these results regarding the validity of the project data.
- **Assessment of DQOs:** An assessment of the quality of data measured and generated in terms of accuracy, precision, and completeness relative to objectives established for the project.
- **Summary of Data Usability:** Summarizes the usability of data, based on the assessment performed in the three preceding steps.

The data quality assessment will help to achieve an acceptable level of confidence in the decisions that are to be made based upon the project data. The project analytical data will be submitted to Ecology's Environmental Information Management (EIM) system within 60 days after the data quality assessment is completed.

5.4. TOC Normalized Data

In general, chemistry concentrations will be reported on a dry-weight basis. For polar organic chemicals, chemistry concentrations will be TOC-normalized to allow direct comparison to the screening levels when the corresponding TOC concentration in the sample ranges from 0.5 to 3.5 percent. Dry-weight values will be reported in cases where TOC values are either very high (> 3.5%) or very low (< 0.5%) for comparison to the screening levels.

5.5. Calculating Chemical Sums

The following guidelines will be used to calculate chemical sums:

- Total polycyclic aromatic hydrocarbons (PAHs) represents the sum of the detected concentrations of the following compounds: 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benzo[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenz[a,h]anthracene, fluoranthene, fluorene, indeno[1,2,3-c,d] pyrene, naphthalene phenanthrene, pyrene, and total benzofluoranthenes [b, j, k] (WAC 173-204-563(2)(h)).
- Total low molecular weight PAHs (LPAHs) represents the sum of the detected concentrations of the following compounds: acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene, (WAC 173-204-562(2)(i)).
- Total high molecular weight PAHs (HPAHs) represents the sum of the detected concentrations of the following compounds: benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, pyrene, and total benzofluoranthenes, (WAC 173-204-562(2)(j)).

- Total benzofluoranthenes represents the sum of detected concentrations of the b, j, and k isomers of benzofluoranthenes (WAC 173-204-562(2)(k)). In some cases, the testing laboratory may report the total benzofluoranthenes concentration rather than concentrations of individual compounds since they may not be able to resolve all three isomers.
- Total PCBs represent the sum of the detected concentrations of Aroclors® 1016, 1221, 1232, 1242, 1248, 1254 and 1260 or the sum of the congeners, using half the PQL for those congeners that were reported as not detected.
- Total cPAHs will be calculated using the toxicity equivalent (TEQ) approach in accordance with WAC 173-340-708(8)(e). Total cPAH TEQs will be calculated using toxicity equivalency factor (TEF) values referenced from Model Toxics Control Act (MTCA) Table 708.2 (WAC 173-340-900). For non-detect results, one-half the PQL will be used in the TEQ calculations.
- Total dioxin/furans and dioxin-like PCB congeners will be calculated using the TEQ approach in accordance with WAC 173-340-708(8)(d). Total dioxin/furan TEQs will be calculated using the 2005 World Health Organization (WHO) TEF values to characterize the toxicity of these mixtures.

The TEFs and minimum individual cPAHs that should be included in the TEQ calculations are listed in Table 5 of the RI/FS Work Plan.

For the summation of chemical totals, any “U” qualified data, which may be data reported at the PQL, the MDL, or the reporting limit (RL), represent non-detects. For the calculations, no distinction is made between these different types of detection limits, and any “U” qualified data are treated as “non-detects”. The following guidelines will be used for reporting and summing non-detects for LPAHs, HPAHs, benzofluoranthenes and PCBs (when measured as Aroclors):

- When all chemicals in a group are non-detect, only the single highest individual chemical quantitation limit in a group will be reported and appropriately qualified.
- If some concentrations were detected and others are not, only the detected concentrations are included in the sum.

Estimated values between the method detection limit and the laboratory reporting limit (i.e. “J” qualified results) will be included in the summation at face value and the sum will also be qualified as estimated with a “J” qualifier. Results that are qualified as estimates with “J” qualifiers through data validation, will also be handled in the same manner.

For calculating TEQ, total cPAH, dioxin and furan, and dioxin-like PCB congener TEQs, the sum will be calculated using a substitution at one-half the detection limit (i.e., $n=1/2$). However, using this alternative may result in generated sums that are estimates with unknown bias and precision. Therefore, these estimates will be bounded by reporting sums using a substitution of the detection limit at $n=0$ and $n=1$. As an alternative, the Kaplan-Meier (KM) method for estimating the TEQ sums when non-detected congeners are present within a sample may be used.

6.0 PROJECT MANAGEMENT AND ORGANIZATION

The project management and organization elements for the RI including the key personnel, roles and responsibilities of the participants and special training/certification are presented in the following sections.

6.1. Project Organization and Responsibilities

Key individuals and positions providing QA and QC are summarized in the following table. A description of the responsibilities, lines of authority and communication for the key individuals and positions providing QA and QC is presented in Sections 6.1.1 through 6.1.8.

Project Role	Name and Organization	Contact Information
Project Coordinator	Becky Darden Port of Anacortes	360.299.1831 becky@portofanacortes.com 100 Commercial Ave. Anacortes, WA 98221
Technical Project Manager	John Herzog GeoEngineers	206.406.6431 jherzog@geoengineers.com 600 Stewart Street, Suite 1700 Seattle, Washington 98101
Task Manager/Field Coordinator	Robert Trahan GeoEngineers	206.239.3253 rtrahan@geoengineers.com 600 Stewart Street, Suite 1700 Seattle, Washington 98101
Health and Safety Manager	Wayne Adams GeoEngineers	253.722.2793 wadams@geoengineers.com 1101 Fawcett Avenue, Suite 200 Tacoma, Washington 98402
Quality Assurance Leader	Mark Lybeer GeoEngineers	206.278.2674 mlybeer@geoengineers.com 600 Stewart Street, Suite 1700 Seattle, Washington 98101
Laboratory Project Manager	Cheronne Oreiro Analytical Resources Inc.	206.621.6490 cheronneo@arilabs.com 333 9th Avenue North Seattle, WA 98109

6.1.1. Port of Anacortes Project Coordinator

The Port's project coordinator duties consist of implementing the project approach and tasks, overseeing the project team members during performance of project tasks.

6.1.2. Technical Project Manager

The technical project manager is responsible for fulfilling contractual and administrative control of the project. The technical project manager's duties include defining the project approach and tasks, selecting project team members and establishing budgets and schedules.

The technical project manager's duties also include implementing the project approach and tasks, overseeing project team members during performance of project tasks, adhering to and communicating the status of budgets and schedules to the Port project manager, providing technical oversight, and providing overall production and review of project deliverables. The technical project manager shall

maintain the official, approved RI/FS Work Plan and supporting documents, and shall be responsible for distributing updated documents to the recipients listed in Section 6.1.

6.1.3. Task Manager

The task manager is responsible for the daily management of project tasks including providing technical direction to the field staff, produces task specific documents including the RI/FS Work Plan and supporting documents, develops schedules and allocates resources for field tasks, coordinates data collection activities to be consistent with information requirements, supervises the compilation of field data and laboratory analytical results, assures that data are correctly and completely reported, implements and oversees field sampling in accordance with project plan and supervises field personnel. Additionally, the task manger coordinates work with on-site subcontractors, verifies that appropriate sampling, testing, and measurement procedures are followed, coordinates the transfer of field data, sample tracking forms, and log books to the technical project manager for data reduction and validation, and participates in QA corrective actions as required.

6.1.4. Field Coordinator

The field coordinator will lead the field sampling effort for the project, serving as the direct point of contact between the task manager, analytical laboratory and subcontractors; and ensures that the appropriate sampling containers, COC forms and field sampling gear including PPE are available. The field coordinator ensures that data collection activities are consistent with information requirements and to assure that field information is correctly and completely reported for the entire duration of the project. The field coordinator will also coordinate appropriate sampling, testing, and measurement procedures and schedule sample delivery/shipment with the analytical laboratory. The field coordinator will transfer field data and sample tracking forms to the project file and data reduction and validation and participate in QA corrective actions as required.

6.1.5. Technical/Field Staff

Technical/field staff have the primary responsibility for duties involving field data collection and documentation. Technical/field staff are responsible for:

- Understanding and following the RI/FS Work Plan, SAP and Health and Safety Plan (HASP).
- Checking all equipment and supplies in advance of field operations.
- Ensuring that samples are properly collected, preserved, labeled, packaged, and shipped.
- Ensuring that all field data are carefully recorded in accordance with the RI/FS Work Plan and supporting documents.
- Following COC procedures and SOPs when they are required.

6.1.6. Quality Assurance Leader

The quality assurance leader will provide oversight required for the completion of sample analyses for the project and verify, in conjunction with the laboratory manager, that the analytical work is proceeding in accordance with internal laboratory standard practices and the QA/QC guidelines for the project. This person will also oversee completion of data validation activities completed for this project. The quality assurance leader maintains independence from the individual(s) generating the data.

6.1.7. Health and Safety Manager

The health and safety manager will oversee implementation of health and safety programs and verify that work on the project proceeds in accordance with the site-specific HASP.

6.1.8. Laboratory Project Manager

The laboratory project manager will fulfill the analytical requirements of this project including being responsible for sample analyses using appropriate analytical laboratory methods. The specific procedures to be used for COC transfer, internal calibrations, laboratory analyses, reporting, preventive instrument maintenance, and corrective action will follow standard protocols.

6.2. Special Training Requirements/Certification

The Superfund Amendments and Reauthorization Act of 1986 required the Secretary of Labor to issue regulations providing health and safety standards and guidelines for workers engaged in hazardous waste operations. Occupational Safety and Health Administration (OSHA) regulations (29 CFR 1910.120) require training to provide employees with the knowledge and skills necessary to enable them to perform their jobs safely and with minimum risk to their personal health. All sampling personnel will have completed the 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and 8-hour refresher courses, as necessary, to meet OSHA regulations.

7.0 LIMITATIONS

We have prepared this Sampling and Analysis Plan for use by the Port of Anacortes during the RI/FS at the Quiet Cove Site located at 202 O Avenue in Anacortes, Washington. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

8.0 REFERENCES

Bouwer, H. (Bouwer), "The Bouwer and Rice Slug Test — An Update," Groundwater, Vol. 27, No. 3, dated 1989.

Bouwer, H., and R.C. Rice (Bouwer and Rice), "A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers With Completely or Partially Penetrating Wells," Groundwater, Vol. 12, No. 3, dated 1976.

Dredged Material Management Program (DMMP), 1998, "DMMP Clarification Paper: Tributyltin Analysis: Clarification of Interstitial Water Extraction and Analysis Methods – Interim," Prepared by Erika Hoffman for DMMP agencies dated December 22, 1998.

GeoEngineers Inc. (GeoEngineers), "Remedial Investigation/Feasibility Study Work Plan, Quiet Cove, Anacortes, Washington, Agreed Order No. DE 11346," prepared for Ecology on Behalf of Port of Anacortes, GEI File No. 5147-024-03, dated January 25, 2017.

Serfes, "Determining the Mean Hydraulic Gradient of Ground Water Affected by Tidal Fluctuations," Ground Water, Vol. 29, No. 4. July-August 1991.

U.S. Environmental Protection Agency (EPA), "Guidance for Quality Assurance Project Plans, EPA QA/R-5," EPA-240/R-02/009, Office of Emergency and Remedial Response, US Environmental Protection Agency, Washington, DC, dated December 2002.

U.S. Environmental Protection Agency (EPA), "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review," EPA 540-R-04-004, Office of Emergency and Remedial Response, US Environmental Protection Agency, Washington, DC, dated October 2004.

U.S. Environmental Protection Agency (EPA), 2008, "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, EPA-540-R-08-01," Office of Emergency and Remedial Response, US Environmental Protection Agency, Washington, DC, dated June 2008.

U.S. Environmental Protection Agency (EPA), "Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells," EQASOP-GW-001, US Environmental Protection Agency, Washington, DC, dated January 2010.

Washington State Department of Ecology (Ecology), 2004, "Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies," dated July 2004.

Washington State Department of Ecology (Ecology), "Sediment Cleanup User's Manual II, Guidance for Implementing the Cleanup Provisions of the Sediment Management Standards, Chapter 173-204 WAC," Publication No. 12-09-057, dated March 2015.

Table C-1 Measurement Quality Objectives - Conventional, Hydrocarbons, VOCs, SVOCs, PCBs and Metals Quiet Cove Property Anacortes, Washington											
Laboratory Analysis	Laboratory Control Sample (LCS) %R Limits		Matrix Spike (MS) %R Limits		Surrogate Standard (SS) %R Limits ^{1,2,3}			MS Duplicate Samples or Lab Duplicate RPD Limits ⁴ (%)		Field Duplicate Samples RPD Limits ⁴ (%)	
	Soil/Sed	Water	Soil/Sed	Water	Soil	Sediment	Water (Default liq-liq Extraction)	Soil/Sed	Water	Soil/Sed	Water
Grain size	--	--	--	--	--	--	--	--	--	--	--
Total Organic Carbon (TOC)	75 - 125	--	75 - 125	--	--	--	--	--	--	≤50	--
Total Volatile Solids (TVS)	--	--	--	--	--	--	--	±20	--	≤50	--
Total Solids (TS)	--	--	--	--	--	--	--	--	--	≤50	--
Sulfides ⁴	75 - 125	--	75 - 125	--	--	--	--	±20	--	≤50	--
Ammonia ⁴	75 - 125	--	75 - 125	--	--	--	--	±20	--	≤50	--
Gasoline-Range Hydrocarbons	50 - 150	50 - 150	--	--	50 - 150	50 - 150	50 - 150	≤30	≤30	≤50	≤35
Diesel- and Heavy Oil-Range Hydrocarbons	50 - 150	50 - 150	--	--	50 - 150	50 - 150	50 - 150	≤40	≤40	≤50	≤35
VOCs	Laboratory Specific Control Limits ¹	Laboratory Specific Control Limits ¹	Laboratory Specific Control Limits ¹	Laboratory Specific Control Limits ¹	80 - 128 (1,2-Dichloroethane-d4) 80 - 120 (All Other Surrogates)	80 - 128 (1,2-Dichloroethane-d4) 80 - 120 (All Other Surrogates)	80 - 128 (1,2-Dichloroethane-d4) 80 - 120 (All Other Surrogates)	≤30	≤30	≤50	≤35
SVOCs	Laboratory Specific Control Limits ¹	Laboratory Specific Control Limits ¹	Laboratory Specific Control Limits ¹	Laboratory Specific Control Limits ¹	22 - 120 (2-Fluorophenol) 27 - 120 (Phenol-d5) 36 - 120 (2-Chlorophenol-d4) 38 - 120 (1,2-Dichlorobenzene-d4) 32 - 120 (Nitorobenzene-d5) 39 - 120 (2-Fluorobiphenyl) 31 - 131 (2,4,6-Tribromophenol) 31 - 130 (p-Terphenyl-d14)	27 - 120 (2-Fluorophenol) 29 - 120 (Phenol-d5) 31 - 120 (2-Chlorophenol-d4) 32 - 120 (1,2-Dichlorobenzene-d4) 30 - 120 (Nitorobenzene-d5) 35 - 120 (2-Fluorobiphenyl) 24 - 134 (2,4,6-Tribromophenol) 37 - 120 (p-Terphenyl-d14)	33 - 120 (2-Fluorophenol) 38 - 120 (Phenol-d5) 41 - 120 (2-Chlorophenol-d4) 20 - 120 (1,2-Dichlorobenzene-d4) 27 - 120 (Nitorobenzene-d5) 33 - 120 (2-Fluorobiphenyl) 52 - 120 (2,4,6-Tribromophenol) 28 - 120 (p-Terphenyl-d14) 39 - 120 (1,4-Dioxane-d8)	≤30	≤30	≤50	≤35
Aroclor-PCBs RL = 0.01 ug/L = 4.0 ug/kg	56 - 120 (Aroclor-1016) 58 - 120 (Aroclor-1260)	56 - 120 (Aroclor-1016) 58 - 120 (Aroclor-1260)	56 - 120 (Aroclor-1016) 58 - 120 (Aroclor-1260)	56 - 120 (Aroclor-1016) 58 - 120 (Aroclor-1260)	Primary/Secondary Columns 40 - 126 (DCB) 44 - 120 (TCX)	Primary/Secondary Columns 40 - 126 (DCB) 44 - 120 (TCX)	Primary/Secondary Columns 29 - 120 (DCB) 32 - 120 (TCX)	≤30	≤30	≤50	≤35
Metals	80 - 120	80 - 120	75 - 125	75 - 125	--	--	--	≤20	≤20	≤50	≤35

Notes:

- ¹Compound-specific ranges will be provided by the laboratory when contracted.
- ²Percent recovery limits are expressed as ranges based on laboratory control limits. Limits will vary for individual analytes.
- ³Individual surrogate recoveries are compound-specific.
- ⁴RPD control limits are only applicable if the primary and duplicate sample concentrations are greater than 5 times the method reporting limit (MRL). For results less than 5 times the MRL, the difference between the primary and duplicate samples must be less than 2X the MRL for soils/sediments and 1X the MRL for waters.
- EPA = U.S. Environmental Protection Agency
- VOCs = Volatile Organic Compounds
- SVOCs = Semi-Volatile Organic Compounds
- PCBs = Polychlorinated biphenyls
- RL = Reporting Limit
- RPD = Relative percent difference
- RSD = Relative standard deviation
- DCB = Decachlorobiphenyl
- TCX = Tetrachlorometaxylene
- MS = Matrix spike

Table C-2
Measurement Quality Objectives - Dioxins and Furans
 Quiet Cove Property
 Anacortes, Washington

Laboratory Analysis	Initial Precision and Recovery		Ongoing Precision and Recovery (%)	Initial Calibration (%)	Calibration Verification (%)	Labeled Compound (% Recovery)	
	RSD (%)	Recovery (%)				Warning Limit	Control Limit
Native Compound							
2,3,7,8-TCDD	28	83 - 129	67 - 158	20	78 - 129	-	-
2,3,7,8-TCDF	20	87 - 137	75 - 158	20	84 - 120	-	-
1,2,3,7,8-PeCDD	15	76 - 132	70 - 142	20	78 - 130	-	-
1,2,3,7,8-PeCDF	15	86 - 124	80 - 134	20	82 - 120	-	-
2,3,4,7,8-PeCDF	17	72 - 150	68 - 160	20	82 - 122	-	-
1,2,3,4,7,8-HxCDD	19	78 - 152	70 - 164	20	78 - 128	-	-
1,2,3,6,7,8-HxCDD	15	84 - 124	76 - 134	20	78 - 128	-	-
1,2,3,7,8,9-HxCDD	22	74 - 142	64 - 162	20	82 - 122	-	-
1,2,3,4,7,8-HxCDF	17	82 - 118	72 - 134	20	90 - 112	-	-
1,2,3,6,7,8-HxCDF	13	92 - 120	84 - 130	20	88 - 114	-	-
1,2,3,7,8,9-HxCDF	13	84 - 122	78 - 130	20	90 - 112	-	-
2,3,4,6,7,8-HxCDF	15	74 - 148	70 - 156	20	88 - 114	-	-
1,2,3,4,6,7,8-HpCDD	15	76 - 130	70 - 140	20	86 - 116	-	-
1,2,3,4,6,7,8-HpCDF	13	90 - 112	82 - 122	20	90 - 110	-	-
1,2,3,4,7,8,9-HpCDF	16	86 - 126	78 - 138	20	86 - 116	-	-
OCDD	19	89 - 127	78 - 144	20	79 - 126	-	-
OCDF	27	74 - 146	63 - 170	20	63 - 159	-	-
Labeled Compounds							
13C ₁₂ -2,3,7,8-TCDD	37	28 - 134	20 - 175	35	82 - 121	40 - 120	25 - 164
13C ₁₂ -2,3,7,8-TCDF	35	31 - 113	22 - 152	35	71 - 140	40 - 120	24 - 169
13C ₁₂ -1,2,3,7,8-PeCDD	39	27 - 184	21 - 227	35	62 - 160	40 - 120	25 - 181
13C ₁₂ -1,2,3,7,8-PeCDF	34	27 - 156	21 -192	35	76 - 130	40 - 120	24 - 185
13C ₁₂ -2,3,4,7,8-PeCDF	38	16 - 279	13 - 328	35	77 - 130	40 - 120	21 - 178
13C ₁₂ -1,2,3,4,7,8-HxCDD	41	29 - 147	21 - 193	35	85 - 117	40 - 120	32 - 141
13C ₁₂ -1,2,3,6,7,8-HxCDD	38	34 - 122	25 - 163	35	85 - 118	40 - 120	28 - 130

Laboratory Analysis	Initial Precision and Recovery		Ongoing Precision and Recovery (%)	Initial Calibration (%)	Calibration Verification (%)	Labeled Compound (% Recovery)	
	RSD (%)	Recovery (%)				Warning Limit	Control Limit
13C ₁₂ -1,2,3,4,7,8-HxCDF	43	27 - 152	19 - 202	35	76 - 131	40 - 120	26 - 152
13C ₁₂ -1,2,3,6,7,8-HxCDF	35	30 - 122	21 - 159	35	70 - 143	40 - 120	26 - 123
13C ₁₂ -1,2,3,7,8,9-HxCDF	40	24 - 157	17 - 205	35	74 - 135	40 - 120	29 - 147
13C ₁₂ -2,3,4,6,7,8-HxCDF	37	29 - 136	22 - 176	35	73 - 137	40 - 120	28 - 136
13C ₁₂ -1,2,3,4,6,7,8-HpCDD	35	34 - 129	26 - 166	35	72 - 138	40 - 120	23 - 140
13C ₁₂ -1,2,3,4,6,7,8-HpCDF	41	32 - 110	21 - 158	35	78 - 129	40 - 120	28 - 143
13C ₁₂ -1,2,3,4,7,8,9-HpCDF	40	28 - 141	20 - 186	35	77 - 129	40 - 120	26 - 138
13C ₁₂ -OCDD	48	21 - 138	13 - 199	35	48 - 208	25 - 120	17 - 157
Cleanup Standard							
37Cl ₄ -2,3,7,8-TCDD	36	39 - 154	31 - 191	35	79 - 127	40 - 120	35 - 197

Notes:

– indicates that the measurement quality objective is not applicable for the laboratory method.

RSD = Relative standard deviation

Table C-3
Measurement Quality Objectives - PCB Congeners
 Quiet Cove Property
 Anacortes, Washington

Laboratory Analysis	Test Concentration ^{1,2,3} (ng/ml)	Calibration Verification (%)	Initial Precision and Recovery		Ongoing Precision and Recovery (%)	Surrogate Standard (% Recovery in Sample)
			RSD (%)	Recovery (%)		
Compound						
PCB-1	50	72 - 125	25	70 - 130	60 - 135	-
PCB-3	50	72 - 125	25	70 - 130	60 - 135	-
PCB-4	50	72 - 125	25	70 - 130	60 - 135	-
PCB-15	50	72 - 125	25	70 - 130	60 - 135	-
PCB-19	50	72 - 125	25	70 - 130	60 - 135	-
PCB-37	50	72 - 125	25	70 - 130	60 - 135	-
PCB-54	50	72 - 125	25	70 - 130	60 - 135	-
PCB-77	50	72 - 125	25	70 - 130	60 - 135	-
PCB-81	50	72 - 125	25	70 - 130	60 - 135	-
PCB-104	50	72 - 125	25	70 - 130	60 - 135	-
PCB-105	50	72 - 125	25	70 - 130	60 - 135	-
PCB-114	50	72 - 125	25	70 - 130	60 - 135	-
PCB-118	50	72 - 125	25	70 - 130	60 - 135	-
PCB-123	50	72 - 125	25	70 - 130	60 - 135	-
PCB-126	50	72 - 125	25	70 - 130	60 - 135	-
PCB-155	50	72 - 125	25	70 - 130	60 - 135	-
PCB-156	50	72 - 125	25	70 - 130	60 - 135	-
PCB-157	50	72 - 125	25	70 - 130	60 - 135	-
PCB-167	50	72 - 125	25	70 - 130	60 - 135	-
PCB-169	50	72 - 125	25	70 - 130	60 - 135	-
PCB-188	50	72 - 125	25	70 - 130	60 - 135	-
PCB-189	50	72 - 125	25	70 - 130	60 - 135	-
PCB-202	50	72 - 125	25	70 - 130	60 - 135	-
PCB-205	50	72 - 125	25	70 - 130	60 - 135	-
PCB-206	50	72 - 125	25	70 - 130	60 - 135	-

Laboratory Analysis	Test Concentration ^{1,2,3} (ng/ml)	Calibration Verification (%)	Initial Precision and Recovery		Ongoing Precision and Recovery (%)	Surrogate Standard (% Recovery in Sample)
			RSD (%)	Recovery (%)		
PCB-208	50	72 - 125	25	70 - 130	60 - 135	-
PCB-209	50	72 - 125	25	70 - 130	60 - 135	-
Surrogate Compounds						
13C-PCB-1	100	50 - 145	70	20 - 135	15 - 145	5 - 145
13C-PCB-3	100	50 - 145	70	20 - 135	15 - 145	5 - 145
13C-PCB-4	100	50 - 145	70	20 - 135	15 - 145	5 - 145
13C-PCB-15	100	50 - 145	70	20 - 135	15 - 145	5 - 145
13C-PCB-19	100	50 - 145	70	20 - 135	15 - 145	5 - 145
13C-PCB-28	100	50 - 145	70	20 - 135	15 - 145	5 - 145
13C-PCB-37	100	50 - 145	70	20 - 135	15 - 145	5 - 145
13C-PCB-54	100	50 - 145	70	20 - 135	15 - 145	5 - 145
13C-PCB-77	100	50 - 145	50	45 - 135	40 - 145	10 - 145
13C-PCB-81	100	50 - 145	50	45 - 135	40 - 145	10 - 145
13C-PCB-104	100	50 - 145	50	45 - 135	40 - 145	10 - 145
13C-PCB-105	100	50 - 145	50	45 - 135	40 - 145	10 - 145
13C-PCB-111	100	50 - 145	50	45 - 135	40 - 145	10 - 145
13C-PCB-114	100	50 - 145	50	45 - 135	40 - 145	10 - 145
13C-PCB-118	100	50 - 145	50	45 - 135	40 - 145	10 - 145
13C-PCB-123	100	50 - 145	50	45 - 135	40 - 145	10 - 145
13C-PCB-126	100	50 - 145	50	45 - 135	40 - 145	10 - 145
13C-PCB-155	100	50 - 145	50	45 - 135	40 - 145	10 - 145
13C-PCB-156	100	50 - 145	50	45 - 135	40 - 145	10 - 145
13C-PCB-157	100	50 - 145	50	45 - 135	40 - 145	10 - 145
13C-PCB-167	100	50 - 145	50	45 - 135	40 - 145	10 - 145
13C-PCB-169	100	50 - 145	50	45 - 135	40 - 145	10 - 145
13C-PCB-178	100	50 - 145	50	45 - 135	40 - 145	10 - 145
13C-PCB-188	100	50 - 145	50	45 - 135	40 - 145	10 - 145
13C-PCB-189	100	50 - 145	50	45 - 135	40 - 145	10 - 145
13C-PCB-202	100	50 - 145	50	45 - 135	40 - 145	10 - 145
13C-PCB-205	100	50 - 145	50	45 - 135	40 - 145	10 - 145
13C-PCB-206	100	50 - 145	50	45 - 135	40 - 145	10 - 145

Laboratory Analysis	Test Concentration ^{1,2,3} (ng/ml)	Calibration Verification (%)	Initial Precision and Recovery		Ongoing Precision and Recovery (%)	Surrogate Standard (% Recovery in Sample)
			RSD (%)	Recovery (%)		
13C-PCB-208	100	50 - 145	50	45 - 135	40 - 145	10 - 145
13C-PCB-209	100	50 - 145	50	45 - 135	40 - 145	10 - 145
Cleanup Surrogate Compounds						
13C-PCB-28	100	65 - 135	70	20 - 135	15 - 145	5 - 145
13C-PCB-111	100	75 - 125	50	45 - 135	40 - 145	10 - 145
13C-PCB-178	100	75 - 125	50	45 - 135	40 - 145	10 - 145

Notes:

¹ Concentration of Congeners and Surrogates in Calibration Verification Standard #3 (CS3)

² Concentration of Congeners and Surrogates in final extract of IPR and OPR

³ Concentration of Surrogates in all final extracts

-- indicates that the measurement quality objective is not applicable for the laboratory method.

PCBs = Polychlorinated biphenyls

ng/ml = nanogram per milliliter

Table C-4
Method Analysis and Target Reporting Limits for Soil and Groundwater
 Quiet Cove Property
 Anacortes, Washington

Laboratory Analysis	CAS Number ¹	Analytical Method	Practical Quantitation Limit ² (PQL)	
			Soil (mg/kg)	Groundwater (µg/L)
Metals				
Arsenic	7440-38-2	EPA 6010/6020/200.8	5	0.5
Cadmium	7440-43-9	EPA 6010/6020/200.8	0.20	0.10
Chromium (total)	7440-47-3	EPA 6010/6020/200.8	0.50	0.5
Copper	7440-50-8	EPA 6010/6020/200.8	0.2	0.5
Lead	7439-92-1	EPA 6010/6020/200.8	2	0.1
Mercury	7439-97-6	EPA 7470A/7471A/1631E	0.05	0.02
Silver	7440-22-4	EPA 6010/6020/200.8	0.3	0.2
Zinc	7440-66-6	EPA 6010/6020/200.8	1	4
Petroleum Hydrocarbons				
Gasoline-Range	8006-61-9	NWTPH-G	5	100
Diesel-Range	68334-30-5	NWTPH-DX with SI/Gel Cleanup	5	100
Heavy Oil-Range	30109	NWTPH-DX with SI/Gel Cleanup	10	200
Volatile Petroleum Hydrocarbons (VPH)	30181	Ecology VPH	10	50
Extractable Petroleum Hydrocarbons (EPH)	30102	Ecology EPH	2	50
BETX Compounds				
Benzene	71-43-2	EPA 8260	0.050	0.2
Ethylbenzene	100-41-4	EPA 8260	0.050	0.2
Toluene	108-88-3	EPA 8260	0.050	0.2
Xylenes	1330-20-7	EPA 8260	0.050	0.2
Volatile Organic Compounds (VOCs)				
1,1,1,2-Tetrachloroethane	630-20-6	EPA 8260	0.001	0.2
1,1,1-Trichloroethane	71-55-6	EPA 8260	0.001	0.2
1,1,2,2-Tetrachloroethane	79-34-5	EPA 8260	0.002	0.2
1,1,2-trichloro-1,2,2-trifluoroethane (CFC113)	76-13-1	EPA 8260	0.002	0.2
1,1,2-Trichloroethane	79-00-5	EPA 8260	0.001	0.2
1,1-Dichloroethane	75-34-3	EPA 8260	0.001	0.2
1,1-Dichloroethene	75-35-4	EPA 8260	0.001	0.2
1,1-Dichloropropene	563-58-6	EPA 8260	0.001	0.2
1,2,3-Trichlorobenzene	87-61-6	EPA 8260	0.005	0.5
1,2,3-Trichloropropane	96-18-4	EPA 8260	0.002	0.5
1,2,4-Trichlorobenzene	120-82-1	EPA 8260	0.005	0.500
1,2,4-Trimethylbenzene	95-63-6	EPA 8260	0.001	0.2
1,2-Dibromo-3-chloropropane	96-12-8	EPA 8260	0.005	0.5
1,2-Dichlorobenzene	95-50-1	EPA 8260	0.001	0.2
1,2-Dichloroethane (EDC)	107-06-2	EPA 8260	0.001	0.2
1,2-Dichloropropane	78-87-5	EPA 8260	0.001	0.2
1,3,5-Trimethylbenzene	108-67-8	EPA 8260	0.001	0.200
1,3-Dichlorobenzene	541-73-1	EPA 8260	0.001	0.200
1,3-Dichloropropane	142-28-9	EPA 8260	0.001	0.2
1,4-Dichlorobenzene	106-46-7	EPA 8260	0.067	0.2
2,2-Dichloropropane	594-20-7	EPA 8260	0.001	0.2
2-Butanone (MEK)	78-93-3	EPA 8260	0.005	5.000
2-Chloroethyl Vinyl Ether	110-75-8	EPA 8260	0.005	1.000
2-Chlorotoluene	95-49-8	EPA 8260	0.001	1.000
2-Hexanone	591-78-6	EPA 8260	0.001	5

Laboratory Analysis	CAS Number ¹	Analytical Method	Practical Quantitation Limit ² (PQL)	
			Soil (mg/kg)	Groundwater (µg/L)
4-Chlorotoluene	106-43-4	EPA 8260	0.001	0.2
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	108-10-1	EPA 8260	0.005	5.000
Acetone	67-64-1	EPA 8260	0.005	5.000
Acrolein	107-02-8	EPA 8260	0.05	5
Acrylonitrile	107-13-1	EPA 8260	0.005	1
Bromobenzene	108-86-1	EPA 8260	0.001	0.2
Bromochloromethane	74-97-5	EPA 8260	0.005	0.2
Bromoform	75-25-2	EPA 8260	0.001	0.200
Bromomethane	74-83-9	EPA 8260	0.001	1.000
Carbon Disulfide	75-15-0	EPA 8260	0.001	0.200
Carbon Tetrachloride	56-23-5	EPA 8260	0.001	0.200
Chlorobenzene	108-90-7	EPA 8260	0.001	0.200
Chloroethane	75-00-3	EPA 8260	0.005	0.200
Chloroform	67-66-3	EPA 8260	0.001	0.200
Chloromethane	74-87-3	EPA 8260	0.001	0.500
Cis-1,2-Dichloroethene	156-59-2	EPA 8260	0.001	0.200
Cis-1,3-Dichloropropene	10061-01-5	EPA 8260	0.001	0.200
Dibromochloromethane	124-48-1	EPA 8260	0.001	0.200
Dibromomethane	74-95-3	EPA 8260	0.001	0.200
Dichlorobromomethane	75-27-4	EPA 8260	0.001	0.200
Dichlorodifluoromethane (CFC 12)	75-71-8	EPA 8260	0.001	0.200
1,2-Dibromoethane (EDB)	106-93-4	EPA 8260	0.001	0.200
Hexachlorobutadiene	87-68-3	EPA 8260	0.005	0.500
Isopropylbenzene	98-82-8	EPA 8260	0.001	0.200
Methyl Iodide	74-88-4	EPA 8260	0.001	1.000
Methyl t-Butyl Ether (MTBE)	1634-04-4	EPA 8260	0.001	0.500
Methylene Chloride	75-09-2	EPA 8260	0.002	1.000
Naphthalene	91-20-3	EPA 8260	0.005	0.500
n-Butylbenzene	104-51-8	EPA 8260	0.001	0.200
n-Hexane	110-54-3	EPA 8260	0.001	0.200
n-Propylbenzene	103-65-1	EPA 8260	0.001	0.200
p-Isopropyltoluene	99-87-6	EPA 8260	0.001	0.200
sec-Butylbenzene	135-98-8	EPA 8260	0.001	0.200
Styrene	100-42-5	EPA 8260	0.001	0.200
tert-Butylbenzene	98-06-6	EPA 8260	0.001	0.200
Tetrachloroethene (PCE)	127-18-4	EPA 8260	0.001	0.200
Trans-1,2-Dichloroethene	156-60-5	EPA 8260	0.001	0.200
Trans-1,3-Dichloropropene	10061-02-6	EPA 8260	0.001	0.200
Trans-1,4-Dichloro-2-butene	110-57-6	EPA 8260	0.005	0.200
Trichloroethene (TCE)	79-01-6	EPA 8260	0.001	0.200
Trichlorofluoromethane (CFC 11)	75-69-4	EPA 8260	0.001	0.200
Vinyl Acetate	108-05-4	EPA 8260	0.005	0.200
Vinyl Chloride	75-01-4	EPA 8260	0.001	1.000
Semi-volatile Organic Compounds (SVOCs)				
1,2,4-Trichlorobenzene	120-82-1	EPA 8270/SIM	0.067	1
1,2-Dichlorobenzene	95-50-1	EPA 8270/SIM	0.067	1
1,3-Dichlorobenzene	541-73-1	EPA 8270/SIM	0.067	1
1,4-Dichlorobenzene	106-46-7	EPA 8270/SIM	0.067	1
2,2'-Oxybis[1-chloropropane]	52438-91-2	EPA 8270/SIM	0.067	1
2,4,5-Trichlorophenol	95-95-4	EPA 8270/SIM	0.33	5

Laboratory Analysis	CAS Number ¹	Analytical Method	Practical Quantitation Limit ² (PQL)	
			Soil (mg/kg)	Groundwater (µg/L)
2,4,6-Trichlorophenol	88-06-2	EPA 8270/SIM	0.33	3
2,4-Dichlorophenol	120-83-2	EPA 8270/SIM	0.33	3
2,4-Dimethylphenol	105-67-9	EPA 8270/SIM	0.067	3
2,4-Dinitrophenol	51-28-5	EPA 8270/SIM	0.67	20
2,4-Dinitrotoluene	121-14-2	EPA 8270/SIM	0.33	3
2,6-Dinitrotoluene	606-20-2	EPA 8270/SIM	0.33	3
2-Chloronaphthalene	91-58-7	EPA 8270/SIM	0.067	1
2-Chlorophenol	95-57-8	EPA 8270/SIM	0.067	1
2-Nitroaniline	88-74-4	EPA 8270/SIM	0.33	3
2-Nitrophenol	88-75-5	EPA 8270/SIM	0.33	3
3,3'-Dichlorobenzidine	91-94-1	EPA 8270/SIM	0.33	5
3-Nitroaniline	99-09-2	EPA 8270/SIM	0.33	3
4,6-Dinitro-2-methylphenol	534-52-1	EPA 8270/SIM	0.67	10
4-Bromophenyl-phenylether	101-55-3	EPA 8270/SIM	0.067	1
4-Chloro-3-Methylphenol	59-50-7	EPA 8270/SIM	0.33	3
4-Chloroaniline	106-47-8	EPA 8270/SIM	0.33	5
4-Chlorophenyl-phenylether	7005-72-3	EPA 8270/SIM	0.067	1
4-Nitroaniline	100-01-6	EPA 8270/SIM	0.33	3
4-Nitrophenol	100-02-7	EPA 8270/SIM	0.33	10
Benzoic acid	65-85-0	EPA 8270/SIM	0.67	20
Benzyl alcohol	100-51-6	EPA 8270/SIM	0.33	2
bis(2-Chloroethoxy)methane	111-91-1	EPA 8270/SIM	0.067	1
bis(2-chloroethyl)ether	111-44-4	EPA 8270/SIM	0.067	1
bis(2-Ethylhexyl)phthalate	117-81-7	EPA 8270/SIM	0.067	3
Butylbenzylphthalate	85-68-7	EPA 8270/SIM	0.067	1
Carbazole	86-74-8	EPA 8270/SIM	0.067	1
Dibenzofuran	132-64-9	EPA 8270/SIM	0.067	1
Diethylphthalate	84-66-2	EPA 8270/SIM	0.067	1
Dimethylphthalate	131-11-3	EPA 8270/SIM	0.067	1
Di-n-butylphthalate	84-74-2	EPA 8270/SIM	0.067	1
Di-n-octylphthalate	117-84-0	EPA 8270/SIM	0.067	1
Hexachlorobenzene	118-74-1	EPA 8270/SIM	0.067	1
Hexachlorobutadiene	87-68-3	EPA 8270/SIM	0.067	3
Hexachlorocyclopentadiene	77-47-4	EPA 8270/SIM	0.067	5
Hexachloroethane	67-72-1	EPA 8270/SIM	0.067	2
Isophorone	78-59-1	EPA 8270/SIM	0.067	1
Nitrobenzene	98-95-3	EPA 8270/SIM	0.067	1
n-Nitroso-di-n-propylamine	621-64-7	EPA 8270/SIM	0.067	1
n-Nitrosodiphenylamine	86-30-6	EPA 8270/SIM	0.067	1
o-Cresol (2-Methylphenol)	95-48-7	EPA 8270/SIM	0.067	1
p-Cresol (4-Methylphenol)	106-44-5	EPA 8270/SIM	0.067	2
Pentachlorophenol	87-86-5	EPA 8270/SIM	0.33	10
Phenol	108-95-2	EPA 8270/SIM	0.067	1
Non-carcinogenic Polycyclic Aromatic Hydrocarbons (PAHs)				
1-Methylnaphthalene	90-12-0	EPA 8270-SIM	0.005	1
2-Methylnaphthalene	91-57-6	EPA 8270-SIM	0.005	1
Acenaphthene	83-32-9	EPA 8270-SIM	0.005	1
Acenaphthylene	208-96-8	EPA 8270-SIM	0.005	1
Anthracene	120-12-7	EPA 8270-SIM	0.005	1
Benzo[g,h,i]perylene	191-24-2	EPA 8270-SIM	0.005	1

Laboratory Analysis	CAS Number ¹	Analytical Method	Practical Quantitation Limit ² (PQL)	
			Soil (mg/kg)	Groundwater (µg/L)
Fluoranthene	206-44-0	EPA 8270-SIM	0.005	1
Fluorene	86-73-7	EPA 8270-SIM	0.005	1
Naphthalene	91-20-3	EPA 8270-SIM	0.005	1
Phenanthrene	85-01-8	EPA 8270-SIM	0.005	1
Pyrene	129-00-0	EPA 8270-SIM	0.005	1
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)				
Benzo[a]anthracene	56-55-3	EPA 8270-SIM	0.005	0.010
Benzo[a]pyrene	50-32-8	EPA 8270-SIM	0.005	0.010
Benzo[b]fluoranthene	205-99-2	EPA 8270-SIM	0.005	0.010
Benzo[k]fluoranthene	207-08-9	EPA 8270-SIM	0.005	0.010
Chrysene	218-01-9	EPA 8270-SIM	0.005	0.010
Dibenz[a,h]anthracene	53-70-3	EPA 8270-SIM	0.005	0.010
Indeno[1,2,3-c,d]pyrene	193-39-5	EPA 8270-SIM	0.005	0.010
Polychlorinated Biphenyls (PCBs)				
PCB Aroclor 1240	12674-11-2	EPA 8082	0.05	0.01
PCB-aroclor 1242	53469-21-9	EPA 8082	0.05	0.01
PCB-aroclor 1248	12672-29-6	EPA 8082	0.05	0.01
PCB-aroclor 1254	11097-69-1	EPA 8082	0.05	0.01
PCB-aroclor 1260	11096-82-5	EPA 8082	0.05	0.01
Dioxins & Furans				
2,3,7,8-TCDD	1746-01-6	EPA 1613	5.00E-07	1.60E-08
1,2,3,7,8-PeCDD	40321-76-4	EPA 1613	2.50E-06	1.60E-08
1,2,3,4,7,8-HxCDD	39227-28-6	EPA 1613	2.50E-06	1.60E-08
1,2,3,6,7,8-HxCDD	57653-85-7	EPA 1613	2.50E-06	1.60E-08
1,2,3,7,8,9-HxCDD	19408-74-3	EPA 1613	2.50E-06	1.60E-08
1,2,3,4,6,7,8-HpCDD	35822-46-9	EPA 1613	2.50E-06	1.60E-08
OCDD	3268-87-9	EPA 1613	5.00E-06	1.60E-08
2,3,7,8-TCDF	51207-31-9	EPA 1613	5.00E-07	1.60E-08
1,2,3,7,8-PeCDF	57117-41-6	EPA 1613	2.50E-06	1.60E-08
2,3,4,7,8-PeCDF	57117-31-4	EPA 1613	2.50E-06	1.60E-08
1,2,3,4,7,8-HxCDF	70648-26-9	EPA 1613	2.50E-06	1.60E-08
1,2,3,6,7,8-HxCDF	57117-44-9	EPA 1613	2.50E-06	1.60E-08
1,2,3,7,8,9-HxCDF	72918-21-9	EPA 1613	2.50E-06	1.60E-08
2,3,4,6,7,8-HxCDF	60851-34-5	EPA 1613	2.50E-06	1.60E-08
1,2,3,4,6,7,8-HpCDF	67562-39-4	EPA 1613	2.50E-06	1.60E-08
1,2,3,4,7,8,9-HPCDF	55673-89-7	EPA 1613	2.50E-06	1.60E-08
OCDF	39001-02-0	EPA 1613	5.00E-06	1.60E-08

Notes:

¹ Chemical abstract service (CAS) registry number.

² Practical Quantitation Limit (PQL) values from ARI of Tukwila, Washington and Frontier Analytical Laboratory of El Dorado Hills, California.

mg/kg = milligram per kilogram

µg/kg = microgram per kilogram

ng/kg = nanogram per kilogram

Table C-5
Method Analysis and Target Reporting Limits for Sediment
 Quiet Cove Property
 Anacortes, Washington

Laboratory Analysis	CAS Number ¹	Analytical Method	Practical Quantification Limit (PQL ²)
Conventionals			
Grain Size (%)	--	PSEP 1986 or ASTM-Mod	--
Total solids (%)	--	SM2540G	0.1
Total volatile solids (%)	--	PSEP 1986/ASTM D2974	0.1
Total Organic Carbon (%)	--	Plumb 1981	0.1
Bulk Ammonia (mg/kg)	--	EPA 350.1 M	1
Bulk Sulfides (mg/kg)	--	SM4500-S2/PSEP 1986	1
Porewater Ammonia (mg/L)	--	SM4500-NH3	0.04
Porewater Sulfide (mg/L)	--	SM4500-S2	0.05
Metals (mg/kg)			
Arsenic	7440-38-2	EPA 6010/6020	5
Cadmium	7440-43-9	EPA 6010/6020	0.2
Chromium	7440-47-3	EPA 6010/6020	0.5
Copper	7440-50-8	EPA 6010/6020	0.2
Lead	7439-92-1	EPA 6010/6020	2
Mercury	7439-97-6	EPA 7470A/7471A	0.05
Silver	7440-22-4	EPA 6010/6020	0.3
Zinc	7440-66-6	EPA 6010/6020	1
Polycyclic Aromatic Hydrocarbons (PAHs; µg/kg)			
Total LPAH	--	--	5
Naphthalene	91-20-3	EPA 8270-SIM	5
Acenaphthylene	208-96-8	EPA 8270-SIM	5
Acenaphthene	83-32-9	EPA 8270-SIM	5
Fluorene	86-73-7	EPA 8270-SIM	5
Phenanthrene	85-01-8	EPA 8270-SIM	5
Anthracene	120-12-7	EPA 8270-SIM	5
2-Methylnaphthalene	91-57-6	EPA 8270-SIM	5
Total HPAH	--	--	5
Fluoranthene	206-44-0	EPA 8270-SIM	5
Pyrene	129-00-0	EPA 8270-SIM	5
Benz(a)anthracene	56-55-3	EPA 8270-SIM	5
Chrysene	218-01-9	EPA 8270-SIM	5
Benzofluoranthenes (b, j, k)	205-99-2/205-82-3/ 207-08-9	EPA 8270-SIM	5
Benzo(a)pyrene	50-32-8	EPA 8270-SIM	5
Indeno(1,2,3-c,d)pyrene	193-39-5	EPA 8270-SIM	5

Laboratory Analysis	CAS Number ¹	Analytical Method	Practical Quantification Limit (PQL ²)
Dibenz(a,h)anthracene	53-70-3	EPA 8270-SIM	5
Benzo(g,h,i)perylene	191-24-2	EPA 8270-SIM	5
Chlorinated Hydrocarbons (µg/kg)			
1,4-Dichlorobenzene	106-46-7	EPA 8270/SIM	5
1,3-Dichlorobenzene	541-73-1	EPA 8270/SIM	5
1,2-Dichlorobenzene	95-50-1	EPA 8270/SIM	5
1,2,4-Trichlorobenzene	120-82-1	EPA 8270/SIM	5
Hexachlorobenzene (HCB)	118-74-1	EPA 8270/SIM	5
Phthalates (µg/kg)			
Dimethyl phthalate	131-11-3	EPA 8270	20
Diethyl phthalate	84-66-2	EPA 8270	20
Di-n-butyl phthalate	84-74-2	EPA 8270	20
Butyl benzyl phthalate	85-68-7	EPA 8270/SIM	5
Bis(2-ethylhexyl) phthalate	117-81-7	EPA 8270	50
Di-n-octyl phthalate	117-84-0	EPA 8270	20
Miscellaneous Extractables (µg/kg)			
Dibenzofuran	132-64-9	EPA 8270/SIM	20
Hexachlorobutadiene	87-68-3	EPA 8270/SIM	5
N-Nitrosodiphenylamine	86-30-6	EPA 8270/SIM	5
Benzyl alcohol	100-51-6	EPA 8270	20
Benzoic acid	65-85-0	EPA 8270	200
Phenols (µg/kg)			
Phenol	108-95-2	EPA 8270	100
2-Methylphenol	95-48-7	EPA 8270	20
4-Methylphenol	106-44-5	EPA 8270	20
2,4-Dimethylphenol	105-67-9	EPA 8270/SIM	25
Pentachlorophenol	87-86-5	EPA 8270	100
Polychlorinated Biphenyl (PCB) Congeners (ng/kg)			
PCB-1	2051-60-7	EPA 1668C	2
PCB-2	2051-61-8	EPA 1668C	2
PCB-3	2051-62-9	EPA 1668C	2
PCB-4	13029-08-8	EPA 1668C	2
PCB-5	16605-91-7	EPA 1668C	2
PCB-6	25569-80-6	EPA 1668C	2
PCB-7	33284-50-3	EPA 1668C	2
PCB-8	34883-43-7	EPA 1668C	2
PCB-9	34883-39-1	EPA 1668C	2
PCB-10	33146-45-1	EPA 1668C	2
PCB-11	2050-67-1	EPA 1668C	2
PCB-12	2974-92-7	EPA 1668C	2
PCB-13	2974-90-5	EPA 1668C	2

Laboratory Analysis	CAS Number ¹	Analytical Method	Practical Quantification Limit (PQL ²)
PCB-14	34883-41-5	EPA 1668C	2
PCB-15	2050-68-2	EPA 1668C	2
PCB-16	38444-78-9	EPA 1668C	2
PCB-17	37680-66-3	EPA 1668C	2
PCB-18	37680-65-2	EPA 1668C	2
PCB-19	38444-73-4	EPA 1668C	2
PCB-20	38444-84-7	EPA 1668C	2
PCB-21	55702-46-0	EPA 1668C	2
PCB-22	38444-85-8	EPA 1668C	2
PCB-23	55720-44-0	EPA 1668C	2
PCB-24	55702-45-9	EPA 1668C	2
PCB-25	55712-37-3	EPA 1668C	2
PCB-26	38444-81-4	EPA 1668C	2
PCB-27	38444-76-7	EPA 1668C	2
PCB-28	7012-37-5	EPA 1668C	2
PCB-29	15862-07-4	EPA 1668C	2
PCB-30	35693-92-6	EPA 1668C	2
PCB-31	16606-02-3	EPA 1668C	2
PCB-32	38444-77-8	EPA 1668C	2
PCB-33	38444-86-9	EPA 1668C	2
PCB-34	37680-68-5	EPA 1668C	2
PCB-35	37680-69-6	EPA 1668C	2
PCB-36	38444-87-0	EPA 1668C	2
PCB-37	38444-90-5	EPA 1668C	2
PCB-38	53555-66-1	EPA 1668C	2
PCB-39	38444-88-1	EPA 1668C	2
PCB-40	38444-93-8	EPA 1668C	2
PCB-41	52663-59-9	EPA 1668C	2
PCB-42	36559-22-5	EPA 1668C	2
PCB-43	70362-46-8	EPA 1668C	2
PCB-44	41464-39-5	EPA 1668C	2
PCB-45	70362-45-7	EPA 1668C	2
PCB-46	41464-47-5	EPA 1668C	2
PCB-47	2437-79-8	EPA 1668C	2
PCB-48	70362-47-9	EPA 1668C	2
PCB-49	41464-40-8	EPA 1668C	2
PCB-50	62796-65-0	EPA 1668C	2
PCB-51	68194-04-7	EPA 1668C	2
PCB-52	35693-99-3	EPA 1668C	2
PCB-53	41464-41-9	EPA 1668C	2
PCB-54	15968-05-5	EPA 1668C	2

Laboratory Analysis	CAS Number ¹	Analytical Method	Practical Quantification Limit (PQL ²)
PCB-55	74338-24-2	EPA 1668C	2
PCB-56	41464-43-1	EPA 1668C	2
PCB-57	70424-67-8	EPA 1668C	2
PCB-58	41464-49-7	EPA 1668C	2
PCB-59	74472-33-6	EPA 1668C	2
PCB-60	33025-41-1	EPA 1668C	2
PCB-61	33284-53-6	EPA 1668C	2
PCB-62	54230-22-7	EPA 1668C	2
PCB-63	74472-34-7	EPA 1668C	2
PCB-64	52663-58-8	EPA 1668C	2
PCB-65	33284-54-7	EPA 1668C	2
PCB-66	32598-10-0	EPA 1668C	2
PCB-67	73575-53-8	EPA 1668C	2
PCB-68	73575-52-7	EPA 1668C	2
PCB-69	60233-24-1	EPA 1668C	2
PCB-70	32598-11-1	EPA 1668C	2
PCB-71	41464-46-4	EPA 1668C	2
PCB-72	41464-42-0	EPA 1668C	2
PCB-73	74338-23-1	EPA 1668C	2
PCB-74	32690-93-0	EPA 1668C	2
PCB-75	32598-12-2	EPA 1668C	2
PCB-76	70362-48-0	EPA 1668C	2
PCB-78	70362-49-1	EPA 1668C	2
PCB-79	41464-48-6	EPA 1668C	2
PCB-80	33284-52-5	EPA 1668C	2
PCB-82	52663-62-4	EPA 1668C	2
PCB-83	60145-20-2	EPA 1668C	2
PCB-84	52663-60-2	EPA 1668C	2
PCB-85	65510-45-4	EPA 1668C	2
PCB-86	55312-69-1	EPA 1668C	2
PCB-87	38380-02-8	EPA 1668C	2
PCB-88	55215-17-3	EPA 1668C	2
PCB-89	73575-57-2	EPA 1668C	2
PCB-90	68194-07-0	EPA 1668C	2
PCB-91	68194-05-8	EPA 1668C	2
PCB-92	52663-61-3	EPA 1668C	2
PCB-93	73575-56-1	EPA 1668C	2
PCB-94	73575-55-0	EPA 1668C	2
PCB-95	38379-99-6	EPA 1668C	2
PCB-96	73575-54-9	EPA 1668C	2
PCB-97	41464-51-1	EPA 1668C	2

Laboratory Analysis	CAS Number ¹	Analytical Method	Practical Quantification Limit (PQL ²)
PCB-98	60233-25-2	EPA 1668C	2
PCB-99	38380-01-7	EPA 1668C	2
PCB-100	39485-83-1	EPA 1668C	2
PCB-101	37680-73-2	EPA 1668C	2
PCB-102	68194-06-9	EPA 1668C	2
PCB-103	60145-21-3	EPA 1668C	2
PCB-104	56558-16-8	EPA 1668C	2
PCB-106	70424-69-0	EPA 1668C	2
PCB-107	70424-68-9	EPA 1668C	2
PCB-108	70362-41-3	EPA 1668C	2
PCB-109	74472-35-8	EPA 1668C	2
PCB-110	38380-03-9	EPA 1668C	2
PCB-111	39635-32-0	EPA 1668C	2
PCB-112	74472-36-9	EPA 1668C	2
PCB-113	68194-10-5	EPA 1668C	2
PCB-115	74472-38-1	EPA 1668C	2
PCB-116	18259-05-7	EPA 1668C	2
PCB-117	68194-11-6	EPA 1668C	2
PCB-119	56558-17-9	EPA 1668C	2
PCB-120	68194-12-7	EPA 1668C	2
PCB-121	56558-18-0	EPA 1668C	2
PCB-122	76842-07-4	EPA 1668C	2
PCB-124	70424-70-3	EPA 1668C	2
PCB-125	74472-39-2	EPA 1668C	2
PCB-127	39635-33-1	EPA 1668C	2
PCB-128	38380-07-3	EPA 1668C	2
PCB-129	55215-18-4	EPA 1668C	2
PCB-130	52663-66-8	EPA 1668C	2
PCB-131	61798-70-7	EPA 1668C	2
PCB-132	38380-05-1	EPA 1668C	2
PCB-133	35694-04-3	EPA 1668C	2
PCB-134	52704-70-8	EPA 1668C	2
PCB-135	52744-13-5	EPA 1668C	2
PCB-136	38411-22-2	EPA 1668C	2
PCB-137	35694-06-5	EPA 1668C	2
PCB-138	35065-28-2	EPA 1668C	2
PCB-139	56030-56-9	EPA 1668C	2
PCB-140	59291-64-4	EPA 1668C	2
PCB-141	52712-04-6	EPA 1668C	2
PCB-142	41411-61-4	EPA 1668C	2
PCB-143	68194-15-0	EPA 1668C	2

Laboratory Analysis	CAS Number ¹	Analytical Method	Practical Quantification Limit (PQL ²)
PCB-144	68194-14-9	EPA 1668C	2
PCB-145	74472-40-5	EPA 1668C	2
PCB-146	51908-16-8	EPA 1668C	2
PCB-147	68194-13-8	EPA 1668C	2
PCB-148	74472-41-6	EPA 1668C	2
PCB-149	38380-04-0	EPA 1668C	2
PCB-150	68194-08-1	EPA 1668C	2
PCB-151	52663-63-5	EPA 1668C	2
PCB-152	68194-09-2	EPA 1668C	2
PCB-153	35065-27-1	EPA 1668C	2
PCB-154	60145-22-4	EPA 1668C	2
PCB-155	33979-03-2	EPA 1668C	2
PCB-158	74472-42-7	EPA 1668C	2
PCB-159	39635-35-3	EPA 1668C	2
PCB-160	41411-62-5	EPA 1668C	2
PCB-161	74472-43-8	EPA 1668C	2
PCB-162	39635-34-2	EPA 1668C	2
PCB-163	74472-44-9	EPA 1668C	2
PCB-164	74472-45-0	EPA 1668C	2
PCB-165	74472-46-1	EPA 1668C	2
PCB-166	41411-63-6	EPA 1668C	2
PCB-168	59291-65-5	EPA 1668C	2
PCB-170	35065-30-6	EPA 1668C	2
PCB-171	52663-71-5	EPA 1668C	2
PCB-172	52663-74-8	EPA 1668C	2
PCB-173	68194-16-1	EPA 1668C	2
PCB-174	38411-25-5	EPA 1668C	2
PCB-175	40186-70-7	EPA 1668C	2
PCB-176	52663-65-7	EPA 1668C	2
PCB-177	52663-70-4	EPA 1668C	2
PCB-178	52663-67-9	EPA 1668C	2
PCB-179	52663-64-6	EPA 1668C	2
PCB-180	35065-29-3	EPA 1668C	2
PCB-181	74472-47-2	EPA 1668C	2
PCB-182	60145-23-5	EPA 1668C	2
PCB-183	52663-69-1	EPA 1668C	2
PCB-184	74472-48-3	EPA 1668C	2
PCB-185	52712-05-7	EPA 1668C	2
PCB-186	74472-49-4	EPA 1668C	2
PCB-187	52663-68-0	EPA 1668C	2
PCB-188	74487-85-7	EPA 1668C	2

Laboratory Analysis	CAS Number ¹	Analytical Method	Practical Quantification Limit (PQL ²)
PCB-190	41411-64-7	EPA 1668C	2
PCB-191	74472-50-7	EPA 1668C	2
PCB-192	74472-51-8	EPA 1668C	2
PCB-193	69782-91-8	EPA 1668C	2
PCB-194	35694-08-7	EPA 1668C	2
PCB-195	52663-78-2	EPA 1668C	2
PCB-196	42740-50-1	EPA 1668C	2
PCB-197	33091-17-7	EPA 1668C	2
PCB-198	68194-17-2	EPA 1668C	2
PCB-199	52663-75-9	EPA 1668C	2
PCB-200	52663-73-7	EPA 1668C	2
PCB-201	40186-71-8	EPA 1668C	2
PCB-202	2136-99-4	EPA 1668C	2
PCB-203	52663-76-0	EPA 1668C	2
PCB-204	74472-52-9	EPA 1668C	2
PCB-205	74472-53-0	EPA 1668C	2
PCB-206	40186-72-9	EPA 1668C	2
PCB-207	52663-79-3	EPA 1668C	2
PCB-208	52663-77-1	EPA 1668C	2
PCB-209	2051-24-3	EPA 1668C	2
Dioxin-Like Polychlorinated Biphenyls (PCBs; ng/kg)			
3,3',4,4'-Tetrachlorobiphenyl (PCB 77)	32598-13-3	EPA 1668C	2
3,4,4',5'-Tetrachlorobiphenyl (PCB 81)	70362-50-4	EPA 1668C	2
2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	32598-14-4	EPA 1668C	2
2,3,4,4',5-Pentachlorobiphenyl (PCB 114)	74472-37-0	EPA 1668C	2
2,3',4,4',5-Pentachlorobiphenyl (PCB 118)	31508-00-6	EPA 1668C	2
2',3,4,4',5-Pentachlorobiphenyl (PCB 123)	65510-44-3	EPA 1668C	2
3,3',4,4',5-Pentachlorobiphenyl (PCB 126)	57465-28-8	EPA 1668C	2
2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)	38380-08-4	EPA 1668C	2
2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157)	69782-90-7	EPA 1668C	2
2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167)	52663-72-6	EPA 1668C	2
2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)	32774-16-6	EPA 1668C	2
2,3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 189)	39635-31-9	EPA 1668C	2
Dioxins & Furans (ng/kg)			
2,3,7,8-TCDD	1746-01-6	EPA 1613	0.5
1,2,3,7,8-PeCDD	40321-76-4	EPA 1613	2.5
1,2,3,4,7,8-HxCDD	39227-28-6	EPA 1613	2.5
1,2,3,6,7,8-HxCDD	57653-85-7	EPA 1613	2.5
1,2,3,7,8,9-HxCDD	19408-74-3	EPA 1613	2.5
1,2,3,4,6,7,8-HpCDD	35822-46-9	EPA 1613	2.5

Laboratory Analysis	CAS Number ¹	Analytical Method	Practical Quantification Limit (PQL ²)
OCDD	3268-87-9	EPA 1613	5
2,3,7,8-TCDF	51207-31-9	EPA 1613	0.5
1,2,3,7,8-PeCDF	57117-41-6	EPA 1613	2.5
2,3,4,7,8-PeCDF	57117-31-4	EPA 1613	2.5
1,2,3,4,7,8-HxCDF	70648-26-9	EPA 1613	2.5
1,2,3,6,7,8-HxCDF	57117-44-9	EPA 1613	2.5
1,2,3,7,8,9-HxCDF	72918-21-9	EPA 1613	2.5
2,3,4,6,7,8-HxCDF	60851-34-5	EPA 1613	2.5
1,2,3,4,6,7,8-HpCDF	67562-39-4	EPA 1613	2.5
1,2,3,4,7,8,9-HPCDF	55673-89-7	EPA 1613	2.5
OCDF	39001-02-0	EPA 1613	5

Notes:

¹ Chemical abstract service (CAS) registry number.

² Practical Quantitation Limit (PQL) values from ARI of Tukwila, Washington and Frontier Analytical Laboratory of El Dorado Hills, California.

mg/kg = milligram per kilogram

µg/L = microgram per liter

µg/kg = microgram per kilogram

ng/kg = nanogram per kilogram

Table C-6
Soil Sample Test Methods, Sample Size, Containers, Preservation and Holding Times
Quiet Cove Property
Anacortes, Washington

Laboratory Analysis	Analytical Method	Minimum Sample Size	Sample Container	Sample Preservation	Holding Time ¹
Metals (As, Cd, Cr, Pb and Hg)	EPA 6010/6020/ 7470/7471	100 g	4-oz glass WM with Teflon-lined lid	Cool ≤6 °C	180 days/28 days for Mercury
Gasoline-Range Hydrocarbons	NWTPH-Gx	5 g	Two 40mL glass vial (VOA)	Cool ≤6 °C	14 days to extraction/analysis
Diesel- and Oil-Range Hydrocarbons	NWTPH-Dx with acid/silica gel cleanup	100 g	8-oz amber glass WM with Teflon-lined lid	Cool ≤6 °C	14 days to extraction/analysis
Volatile Petroleum Hydrocarbons	Ecology VPH	5 g	Two 40mL glass vial (VOA)	Cool ≤6 °C, Methanol	14 days to extraction/analysis
Extractable Petroleum Hydrocarbons	Ecology EPH	100 g	8-oz amber glass WM with Teflon-lined lid	Cool ≤6 °C	14 days to extraction/analysis
VOCs (Including Volatile Petroleum Compounds)	EPA 8260	5 g	Three 40mL glass vial (VOA)	Cool ≤6 °C Two VOAs - Sodium Bisulfate One VOA - Methanol	14 days to extraction/analysis
SVOCs (Including PAHs)	EPA 8270/SIM	100 g	8-oz amber glass WM with Teflon-lined lid	Cool ≤6 °C	14 days to extraction, 40 days from extraction to analysis
PCB Aroclors	EPA 8082	100 g	8-oz amber glass WM with Teflon-lined lid	Cool ≤6 °C	None
Dioxins and Furans	EPA 1613	100 g	8-oz amber glass WM with Teflon-lined lid	Freeze -18 C	1 year

Notes:

¹ Holding times are based on elapsed time from date of collection.

NWTPH = Northwest total petroleum hydrocarbons

Dx = diesel-range extended

EPA = Environmental Protection Agency

EPH = extractable petroleum hydrocarbons

g = gram

Gx = gasoline-range extended

mL = milliliter

oz. = ounce

PCBs = polychlorinated biphenyls

SIM = selected ion mode

SVOC = semi-volatile organic compound

VOC = volatile organic compound

VPH = volatile petroleum hydrocarbons

WM = wide mouth

Table C-7
Groundwater Sample Test Methods, Sample Size, Containers, Preservation and Holding Times
Quiet Cove Property
Anacortes, Washington

Laboratory Analysis	Analytical Method	Minimum Sample Size	Sample Container	Sample Preservation	Holding Time ¹
Metals (As, Cd, Cr, Pb and Hg)	EPA 6010/6020/200.8 7470/7471	500 mL	500mL HDPE bottle	Cool ≤6 C, HNO ₃ - pH<2 (Dissolved metals preserved after filtration)	180 days/28 days for Mercury
Gasoline-Range Hydrocarbons	NWTPH-Gx	80 mL	Two 40mL glass vial (VOA)	Cool ≤6 C, HCl to pH < 2	14 days to extraction/analysis
Diesel- and Oil-Range Hydrocarbons	NWTPH-Dx	500 mL	Two 500 mL amber glass with Teflon-lined lid	Cool ≤6 C	14 days to extraction 40 days from extraction to analysis
Volatile Petroleum Hydrocarbons	Ecology VPH	120 mL	Three 40mL glass vial (VOA)	Cool ≤6 °C, HCl	14 days to extraction/analysis
Extractable Petroleum Hydrocarbons	Ecology EPH	500 mL	Two 500mL amber glass with Teflon-lined lid	Cool ≤6 °C	14 days to extraction/analysis
VOCs (Including Volatile Petroleum Compounds)	EPA 8011/8021/8260	120 mL	Three 40mL glass vial (VOA)	Cool ≤6 C, HCl to pH < 2	14 days to extraction/analysis
SVOCs (Including PAHs)	EPA 8270/SIM	1 L	Four 500mL amber glass with Teflon-lined lid	Cool ≤6 °C	14 days to extraction, 40 days from extraction to analysis
PCB Aroclors	EPA 8082	1 L	Two 1L amber glass with Teflon-lined lid	Cool ≤6 °C	None
Dioxins and Furans	EPA 1613	1 L	Two 1L amber glass with Teflon-lined lid	Cool ≤6 °C	1 year

Notes:

¹ Holding times are based on elapsed time from date of collection.

NWTPH = Northwest total petroleum hydrocarbons

Dx = diesel-range extended

EPA = Environmental Protection Agency

EPH = extractable petroleum hydrocarbons

Gx = gasoline-range extended

HCl = hydrochloric acid

HDPE = high density polyethylene

HNO₃ = nitric acid

L = liter

mL = milliliter

PCBs = polychlorinated biphenyls

SIM = selected ion mode

SVOC = semi-volatile organic compound

VOC = volatile organic compound

VPH = volatile petroleum hydrocarbons

Table C-8
Sediment Sample Test Methods, Sample Size, Containers, Preservation and Holding Times
 Quiet Cove Property
 Anacortes, Washington

Laboratory Analysis	Analytical Method	Minimum Sample Size	Sample Containers	Sample Preservation	Holding Time ¹
Grain Size	PSEP 1986 or ASTM-Mod	300 g	16-oz HDPE or Ziploc	Not Applicable	6 months
Total Organic Carbon (TOC)	PSEP 1986/Plumb 1981	10 g	8-oz glass WM with Teflon-lined lid	Cool ≤6 °C	14 days
				Freeze -18 °C	6 months
Total Volatile Solids (TVS)	PSEP 1986/ ASTM D2974	300 g	16-oz HDPE or Ziploc	Cool ≤ 6 °C	6 months
Total Solids (TS)	SM2540G	10 g	From TOC Container	Cool ≤ 6 °C	14 days
				Freeze -18 °C	6 months
Bulk Sulfides	SM4500-S2	20g	2-oz glass WM with Teflon-lined lid	Cool ≤ 6 °C, Zinc Acetate	7 days
Bulk Ammonia	EPA 350.1 M/SM4500-S2	10g	From TOC/TVS Container Container	Cool ≤ 6 °C	7 days
Porewater Sulfide	SM4500-S2	1200g/150 mL	Two 32-oz glass WM with Teflon-lined lid	Cool <6 °C	7 days until extraction 7 days after extraction
Porewater Ammonia	EPA 350.1M/SM4500-NH3	600g/75mL			7 days until extraction 28 days after extraction
Total Metals (As, Cd, Cr, Cu, Pb, Ag and Zn)	EPA 6010/6020	20 g	4-oz glass WM with Teflon-lined lid	Cool ≤ 6 °C	6 months
				Freeze -18 °C	2 years
Mercury	EPA 7471A	2 g	From Metals Container	Cool ≤ 6 °C	28 days
Gasoline-Range Hydrocarbons	NWTPH-Gx	5 g	Two 40mL glass vial (VOA)	Cool ≤6 °C	14 days to extraction/analysis
Diesel- and Oil-Range Hydrocarbons	NWTPH-Dx with acid/silica gel cleanup	100 g	8-oz amber glass WM with Teflon-lined lid	Cool ≤6 °C	14 days to extraction/analysis

Laboratory Analysis	Analytical Method	Minimum Sample Size	Sample Containers	Sample Preservation	Holding Time ¹
Volatile Petroleum Hydrocarbons	Ecology VPH	5 g	Two 40mL glass vial (VOA)	Cool ≤6 °C, Methanol	14 days to extraction/analysis
Extractable Petroleum Hydrocarbons	Ecology EPH	100 g	8-oz amber glass WM with Teflon-lined lid	Cool ≤6 °C	14 days to extraction/analysis
VOCs (Including Volatile Petroleum Compounds)	EPA 8021/8260	5 g	Three 40mL glass vial (VOA)	Cool ≤6 °C Two VOAs - Sodium Bisulfate One VOA - Methanol	14 days to extraction/analysis
SVOCs (Including PAHs)	EPA 8270/SIM	150 g	16-oz glass WM with Teflon-lined lid	Cool <6 °C	14 days until extraction
				Cool <6 °C	40 days after extraction
				Freeze -18 °C	1 year until extraction
PCB Congeners	EPA 1668C	100 g	4-oz amber glass WM with Teflon-lined lid	Cool <6 °C/Store<-10 °C	1 year until extraction
Dioxins and Furans	EPA 1613	100 g	4-oz amber glass WM with Teflon-lined lid	Cool <4 °C/Store<-10 °C	1 year until extraction
Bioassay	PSEP 1995	5 L	5 x 1L WM glass or HDPE	Cool, 4 °C, nitrogen atmosphere	8 weeks

Notes:

¹ Holding times are based on elapsed time from date of collection.

ASTM = American Society for Testing and Materials

Dx = diesel-range extended

EPA = Environmental Protection Agency

EPH = extractable petroleum hydrocarbons

g = gram

Gx = gasoline-range extended

HDPE = high-density polyethylene

L = liter

mL = milliliter

NWTPH = Northwest total petroleum hydrocarbons

oz = ounce

PCBs = polychlorinated Biphenyls

PSEP = Puget Sound Estuary Program

SIM = selected Ion Mode

SVOC = semi-volatile organic compound

VOC = volatile organic compound

VPH = volatile petroleum hydrocarbons

WM = wide mouth

Table C-9
Quality Control Procedures and Acceptance Criteria for Organic Analysis^{1,2,3}
 Quiet Cove Property
 Anacortes, Washington

Quality Control Procedure	Frequency	Control Limit	Corrective Action
Instrument Quality Assurance/Quality Control			
Initial Calibration	Before sample analysis and when continuing calibration does not meet method requirements. See reference method(s) in Tables C-1 through C-3.	See reference method(s) in Tables C-4 and C-5.	Follow corrective actions specified in analytical method and/or ARI SOP
Continuing Calibration	Method-specific. See reference method(s) in Tables C-4 and C-5.	Method-specific. See reference method(s) in Tables C-4 and C-5.	Follow corrective actions specified in analytical method and/or ARI SOP
Method Quality Assurance/Quality Control			
Holding Times	All samples.	See Tables C-6 through C-8.	Laboratory to qualify results if holding times are exceeded. Data validator will use professional judgment to qualify results as estimated or reject data.
Method Detection Limits (MDL)	Update method detection limit studies annually.	See reference method(s) in Tables C-1 through C-8.	Revise detection limits.
Method Blanks	One per sample batch or every 20 samples, whichever is more frequent, or when there is a change in reagents.	Analyte concentration $\leq$ PQL. Control limits are not applicable if sample concentrations are $<$ MDL.	Follow corrective actions specified in analytical method and/or ARI SOP. Laboratory to eliminate or greatly reduce laboratory contamination due to glassware, or reagents, or analytical system.
Analytical Laboratory Matrix Spike Duplicates	One matrix spike duplicate analysis with every sample batch or every 20 samples, whichever is more frequent.	Compound and matrix specific. Use intra-laboratory control chart results if sufficient data are available to generate control charts. Otherwise use analytical method default criteria.	No corrective action necessary for failing matrix spike duplicates. Matrix spike duplicates are not required organic QC.
Matrix Spikes	One per sample batch or every 20 samples, whichever is more frequent. Spiked with the same analytes at the same concentration as the laboratory control sample.	Compound and matrix specific, recovery should not exceed method or performance -based intra-laboratory control chart limits.	No corrective action necessary for failing matrix spikes. Matrix spikes are not required organic QC.

Quality Control Procedure	Frequency	Control Limit	Corrective Action
Surrogate Spikes	Added to every organics sample as specified in analytical protocol.	Compound specific, recovery should not exceed the control limits specified in the method or performance-based intra- laboratory control limits.	Follow corrective actions specified in analytical method and/or ARI SOP
Laboratory Control Samples	One per analytical batch or every 20 samples, whichever is more frequent.	Compound specific, recovery should not exceed performance- based intra-laboratory control limits.	Follow corrective actions specified in analytical method and/or ARI SOP
Field Quality Assurance/Quality Control			
Field Duplicates	One per every 20 samples	Project, matrix, and compound specific	Modify field sample homogenization procedures.
Field Blanks	At project manager's discretion	Analyte concentration $\leq$ PQL	Compare to method blank results to rule out laboratory contamination. Modify sample collection and equipment decontamination procedures. Qualify associated data.

Notes:

¹ Instrument and method QA/QC to monitor the performance of the instrument and sample preparation procedures are the responsibility of the analytical laboratory. When an instrument or method control limit is exceeded, the laboratory is responsible for correcting the problem and reanalyzing the samples.

² Instrument and method QA/QC results reported in the final data package should always meet control limits with a very small number of exceptions that apply to difficult analytes as specified by EPA CLP. If instrument and method QA/QC procedures meet control limits, laboratory procedures are deemed to be adequate.

³ Matrix and field QA/QC procedures monitor matrix effects, field procedures, and variability. Although poor analytical procedures may also result in poor spike recovery or duplicate results, the laboratory is not held responsible for meeting control limits for these QA/QC samples.

ARI = Analytical Resources Inc.

CLP = Contract Laboratory Program

MDL = method detection limit

PQL = practical quantification limit

QC = quality control

SOP = standard operating procedures

Table C-10
Quality Control Procedures and Acceptance Criteria for Metals Analysis^{1,2,3}
 Quiet Cove Property
 Anacortes, Washington

Quality Control Procedure	Frequency	Control Limit	Corrective Action
Instrument Quality Assurance/Quality Control			
Initial Calibration	Daily.	Correlation coefficient ≥ 0.995 .	Laboratory to optimize and recalibrate the instrument and reanalyze any affected samples.
Initial Calibration Verification	Immediately after initial calibration.	90-110% recovery for ICP-AES, ICP-MS and GFAA (80-120% for Mercury), or method based.	Laboratory to resolve discrepancy prior to sample analysis.
Continuing Calibration Verification	After every 10 samples or every 2 hours, whichever is more frequent, and after the last sample.	90-110% recovery for ICP-AES and GFAA, 85-115% for ICP-MS (80-120% for mercury).	Follow corrective actions specified in analytical method and/or ARI SOP
Initial and Continuing Calibration Blanks	Immediately after initial calibration, then 10% of samples or every 2 hours, whichever is more frequent, and after the last sample.	Analyte concentration $\leq$ PQL.	Follow corrective actions specified in analytical method and/or ARI SOP
ICP Inter-element Interference Check Samples	At the beginning and end of each analytical sequence or twice per 8- hour shift, whichever is more frequent.	80-120% of the true value.	Follow corrective actions specified in analytical method and/or ARI SOP
Method Quality Assurance/Quality Control			
Holding Times	All samples.	See Tables C-6 through C-8	Laboratory to qualify results if holding times are exceeded. Data validator will use professional judgment to qualify results as estimated or reject data.
Method Detection Limits (MDL)	Update method detection limit studies annually.	See reference method(s) in Tables C-1 through C-8	Revise detection limits.
Method Blanks	With every sample batch or every 20 samples, whichever is more frequent.	Analyte concentration $\leq$ PQL. Control limits are not applicable if sample concentrations are $<$ MDL	Follow corrective actions specified in analytical method and/or ARI SOP

Quality Control Procedure	Frequency	Control Limit	Corrective Action
Analytical (Laboratory) Duplicates or Matrix Spike Duplicates	One duplicate analysis with every sample batch or every 20 samples, whichever is more frequent; Use analytical replicates when samples are expected to contain target analytes. Use matrix spike replicates when samples are not expected to contain target analytes.	Analyte and matrix specific. Use intra- laboratory control chart limits if sufficient data are available to generate control charts; otherwise use analytical method default criteria.	Follow corrective actions specified in analytical method and/or ARI SOP
Matrix Spikes	With every sample batch or every 20 samples, whichever is more frequent.	75-125% recovery applied when the sample concentration is ≤ 4 times the spiked concentration for a particular analyte.	Follow corrective actions specified in analytical method and/or ARI SOP
Field Quality Assurance/Quality Control			
Field Duplicates	One per every 20 samples	Project, matrix, and compound specific	Modify field sample homogenization procedures.
Field Blanks	At project manager's discretion	Analyte concentration $\leq$ PQL	Compare to method blank results to rule out laboratory contamination. Modify sample collection and equipment decontamination procedures. Qualify associated data.

Notes:

¹ Instrument and method QA/QC to monitor the performance of the instrument and sample preparation procedures are the responsibility of the analytical laboratory. When an instrument or method control limit is exceeded, the laboratory is responsible for correcting the problem and reanalyzing the samples.

² Instrument and method QA/QC results reported in the final data package should always meet control limits with a very small number of exceptions that apply to difficult analytes as specified by EPA CLP. If instrument and method QA/QC procedures meet control limits, laboratory procedures are deemed to be adequate.

³ Matrix and field QA/QC procedures monitor matrix effects, field procedures, and variability. Although poor analytical procedures may also result in poor spike recovery or duplicate results, the laboratory is not held responsible for meeting control limits for these QA/QC samples.

ARI = Analytical Resources Inc.

CLP = Contract Laboratory Program

GFAA = graphite furnace atomic absorption

ICP-AES - inductively coupled plasma/atomic emission spectrometry

ICP-MS = inductively coupled plasma/mass spectrometry

MDL = method detection limit

PQL = practical quantification limit

SOP = standard operating procedures

Table C-11
Quality Control Procedures and Acceptance Criteria for Conventional Analysis^{1,2}
 Quiet Cove Property
 Anacortes, Washington

Analyte	Initial Calibration	Continuing Calibration	Calibration Blanks	Laboratory Control Samples	Matrix Spikes	Laboratory Duplicates	Method Blank
Grain Size	N/A	N/A	N/A	N/A	N/A	20% RSD	N/A
Total Organic Carbon (TOC)	Correlation Coefficient ≥ 0.995	90-110% Recovery	Analyte Concentration $\leq$ PQL	80-120% Recovery	75-125% Recovery	20% RSD	Analyte Concentration $\leq$ PQL
Total Volatile Solids (TVS)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Solids (TS)	N/A	N/A	N/A	N/A	N/A	20% RSD	Analyte Concentration $\leq$ PQL
Ammonia	Correlation Coefficient ≥ 0.995	90 -110% Recovery	Analyte concentration $\leq$ PQL	75 -120% Recovery	75 -125% Recovery	20% RSD	Analyte Concentration $\leq$ PQL
Total Sulfides	Correlation Coefficient ≥ 0.990	85 -115% Recovery	N/A	75 -125% Recovery	75 -125% Recovery	20% RSD	Analyte Concentration $\leq$ PQL

Notes:

¹ The control limits provided above are suggested limits only. They are based on EPA control limits for metals analyses (Table C-10), and an attempt has been made to take into consideration the expected analytical accuracy using PSEP methodology. The corrective action indicated for metals in Table C-10 will be applied to the conventional analytes using professional judgment.

² As applicable, the QA/QC procedures indicated in this table will be completed at the same frequency as for metals analyses (see Table C-10).

N/A = not applicable

PQL = practical quantification limit

RSD - relative standard deviation

Table C-12
Quality Control Procedures and Acceptance Criteria for PCDD/PCDF Analysis^{1,2,3}
 Quiet Cove Property
 Anacortes, Washington

Quality Control Procedure	Frequency	Acceptance Criteria	Corrective Action
Instrument and Method Quality Assurance/Quality Control			
Ongoing Precision and Recovery	One per sample batch or every 20 samples, whichever is more frequent.	Recovery within limits presented in Table C-2.	1. Check calculation. 2. Re-extract and reanalyze batch.
Stable-isotope- labeled compounds	Spiked into each sample for every target analyte	Recovery within limits presented in Table C-2.	1. Check calculations. 2. Flag outlier and confirm not an ongoing trend.
		Ion abundance ratios must be within the criteria specified by the method.	
Sample target analyte Ion abundance ratios	All detected analytes for all samples.	Ion abundance ratios must be within the criteria specified by the method.	1. Report and qualify as EMPC if ratios outside limit.
Method blank	One per sample batch or every 20 samples, whichever is more frequent.	Detection $\leq$ minimum level as specified by the method.	1. If the method blank results are greater than the reporting limit, flag sample results greater than 10x's method blank with B qualifier.

Quality Control Procedure	Frequency	Acceptance Criteria	Corrective Action
GC/MS Tune	At the beginning of each 12 hour shift; must start and end each analytical sequence	>10,000 resolving power at m/z304.9825. Exact mass of 380.9760 within 5 ppm of theoretical values.	1. Re-analyze affected samples. 2. Reject all data not meeting method 1613B requirements.
Initial Calibration	Initially and when continuing calibration fails	Five point curve for all analytes. RSD must meet Table C-4 requirements for all target compounds and labeled compounds. Signal to noise ratio (S/N)>10. Ion abundance (IA) ratios within method specified limits.	
Window Defining/Column Performance Mix	Before every initial and continuing calibration	Valley < 25% for all peaks near 2378-TCDD/F peaks.	1. Re-analyze affected samples. 2. Reject all data not meeting method 1613B requirements.
Continuing Calibration	Must start and end each analytical sequence.	%Difference must use the limits for target compounds & labeled compounds as specified by the method. S/N>10. IA ratios within method specified limits.	
Confirmation of 2,3,7,8-TCDF	For all primary column detections of 2,3,7,8-TCDF using a DB-5 GC column or equivalent.	Confirmation presence of 2,3,7,8-TCDF in accordance with method 1613B requirements.	ARI uses a specific RTX-Dioxin 2 column which eliminates the need for second column confirmation
Sample data not achieving target reporting limits or method performance in presence of possibly interfering compounds	N/A	N/A	Rather than simply diluting an extract to reduce interferences, the lab should perform additional cleanup techniques identified in the method to insure minimal matrix effects and background interference. Thereafter, the lab can dilute the extract. If reanalysis is required, the laboratory shall report both initial and re-analysis results.
Sediment Reference Material	One per analytical project.	Results must be within 20% of the 95% confidence interval.	No corrective action required for SRM/CRM outliers.

Quality Control Procedure	Frequency	Acceptance Criteria	Corrective Action
Field Quality Assurance/Quality Control			
Field Duplicates	One per every 20 samples	Project, matrix, and compound specific	Modify field sample homogenization procedures.
Field Blanks	At project manager's discretion	Analyte concentration $\leq$ PQL	Compare to method blank results to rule out laboratory contamination. Modify sample collection and equipment decontamination procedures. Qualify associated data.

Notes:

- ¹ Instrument and method QA/QC to monitor the performance of the instrument and sample preparation procedures are the responsibility of the analytical laboratory. When an instrument or method control limit is exceeded, the laboratory is responsible for correcting the problem and reanalyzing the samples.
- ² Instrument and method QA/QC results reported in the final data package should always meet control limits with a very small number of exceptions that apply to difficult analytes as specified by EPA CLP. If instrument and method QA/QC procedures meet control limits, laboratory procedures are deemed to be adequate.
- ³ Matrix and field QA/QC procedures monitor matrix effects, field procedures, and variability. Although poor analytical procedures may also result in poor spike recovery or duplicate results, the laboratory is not held responsible for meeting control limits for these QA/QC samples.

CLP = Contract Laboratory Program

GC/MS = gas chromatography-mass spectrometry

MDL = method detection limit

N/A = not applicable

ppm = part per million

PQL = practical quantification limit

RM = reference material

RSD - relative standard deviation

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APPENDIX D

Health and Safety Plan

Health and Safety Plan

Quiet Cove Property
Anacortes, Washington
Ecology Agreed Order No. DE 11346

for

**Washington State Department of Ecology
on Behalf of Port of Anacortes**

January 25, 2017



GEOENGINEERS 
Earth Science + Technology

Health and Safety Plan

Quiet Cove Property
Anacortes, Washington
Ecology Agreed Order No. DE 11346

for

**Washington State Department of Ecology
on Behalf of Port of Anacortes**

January 25, 2017



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Health and Safety Plan
Quiet Cove Property
Anacortes, Washington
Ecology Agreed Order No. DE 11346

File No. 5147-024-03

January 25, 2017

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ATTACHMENTS

Form 1. Health and Safety Pre-Entry Briefing and Acknowledgement of the Site Health and Safety Plan for GeoEngineers' Employees, Subcontractors and Visitors

Form 2. Safety Meeting Record

Form 3. Accident/Exposure Report Form

GEOENGINEERS, INC.
SITE HEALTH AND SAFETY PLAN
QUIET COVE
FILE NO. 5147-024-03

This Health and Safety Plan (HASP) is to be used in conjunction with the GeoEngineers, Inc. (GeoEngineers) Safety Programs. Together, the written safety programs and this HASP constitute the site safety plan for this site. This plan is to be used by GeoEngineers personnel on this site and must be available on site. If the work entails potential exposures to other substances or unusual situations, additional safety and health information will be included, and the plan will need to be approved by the GeoEngineers Health and Safety Program Manager. Plans are to be used in conjunction with current standards and policies outlined in the GeoEngineers Health and Safety Programs.

Liability Clause: If requested by subcontractors, this site HASP may be provided for informational purposes only. In this case, Form 1 shall be signed by the subcontractor. Please be advised that this site-specific HASP is intended for use by GeoEngineers employees only. Nothing herein shall be construed as granting rights to GeoEngineers' subcontractors or any other contractors working on this site to use or legally rely on this HASP. GeoEngineers specifically disclaims any responsibility for the health and safety of any person not employed by the company.

1.0 GENERAL PROJECT INFORMATION

Project Name:	Quiet Cove
Project Number:	5147-024-03
Type of Project:	Environmental Investigation including drilling, monitoring well installation, groundwater sampling, marine sediment sampling and soil sampling.
Start/Completion:	Within 60 Calendars Days following Ecology's approval of the Remedial Investigation/Feasibility Study (RI/FS) Work Plan
Subcontractors:	Utility locate contractor, drilling contractor and concrete coring contractor

Chain of Command	Title	Name	Telephone Numbers
1	Project Manager	John Herzog	(c) 206.406.6431 (o) 206.239.3252
2	Site Safety Officer	TBD	TBD
3	Field Engineer/Geologist	TBD	TBD
4	Health and Safety Program Manager	Wayne Adams	(c) 253.350.4387 (o) 253.722.2793
N/A	Current Owner	Becky Darden Project Coordinator Port of Anacortes	(c) 360.661.4646 (o) 360.299.1831
N/A	Subcontractor(s)	TBD	TBD

1.1. Functional Responsibility

1.1.1. Project Manager

The Project Manager (PM) is responsible for fulfilling contractual and administrative control of the project. The Project Manager's duties include defining the project approach and tasks, selecting project team members and establishing budgets and schedules.

The Project Manager's duties also include implementing the project approach and tasks, overseeing project team members during performance of project tasks, adhering to and communicating the status of budgets and schedules to the Port Project Manager, providing technical oversight, and providing overall production and review of project deliverables. The Technical Project Manager shall maintain the official, approved RI/FS Work Plan and supporting documents, and shall be responsible for distributing updated documents to the project team.

1.1.2. Site Safety Officer

The Site Safety Officer (SSO) will have the on-site responsibility and authority to modify and stop work, or remove personnel from the site if working conditions change that may affect on-site and off-site health and safety. The SSO will be the main contact for any on-site emergency situation. The SSO is First Aid and CPR qualified, and has current Hazardous Waste Operations and Emergency Response (HAZWOPER) training. The SSO is responsible for implementing and enforcing the project safety program and safe work practices during site activities. The SSO shall conduct daily safety meetings, perform air monitoring as required, conduct site safety inspections as required, coordinate emergency medical care, and ensure personnel are wearing the appropriate personal protective equipment (PPE). The SSO shall have advanced field work experience and shall be familiar with health and safety requirements specific to the project. The SSO has the authority to suspend site activities if unsafe conditions are reported or observed.

Duties of the SSO include the following:

- Implementing the HASP in the field and monitoring compliance with its guidelines by staff.
- Being sure that GeoEngineers field personnel have met the training and medical examination requirements. Advising other contractor employees of these requirements.
- Maintaining adequate and functioning safety supplies and equipment at the site.
- Setting up work zones, markers, signs and security systems, if necessary.
- Performing or supervising air quality measurements. Communicating information on these measurements to GeoEngineers field staff and subcontractor personnel.
- Communicating health and safety requirements and site hazards to field personnel, subcontractors and contractor employees, and site visitors.
- Directing personnel to wear PPE and guiding compliance with health and safety practices in the field.
- Consulting with the PM regarding new or unanticipated site conditions, including emergency response activities. If monitoring detects concentrations of potentially hazardous substances at or above the established exposure limits, notify/consult with the PM. Consult with the PM and the Health and Safety Program Manager (HSM) regarding new or unanticipated site conditions,

including emergency response activities. If field monitoring indicates concentrations of potentially hazardous substances at or above the established exposure limits, the HSM must be notified and corrective action taken.

- Documenting site accidents, illnesses and unsafe activities or conditions, and reporting them to the PM and the HSM.
- Directing decontamination operations of equipment and personnel.

1.1.3. Field Engineer/Geologist

The Field Engineer/Geologist working on-site that has the potential of coming in contact with hazardous substances or physical hazards is responsible for participating in the health and safety program and complying with the site-specific HASP. These personnel are required to:

- Participate and be familiar with the health and safety program as described in this manual.
- Notify the SSO when there is need to stop work to address an unsafe situation.
- Comply with the HASP and acknowledge understanding of the plan.
- Report to the SSO, PM or HSM any unsafe conditions and all facts pertaining to incidents or accidents that could result in physical injury or exposure to hazardous materials.
- Participate in health and safety training, including initial 40-hour Occupational Safety and Health Administration (OSHA) course, annual 8-hour HAZWOPER refresher, and First Aid/cardiopulmonary resuscitation (CPR) training.
- Participate in the medical surveillance program if applicable.
- Schedule and take a respirator fit test annually.
- Any field employee working onsite may stop work if the employee believes the work is unsafe.

1.1.4. Health and Safety Program Manager

The Health and Safety Program Manager (HSM) is responsible for implementing and promoting employee participation in the program. The HSM issues directives, advisories and information regarding health and safety to the technical staff. Additionally, the HSM has the authority to audit on-site compliance with Health and Safety Plans (HASP), suspend work or modify work practices for safety reasons, and dismiss from the site any GeoEngineers or subcontractor employees whose conduct on the site endangers the health and safety of themselves or others.

1.1.5. Port of Anacortes Project Coordinator

The Port of Anacortes (Port) Project Coordinator's duties consist of implementing the project approach and tasks, overseeing the project team members during performance of project tasks.

1.1.6. Subcontractors Under GeoEngineers Supervision

Subcontractors working on the site under GeoEngineers supervision or direct control that have the potential of coming in contact with hazardous substances or physical hazards shall have their own health and safety program that is in line with the site-specific HASP.

1.2. List of Field Personnel and Training

Anticipated field personnel include the following:

- Nate Solomon
- Claudia De La Via
- Brian Anderson
- Robert Trahan
- Abhijit Joshi

Field personnel will have appropriate training and up to date certifications.

1.3. Site Description

The Quiet Cove property is located at 202 O Avenue in Anacortes, Washington, southeast of Guemes Channel. The property is approximately 0.8 acres in size and is located at the intersection of 2nd Street and O Avenue. The Site is bordered to the north by 2nd Street, east by O Avenue and south by 3rd Street. The western portion of the property borders a Port of Anacortes owned storage yard and a bulk fuel distribution facility owned and operated by Texaco/Reisner.

The Quiet Cove Property is generally flat. The property and surrounding area is paved with concrete or asphalt with the exception of planter strips located on the 2nd and 3rd Street, and O Avenue Rights-Of-Way (ROW) and surface areas of 2nd Street, west adjacent Port and Texaco/Reisner properties which are gravel. Stormwater runoff at the Site is collected in catch basins that discharge to the City of Anacortes stormwater system. Currently, an office and two warehouse buildings are present in the northwest portion of the property. A chain link fence surrounds the property preventing general public access. Vehicle and pedestrian access to the property is through gated entrance south of 2nd Street.

1.4. Site History

The property was historically used for bulk fuel distribution from 1909 to at least 1977 (the date when fuel operations ceased is unknown). Fuel (primarily gasoline and diesel) was supplied to the facility from product lines routed from the property north across 2nd Street to the pier face of Curtis Wharf. While operating as a bulk fuel storage and distribution facility, fuel was stored in above ground storage tanks (ASTs) for general distribution. During the late 1970s, the bulk fuel facility was decommissioned and all of the ASTs and associated structures removed. Between 1977 and 2014, the property was operated as a storage yard for marine vessels and recreational vehicles, and leased office and warehouse space to various tents for sales and marine services. In 2013, the property was purchased by the Port as part of their plans for expansion and improvements to the Curtis Wharf International Shipping Terminal.

2.0 WORK PLAN

2.1. Project Description and Objectives

Field investigation activities will be completed to characterize the nature and extent of hazardous substances in areas where historical uses may have resulted in a release or releases to the environment. RI activities will include the following:

- Characterization of the geology/stratigraphy including: nature and extent of fill materials (i.e., soil fill, wood fill, construction debris such as concrete and brick, etc.) and nature and depth to native soil (i.e., depth to native materials underlying the fill);
- Characterize the groundwater gradient and flow direction, and evaluate the hydraulic connection between groundwater and adjacent marine surface water; and
- Characterization of the nature and extent of hazardous substances in media of concern.

RI data gathering for the RI will follow a phased or tiered approach consisting of an initial investigation and follow-up investigation(s) as described in the RI/FS Work Plan. Sample locations and laboratory analyses that will be completed are detailed in the RI/FS Work Plan.

2.2. List of Field Activities

Anticipated field activities to be completed during the project:

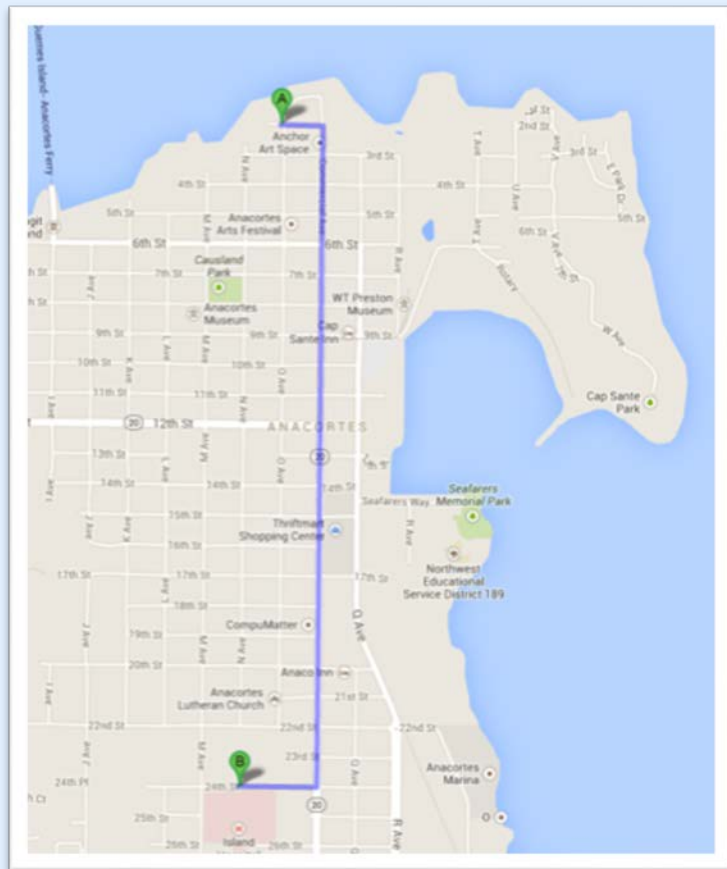
Y/N	Field Activity	Y/N	Field Activity
Y	Site Reconnaissance	N	Vapor Measurements
Y	Exploratory Borings	N	Product Sample collection
N	Construction Monitoring	N	Soil Stockpile Testing
Y	Surveying	N	Remedial Excavation
N	Test Pit Exploration	N	Recovery of Free Product
Y	Soil Sample Collection	Y	Monitoring Well Installation
Y	Groundwater Sampling	Y	Monitoring Well Development
Y	Sediment Sampling	N	Underground Storage Tank (UST) Removal Monitoring
Y	Groundwater Depth/Free Product Measurement	N	Other: Click here to enter text.

3.0 EMERGENCY INFORMATION

Hospital Name and Address:	Island Hospital 1211 24 th Street Anacortes, WA 98221
Phone Numbers (Hospital ER):	Phone: (360) 468-3185 /(360) 299-1300
Distance:	1.5 Miles

Route to Hospital:

- 1) Head east on 2nd St toward O Ave – 410 feet
- 2) Turn right onto Commercial Ave – 1.2 mile
- 3) Turn right onto 24th Street – 0.1 mile
- 4) Arrive at 1211 24th St, Anacortes



Ambulance:	9-1-1
Poison Control:	Seattle (206) 253-2121; Other (800) 732-6985
Police:	9-1-1
Fire:	9-1-1
Location of Nearest Telephone:	Cell phones are carried by field personnel.
Nearest Fire Extinguisher:	Located in the GeoEngineers vehicle on-site.
Nearest First-Aid Kit:	Located in the GeoEngineers vehicle on-site.

3.1. Standard Emergency Procedures

- Get help
 - Send another worker to phone 9-1-1 (if necessary)
 - As soon as feasible, notify GeoEngineers' Project Manager
- Reduce risk to injured person
 - Turn off equipment
 - Move person from injury location (if in life-threatening situation only)

- Keep person warm
- Perform CPR (if necessary)
- Transport injured person to medical treatment facility (if necessary)
 - By ambulance (if necessary) or GeoEngineers vehicle
 - Stay with person at medical facility
 - Keep GeoEngineers Project Manager apprised of situation and notify Human Resources Manager of situation

3.2. Emergency Response

- Visual contact should be maintained between “pairs” on site, with the team remaining in proximity to assist each other in case of emergencies.
- If any member of the field crew experiences any adverse exposure symptoms while on site, the entire field crew should immediately halt work and act according to the instructions provided by the SSO.
- The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the field team, contact of the PM, and reevaluation of the hazard and the level of protection required.
- If an accident occurs, the Site Safety Officer and the injured person are to complete, within 24 hours, an Accident Report (Form 3) for submittal to the PM, the HSPM, and HR. The PM should ensure that follow-up action is taken to correct the situation that caused the accident or exposure.

4.0 HAZARD ANALYSIS

A hazard analysis has been completed as part of preparation of this HASP. The hazard analysis was performed taking into account the known and potential hazards at the site and surrounding areas, as well as the planned work activities. The results of the hazard analysis are presented in this section. The hazard assessment will be evaluated each day before beginning work. Updates will be made as necessary and documented in the daily field log.

The following are known applicable hazards.

4.1. Physical Hazards and Mitigation Measures/Procedures

PHYSICAL HAZARDS (POTENTIALLY PRESENT AT THE SITE)

Y/N	Physical Hazard
Y	Drill rigs and Concrete Coring, including working inside a warehouse
N	Backhoe
N	Trackhoe
N	Crane
N	Front End Loader

Y/N	Physical Hazard
N	Excavations/trenching (1:1 slopes for Type B soil)
N	Shored/braced excavation if greater than 4 feet of depth
Y	Overhead hazards/power lines
Y	Tripping/puncture hazards (debris on-site, steep slopes or pits)
Y	Unusual traffic hazard – Street traffic
Y	Heat/Cold, Humidity
Y	Utilities/ utility locate
Y	Noise
N	Other: Click here to enter text.

4.1.1. Mitigation Measures/Procedures

- A utility shall be completed as required for the location to prevent drilling or digging into utilities.
- Work areas will be marked with reflective cones, barricades and/or caution tape. High-visibility vests will be worn by on-site personnel to ensure they can be seen by vehicle and equipment operators.
- Field personnel will be aware of the location and motion of heavy equipment in the area of work to ensure a safe distance between personnel and the equipment. Personnel will be visible to the operator at all times and will remain out of the swing and/or direction of the equipment apparatus. Personnel will approach operating heavy equipment only when they are certain the operator has indicated that it is safe to do so through hand signal or other acceptable means.
- Heavy equipment and/or vehicles used on this site will not work within 20 feet of overhead utility lines without first ensuring that the lines are not energized. This distance may be reduced to 10 feet, depending on the client and the use of a safety watch.
- Personnel entry into unshored or unsloped excavations deeper than 4 feet is not allowed. Any trenching and shoring requirements will follow guidelines established in Washington Administrative Code (WAC) 296-155, the Washington State Construction Standards or OSHA 1926.651 Excavation Requirements. In the event that a worker is required to enter an excavation deeper than 4 feet, a trench box or other acceptable shoring will be employed or the side walls of the excavation will be sloped according to the soil type and guidelines as outlined in Department of Occupational Safety and Health (DOSH) and OSHA regulations. If the shoring/sloping deviates from that outlined in the WAC, it will be designed and stamped by a Professional Engineer (PE). Prior to entry, personnel will conduct air monitoring as described later in this plan. All hazardous encumbrances and excavated material will be stockpiled at least 2 feet from the edge of a trench or open pit. If concentrations of volatile gases accumulate within an open trench or excavation, the means of entering shall adhere to confined space entry and air monitoring procedures outlined under the air monitoring recommendations in this Plan and/or the GeoEngineers Health and Safety Programs.
- Personnel will avoid tripping hazards, steep slopes, pits and other hazardous encumbrances. If it becomes necessary to work within 6 feet of the edge of a pit, slope or other potentially hazardous

area, appropriate fall protection measures will be implemented by the Site Safety Officer in accordance with OSHA/DOSH regulations and the GeoEngineers Health and Safety Program.

- Cold stress control measures will be implemented according to the GeoEngineers Health and Safety Program to prevent frost nip (superficial freezing of the skin), frost bite (deep tissue freezing), or hypothermia (lowering of the core body temperature). Heated break areas and warm beverages shall be available during periods of cold weather.
- Heat stress control measures required for this site will be implemented according to GeoEngineers Health and Safety Program with water provided on-site.

4.1.2. Engineering Controls

Y/N	Engineering Control
N	Trench shoring (1:1 slope for Type B Soils)
Y	Location work spaces upwind/wind direction monitoring
N	Other soil covers (as needed)
N	Other (specify): Click here to enter text.

4.2. Biological Hazards and Mitigation Measures/Procedures

BIOLOGICAL HAZARDS (POTENTIALLY PRESENT AT SITE)

Y/N	Biological Hazard	Mitigation Measure/Procedure
N	Poison Ivy or other vegetation	Work gloves and long sleeve shirt
Y	Insects or snakes	Work gloves and long sleeve shirt
N	Hypodermic needles or other infectious hazards	Do not pick up or contact
N	Wildlife	Click here to enter text.
Y	Other: Bird droppings	Hard hat, gloves and long sleeve shirt

4.3. Ergonomic Hazards and Mitigation Measures/Procedures

4.3.1. Lifting Injuries

Back injuries often result from lifting objects that are too heavy or from using the wrong lifting technique. Keep your back healthy and pain-free by following common sense safety precautions.

- Minimize reaching by keeping frequently used items within arm's reach, moving your whole body as close as possible to the object.
- Avoid overextending by standing up when retrieving objects on shelves.
- Keep your back in shape with regular stretching exercises.
- Get help from a coworker or use a hand truck if the load is too heavy or bulky to lift alone.

4.3.2. Lifting Techniques

- Face the load; don't twist your body. Stand in a wide stance with your feet close to the object.

- Bend at the knees, keeping your back straight. Wrap your arms around the object.
- Let your legs do the lifting.
- Hold the object close to your body as you stand up straight. To set the load down, bend at the knees, not from the waist.

4.4. Chemical Hazards

CHEMICAL HAZARDS (POTENTIALLY PRESENT AT SITE)

Substance	Pathways
Petroleum Products Gasoline Diesel Heavy oil Waste oil	Air/Soil/Water
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs) and Naphthalenes	Air/Soil/Water
Halogenated Volatile Organic Compounds	Air/Soil/Water
Volatile Organic Compounds (VOCs) Benzene, ethylbenzene, toluene, xylenes (BETX) n-Hexane Methyl tertiary-butyl ether (MTBE) 1,2-dibromoethane (EDB) 1,2-dichloroethane (EDC)	Air/Soil/Water
Polychlorinated Biphenyl's (PCBs)	Air/Soil/Water
Metals Arsenic Cadmium Chromium Lead Mercury	Air/Soil/Water

SPECIFIC CHEMICAL HAZARDS AND EXPOSURES (POTENTIALLY PRESENT AT SITE)

Chemical or Compound/Description	Exposure Limits/IDLH	Exposure Route	Immediate Symptoms of Exposure/Health Effects
Arsenic	PEL 0.05 mg/m ³ IDLH 5.0 mg/m ³	Inhalation, skin absorption, skin and eye contact, ingestion	Ulceration of nasal septum; dermatitis; GI disturbances; peripheral neuropathy; respiratory irritation; hyperpigmentation of skin
Cadmium	PEL 0.005 mg/m ³ IDLH 9 mg/m ³	respiratory system, kidneys, prostate, blood	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle

Chemical or Compound/ Description	Exposure Limits/ IDLH	Exposure Route	Immediate Symptoms of Exposure/Health Effects
			aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]
Chromium	PEL 1 mg/m ³ IDLH 250 mg/m ³	Inhalation, ingestion, skin and eye contact	Irritated eyes, skin respiratory system
Lead	PEL 0.05 mg/m ³ IDLH 100 mg/m ³	Inhalation, ingestion, skin and eye contact	Lassitude; insomnia; facial pallor; abnormalities; weight loss, malnutrition, constipation, abdominal pain; colic; anemia; gingival lead line; tremors; paralysis of the wrist and ankles; encephalopathy; kidney disease; irritated eyes; hypertension
Mercury	PEL 0.05 mg/m ³ IDLH 10 mg/m ³	Inhalation, skin absorption, skin and eye contact, ingestion	Irritated eyes, skin; cough, chest pain, dyspnea, bronchitis, pneumonia; tremors, insomnia, irritability, indecision, headache, lassitude; stomatitis, salivation; GI disturbances, abnormalities, low weight; proteinuria
Gasoline (Unleaded) — clear liquid with a characteristic odor	PEL 300 ppm TLV 300 ppm STEL 500 ppm	Ingestion, inhalation, skin absorption, skin and eye contact	Irritated eyes, skin, and mucous membrane; fatigue; blurred vision; dizziness; slurred speech; confusion; convulsions; headache; dermatitis
Diesel Fuel — liquid with a characteristic odor	None established by OSHA, but ACGIH has adopted 100 mg/m ³ for a TWA (as total hydrocarbons)	Ingestion, inhalation, skin absorption, skin and eye contact	Irritated eyes, skin, and mucous membrane; fatigue; blurred vision; dizziness; slurred speech; confusion; convulsions; headache; dermatitis
Waste oil – may contain metals, gas, antifreeze and PAHs	Depends on the ancillary contaminants	Ingestion, inhalation, skin absorption, skin and eye contact	Depends on the ancillary contaminants.
Lube Oil/Mineral Oil – as a mist	The current OSHA PEL for mineral oil mist is 5 mg/m ³ of air as an 8-hr TWA	If the oil is not a mist, then route of exposure is skin and eye contact	Exposure to oil mists can cause eye, skin and upper respiratory tract irritation.
Benzene	OSHA PEL 1 ppm Short term: 5 ppm ACGIH PEL 0.5 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritated eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]

Chemical or Compound/ Description	Exposure Limits/ IDLH	Exposure Route	Immediate Symptoms of Exposure/Health Effects
Toluene	PEL 100 ppm IDLH 500 ppm	Inhalation, absorption, ingestion, direct contact	Irritation to eyes, nose, exhaustion, confusion, dizziness, headaches, dilated pupils, euphoria, anxiety, teary eyes, muscle fatigue, insomnia, paresthesia, dermatitis, liver and kidney damage.
Ethyl benzene	PEL 100 ppm IDLH 800 ppm	Inhalation, ingestion, direct contact	Irritation to eyes, skin, respiratory system, burning
Xylenes	PEL 100 ppm IDLH 900 ppm	Inhalation, skin absorption, ingestion, direct contact	Irritation to eyes, skin, nose, throat, dizziness, excitement, drowsiness, incoordination, staggering gait, corneal vacuolization, anorexia, nausea, vomiting, abdominal
MTBE	PEL 40 ppm	Ingestion, Inhalation, skin absorption, direct contact	Irritation to eyes, skin, nose, throat and lungs, aspiration, chemical pneumonia, nausea, vomiting, diarrhea, tremors, convulsions, loss of consciousness, headache, dizziness, loss of balance or coordination.
Polycyclic aromatic hydrocarbons (PAH) as coal tar pitch volatiles	PEL 0.2 mg/m ³ TLV 0.2 mg/m ³ REL 0.1 mg/m ³ IDLH 80 mg/m ³	Inhalation, ingestion, skin and/or eye contact	Dermatitis, bronchitis, potential carcinogen
PCBs (as Arochlor 1254)—colorless to pale-yellow viscous liquid with a mild, hydrocarbon odor	PEL 0.5 mg/m ³ TLV 0.5 mg/m ³ REL 0.001 mg/m ³ IDLH 5.0 mg/m ³	Inhalation (dusts or mists), skin absorption, ingestion, skin and/or eye contact	Irritated eyes, chloracne, liver damage, reproductive effects, potential carcinogen

Notes:

IDLH = immediately dangerous to life or health
 OSHA = Occupational Safety and Health Administration
 ACGIH = American Conference of Governmental Industrial Hygienists
 mg/m³ = milligrams per cubic meter
 TWA = time-weighted average (Over 8 hrs.)
 PEL = permissible exposure limit
 TLV = threshold limit value (over 10 hrs)
 STEL = short-term exposure limit (15 min)
 ppm = parts per million

4.4.1. Mitigation Measures/Procedures

- **Groundwater Sampling:** Splash hazard associated with groundwater extraction and sample collection. Possible corrosion hazard associated with sample preservatives. Wear protective clothing and eye protection and chemical-resistant gloves are required when handling samples.
- **Sample handling, packaging, and processing:** skin contact with contaminated media and preservative acids. Wear modified Level D personal protective equipment (PPE).

- **Decontamination of equipment:** inhalation or eye contact or skin contact with airborne mists or vapors, or contaminated liquids. Wear safety glasses; decontaminate clothing and skin prior to eating, drinking or other hand to mouth contact.

4.5. Additional Hazards

Update in Daily Report. Include evaluation of:

- Physical Hazards (excavations and shoring, equipment, traffic, tripping, heat stress, cold stress and others)
- Chemical Hazards (odors, spills, free product, airborne particulates and others present)
- Biological Hazards (snakes, spiders, other animals, discarded needles, poison ivy, pollen, bees/wasps and others present)

5.0 AIR MONITORING PLAN

An air monitoring plan has been prepared as part of development of this HASP. The air monitoring plan is based on the results of the chemical exposure assessment and the known and potential inhalation hazards on-site. The air monitoring plan addresses steps necessary to limit worker exposure. Non-occupational exposures are not addressed in this plan. When possible, position yourself up upwind of the field activity.

FIELD INSTRUMENTATION

Applicable Field Instrumentation	
X	Multi-Gas Detector (may include oxygen, carbon monoxide, hydrogen sulfide, lower explosive limit)
	Dust Monitor
	Other (i.e., detector tubes or badges) Please specify: Click here to enter text.

MONITORING FREQUENCY

Applicable Monitoring Frequency/Locations and Type	
X	Continuous during soil disturbance activities or handling samples
	15 minutes
	30 minutes
	Hourly

5.1. Action Levels for Volatile Organic Chemicals

- The workspace will be monitored using a photoionization detector (PID). These instruments must be properly maintained, calibrated and charged (refer to the instrument manuals for details). Zero this meter in the same relative humidity as the area in which it will be used and allow at least a 10-minute warm-up prior to zeroing. Do not zero in a contaminated area.

- An initial vapor measurement survey of the site should be conducted to detect “hot spots” if contaminated soil is exposed at the surface. Vapor measurement surveys of the workspace should be conducted at least hourly or more often if persistent petroleum-related odors are detected. Additionally, if vapor concentrations exceed 5 parts per million (ppm) above background continuously for a 5-minute period as measured in the breathing zone, upgrade to Level C personal protective equipment (PPE) or move to a non-contaminated area.
- Standard industrial hygiene/safety procedure is to require that action be taken to reduce worker exposure to organic vapors when vapor concentrations exceed one-half the threshold limit value (TLV). Because of the variety of chemicals, the PID will not indicate exposure to a specific permissible exposure limit (PEL) and is therefore not a preferred tool for determining worker exposure to chemicals. If odors are detected, then employees shall upgrade to respirators with Organic Vapor cartridges and will contact the Health and Safety Program Manager for other sampling options.

AIR MONITORING ACTION LEVELS

Contaminant	Activity	Monitoring Device	Frequency of Monitoring Breathing Zone	Action Level	Action
Organic Vapors	Environmental Remedial Actions	PID	Start of shift; prior to excavation entry; every 30 to 60 minutes and in event of odors	Background to 5 ppm in breathing zone	Use Level D or Modified Level D PPE
Organic Vapors	Environmental Remedial Actions	PID	Start of shift; prior to excavation entry; every 30 to 60 minutes and in event of odors	5 to 50 ppm in breathing zone	Upgrade to Level C PPE *
Organic Vapors	Environmental Remedial Actions	PID	Start of shift; prior to excavation entry; every 30 to 60 minutes	> 50 ppm in breathing zone	Stop work and evacuate the area. Contact Health and Safety Program Manager for guidance.
Combustible Atmosphere	Environmental Remedial Actions	PID	Start of shift; prior to excavation entry; every 30 to 60 minutes	>10% LEL or >1,000 ppm	Depends on contaminant. The PEL is usually exceeded before the lower explosive limit (LEL).
Combustible Atmosphere	Environmental Remedial Actions	PID or 4-gas meter	Start of shift; prior to excavation entry; every 30 to 60 minutes	>10% LEL or >1,000 ppm	Stop work and evacuate the site. Contact Health and Safety Program Manager for guidance.

Contaminant	Activity	Monitoring Device	Frequency of Monitoring Breathing Zone	Action Level	Action
Oxygen Deficient/ Enriched Atmosphere	Environmental Remedial Actions Confined Spaces	Oxygen meter or 4-gas meter	Start of shift; prior to excavation entry; every 30 to 60 minutes	<19.5 >23.5%	Continue work if inside range. If outside range, evacuate area and contact Health and Safety Program Manager.

*Contact the HSPM and Project Manager

6.0 SITE CONTROL PLAN

Use this section to provide an up-to-date Site Control Plan for cleanup operations to minimize employee exposure to hazardous substances.

6.1. Traffic or Vehicle Access Control Plans

GeoEngineers will work with the Port to obtain a Right-of-Way Permit from the City of Anacortes for borings performed near sidewalks and on roads, including preparation of a streamlined traffic control plan, if needed. Flagging and traffic control, if needed, will be performed by contractors of GeoEngineers. All persons contracting to perform flagging will have on site a current flagging card indicating that they are trained.

Traffic control procedures and devices must be used in accordance with Part VI of the Manual on Uniform Traffic Control Devices (MUTCD) and Washington Safety and Health Standard WAC 296-155-305. Where flaggers are needed, supervisor must ensure that each flagger has the qualifications, training and equipment necessary to perform assigned task in accordance with the MUTCD. Training must be updated every 3 years. At a minimum, flaggers must have a stop/slow paddle, high visibility clothing, safety shoes, and a hard hat, before approaching any right of way to control traffic.

6.2. Site Work Zones

Exclusion zones will be established within approximately 10 feet around each boring or well during drilling/sampling. Only persons with the appropriate training will enter this perimeter while work is being conducted there.

A contamination reduction zone will be established just outside the exclusion zone for the decontamination of sampling equipment. Care will be taken to prevent the spread of contamination. Equipment and personnel decontamination are discussed in the following sections, and the following types of equipment will be available to perform these activities:

- Scrub brushes
- Spray rinse applicator
- Plastic garbage bags
- Container of Alconox/water solution and Alconox powder
- Hot zone/exclusion zone (Approximately 10 to 15 feet around boring locations).

METHOD OF DELINEATION/EXCLUDING NON-SITE PERSONNEL

Applicable Delineation/Exclusion Methods	
X	Fence
	Survey Tape
X	Traffic Cones
	Other

6.3. Buddy System

Personnel on-site should use the buddy system (pairs), particularly whenever communication is restricted. If only one GeoEngineers employee is on site, a buddy system can be arranged with subcontractor/contractor personnel.

6.4. Site Communication Plan

Positive communications (within sight and hearing distance or via radio) should be maintained between pairs on-site, with the pair remaining in proximity to assist each other in case of emergencies. The team should prearrange hand signals or other emergency signals for communication when voice communication becomes impaired (including cases of lack of radios or radio breakdown) and an agreed upon location for an emergency assembly area.

In instances where communication cannot be maintained, you should consider suspending work until it can be restored. If this is not an option, the following are some examples for communication:

- Hand gripping throat: Out of air, can't breathe.
- Gripping partner's wrist or placing both hands around waist: Leave area immediately, no debate.
- Hands on top of head: Need assistance.
- Thumbs up: Okay, I'm all right; or, I understand.
- Thumbs down: No, negative.

6.5. Emergency Action

In the event of an emergency, employees will convene in a designated area. Employees should communicate with others working on site and the PM to determine the Emergency Action Plan for each site. GeoEngineers employees and subcontractor(s) should be made aware of the Emergency Action for the site at each morning's safety tailgate meeting (drill rig shutoff switch, location of fire extinguishers, cell phone numbers, etc.). For medical assistance, see Section 3.0 above.

6.6. Decontamination Procedures

Decontamination, at a minimum, should include removing and disposing of PPE when exiting the exclusion zone and washing your hands. Decontamination may also consist of removing outer protective gloves and washing soiled boots and gloves using bucket and brush provided on-site in the contamination reduction zone. If needed, inner gloves will then be removed, and respirator, hands and face will be

washed in either a portable wash station or a bathroom facility at the site. Employees will perform decontamination procedures and wash before eating, drinking or leaving the site.

6.7. Waste Disposal or Storage

Incidental waste including used PPE is to be placed in a plastic bag for disposal. Investigation derived waste (IDW) will be placed in 35/55-gallon drums and stored on site in a secure location pending characterization and disposal.

7.0 PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment (PPE) will consist of standard Level D equipment. Site activities include handling and sampling of soil, groundwater and sediment. Depth-to-groundwater measurements will be performed as well. Site hazards include potential exposure to hazardous materials, and physical hazards such as trips/falls, heavy equipment, and contaminant exposure.

Air monitoring will be conducted to determine the level of respiratory protection.

- Half-face combination organic vapor/high efficiency particulate air (HEPA) or P100 cartridge respirators will be available on site to be used as necessary. P100 cartridges are to be used only if PID measurements are below the site action limit. P100 cartridges are used for protection against dust, metals and asbestos, while the combination organic vapor/HEPA cartridges are protective against both dust and vapor. Ensure that the PID or TLV will detect the chemicals of concern on-site.
- Level D PPE, unless a higher level of protection is required, will be worn on the site. Potentially exposed personnel will wash gloves, hands, face and other pertinent items to prevent hand-to-mouth contact. This will be done prior to hand-to-mouth activities including eating, smoking, etc.
- Adequate personnel and equipment decontamination will be used to decrease potential ingestion and inhalation.

PERSONAL PROTECTIVE EQUIPMENT

Applicable Personal Protection Equipment	
Field Equipment (specify):	
X	Hardhat (if overhead hazards, or client requests)
X	Steel-toed boots (if crushing hazards are a potential or if client requests)
X	Safety glasses (if dust, particles, or other hazards are present or client requests)
X	Reflective vest (if working near traffic or equipment)
X	Hearing protection (if it is difficult to carry on a conversation 3 feet away)
X	Rubber boots (if wet conditions)
Gloves (specify):	
X	Nitrile
	Latex

Applicable Personal Protection Equipment	
	Liners
	Leather
	Other (specify) Click here to enter text.
Protective Clothing (specify):	
	Tyvek (if dry conditions are encountered, Tyvek is sufficient) (modified Level D or Level C)
	Saranex (personnel shall use Saranex if liquids are handled or splash may be an issue) (modified Level D or Level C)
X	Cotton (Level D)
X	Rain gear (as needed) (Level D)
X	Layered warm clothing (as needed) (Level D)
Inhalation Hazard Protection (specify):	
X	Level D (no respirator)
	Level C (respirators with organic vapor/HEPA P100 filters)
	Level B (Self Contained Breathing Apparatus— STOP, Consult the HSM)

7.1. Personal Protective Clothing Inspections

PPE clothing ensembles designated for use during site activities shall be selected to provide protection against known or anticipated hazards. However, no protective garment, glove or boot is entirely chemical-resistant, nor does any PPE provide protection against all types of hazards. To obtain optimum performance from PPE, site personnel shall be trained in the proper use and inspection of PPE. This training shall include the following:

- Inspect PPE before and during use for imperfect seams, non-uniform coatings, tears, poorly functioning closures or other defects. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Inspect PPE during use for visible signs of chemical permeation such as swelling, discoloration, stiffness, brittleness, cracks, tears or other signs of punctures. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Disposable PPE should not be reused after breaks unless it has been properly decontaminated.

7.2. Respirator Selection, Use and Maintenance

If respirators are required, site personnel shall be trained before use on the proper use, maintenance and limitations of respirators. Additionally, they must be medically qualified to wear respiratory protection in accordance with 29 CFR 1910.134. Site personnel who will use a tight-fitting respirator must have passed a qualitative or quantitative fit test conducted in accordance with an OSHA-accepted fit test protocol. Fit testing must be repeated annually or whenever a new type of respirator is used. Respirators will be stored in a protective container.

7.3. Respirator Cartridges

If the action levels identified in the Air Monitoring Action Levels Table in Section 5.0, are exceeded, site personnel should don respiratory protection appropriate for the known or suspected chemical of concern. For most sites, a half-face or full-face air purifying respirator with a National Institute for Occupational Safety and Health (NIOSH)-approved organic vapor/HEPA P100 combination cartridge (Level C), will be appropriate for the known or suspected chemicals of concern. Monitoring frequency should be continuous while using Level C respiratory protection. The SSO closely monitor personnel using respiratory protection, including observing for signs of fatigue or respiratory distress, the potential for cartridge breakthrough or increased resistance to inhalation, and the need for changes in the level of respiratory protection based on air monitoring. The frequency and duration of breaks should be increased for personnel working in respiratory protection. If at any time on-site air monitoring indicates Level B respiratory protection is warranted, personnel should leave the exclusion zone and consult with the HSM.

If site personnel are required to wear air-purifying respirators, the appropriate cartridges shall be selected to protect personnel from known or anticipated site contaminants. The respirator/cartridge combination shall be approved and NIOSH-certified. A cartridge change-out schedule shall be developed based on known site contaminants, anticipated contaminant concentrations and data supplied by the cartridge manufacturer related to the absorption capacity of the cartridge for specific contaminants. Site personnel shall be made aware of the cartridge change-out schedule prior to the initiation of site activities. Site personnel shall also be instructed to change respirator cartridges if they detect increased resistance during inhalation or detect vapor breakthrough by smell, taste or feel, although breakthrough is not an acceptable method of determining the change-out schedule.

7.4. Respirator Inspection and Cleaning

The Site Safety Officer shall periodically (weekly) inspect respirators at the project site. Site personnel shall inspect respirators prior to each use in accordance with the manufacturer's instructions. In addition, site personnel wearing a tight-fitting respirator shall perform a positive and negative pressure user seal check each time the respirator is donned, to ensure proper fit and function. User seal checks shall be performed in accordance with the GeoEngineers respiratory protection program or the respirator manufacturer's instructions.

8.0 ADDITIONAL ELEMENTS

8.1. Heat/Cold Stress

8.1.1. Cold Stress Prevention

Working in cold environments presents many hazards to site personnel and can result in frost nip (superficial freezing of the skin), frost bite (deep tissue freezing), or hypothermia (lowering of the core body temperature).

The combination of wind and cold temperatures increases the degree of cold stress experienced by site personnel. Site personnel shall be trained on the signs and symptoms of cold-related illnesses, how the human body adapts to cold environments, and how to prevent the onset of cold-related illnesses. Heated break areas and warm beverages shall be provided during periods of cold weather.

8.1.2. Heat Stress Prevention

Keeping workers hydrated in a hot outdoor environment requires more water be provided than at other times of the year. When employee exposure is at or above an applicable temperature listed in the Heat Stress table below, Project Managers will ensure that:

- A sufficient quantity of drinking water is readily accessible to employees at all times; and
- All employees have the opportunity to drink at least one quart of drinking water per hour.

HEAT STRESS

Type of Clothing	Outdoor Temperature Action Levels
Nonbreathing clothes including vapor barrier clothing or PPE such as chemical resistant suits	52°
Double-layer woven clothes including coveralls, jackets and sweatshirts	77°
All other clothing	89°

8.2. Personnel Medical Surveillance

GeoEngineers employees are not in a medical surveillance program because they do not fall into the category of “Employees Covered” in OSHA 1910.120(f)(2), which states that a medical surveillance program is required for the following employees:

1. Employees who are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits or, if there is no permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year;
2. Employees who wear a respirator for 30 days or more a year or as required by state and federal regulations;
3. Employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation; and
4. Members of HAZMAT teams.

8.3. Spill Containment Plans (Drum and Container Handling)

Drums and containers used during the cleanup shall meet the appropriate Department of Transportation (DOT), OSHA and U.S. Environmental Protection Agency (EPA) regulations for the waste that they contain. Site operations shall be organized to minimize the amount of drum or container movement. When practicable, drums and containers shall be inspected and their integrity shall be ensured before they are moved. Unlabeled drums and containers shall be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled. Before drums or containers are moved, all employees involved in the transfer operation shall be warned of the potential hazards associated with the contents.

Drums or containers and suitable quantities of proper absorbent shall be kept available and used where spills, leaks or rupture may occur. Where major spills may occur, a spill containment program shall be implemented to contain and isolate the entire volume of the hazardous substance being transferred. Fire extinguishing equipment shall be on hand and ready for use to control incipient fires.

8.4. Entry Procedures for Tanks or Vaults (Confined Spaces)

GeoEngineers employees shall not enter confined spaces to perform work unless they have been properly trained and with hands-on experience in the use of retrieval equipment. If a project requires confined space entry, please include a copy of the confined space permit and include the training documentation in this HASP.

Trenches greater than 4 feet in depth with the potential for buildup of a hazardous atmosphere are considered confined spaces.

8.5. Sanitation

Washrooms are assumed to be present in on-site buildings. If necessary, portable toilets will be provided during work activities.

8.6. Lighting

Work is anticipated to be performed during daylight hours. Work may extend slightly into the evening provided adequate lighting is used (e.g. portable flood lights).

9.0 DOCUMENTATION TO BE COMPLETED FOR HAZWOPER PROJECTS

The following forms shall be completed:

- Daily Field Log (include the following information)
 - Updates on hazard assessments, field decisions, conversations with subcontractors, client or other parties, etc.;
 - Air monitoring/calibration results, including: personnel, locations monitored, activity at the time of monitoring, etc.;
 - Actions taken;
 - Action level for upgrading PPE and rationale; and
 - Meteorological conditions (temperature, wind direction, wind speed, humidity, rain, snow, etc.).
- FORM 1 – Health and Safety Pre-Entry Briefing and Acknowledgment of the Site Health and Safety Plan for GeoEngineers' Employees, Subcontractors and Visitors
- FORM 2 – Safety Meeting Record
- FORM 3 – Accident/Exposure Report Form

FORM 1
HEALTH AND SAFETY PRE-ENTRY BRIEFING AND ACKNOWLEDGEMENT OF THE SITE HEALTH AND
SAFETY PLAN FOR GEOENGINEERS' EMPLOYEES, SUBCONTRACTORS AND VISITORS
QUIET COVE PROPERTY
FILE NO. 5147-024-03

Inform employees, contractors and subcontractors or their representatives about:

- The nature, level and degree of exposure to hazardous substances they're likely to encounter;
- Site-related emergency response procedures; and
- Any identified potential fire, explosion, health, safety or other hazards.

Conduct briefings for employees, contractors and subcontractors, or their representatives as follows:

- A pre-entry briefing before any site activity is started.
- Additional briefings, as needed, to make sure that the Site-specific HASP is followed.
- Make sure employees working on the Site are informed of any risks identified and trained on how to protect themselves and other workers against the Site hazards and risks.
- Update information to reflect current sight activities and hazards.
- Personnel participating in this project must receive initial health and safety orientation. Thereafter, brief tailgate safety meetings will be held as deemed necessary by the Site Safety Officer.
- The orientation and the tailgate safety meetings shall include a discussion of emergency response, site communications and site hazards.

(GeoEngineers' Site workers shall complete this form, which should remain attached to the HASP and be filed with other project documentation). Please be advised that this site-specific HASP is intended for use by GeoEngineers employees only. Nothing herein shall be construed as granting rights to GeoEngineers' subcontractors or any other contractors working on this site to use or legally rely on this HASP. GeoEngineers specifically disclaims any responsibility for the health and safety of any person not employed by the company.

I hereby verify that a copy of the current HASP has been provided by GeoEngineers, Inc., for my review and personal use. I have read the document completely and acknowledge an understanding of the safety procedures and protocol for my responsibilities on Site. I agree to comply with the required, specified safety regulations and procedures.

Print Name

Signature

Date

FORM 3
ACCIDENT/EXPOSURE REPORT FORM
QUIET COVE
FILE NO. 5147-024-03

To (Supervisor): _____ From (Employee): _____
Telephone (with area code): _____

Name of injured or ill employee: _____

Date of accident: _____ Time of accident: _____ Exact location of accident: _____

Narrative description of accident/exposure (circle one):

Medical attention given on site:

Nature of illness or injury and part of body involved: _____ Lost Time? Yes ☐ No ☐

Probably Disability (check one):

Fatal	Lost work day with days away from work	Lost work day with days of restricted activity	No lost work day	First Aid only
☐	☐	☐	☐	☐

Corrective action taken by reporting unit and corrective action that remains to be taken (by whom and when):

Employee Signature: _____ Date: _____

Name of Supervisor: _____

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Please let us know by visiting [**www.geoengineers.com/feedback**](http://www.geoengineers.com/feedback).



APPENDIX E

Public Participation Plan

Site Cleanup:

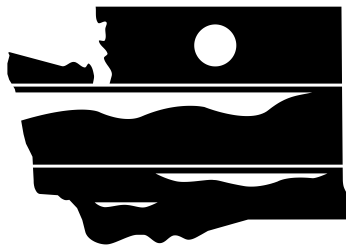
QUIET COVE

202 O Avenue, Anacortes
Skagit County, Washington

DRAFT PUBLIC PARTICIPATION PLAN

Prepared by:

Washington State Department of Ecology



DEPARTMENT OF
ECOLOGY
State of Washington

October 2015

This plan is for you!

This Public Participation Plan (Plan) is prepared for the Quiet Cove Site cleanup as part of the requirements of the Model Toxics Control Act (MTCA). The Plan provides information about MTCA cleanup actions and requirements for public involvement, and identifies how the Washington State Department of Ecology (Ecology) will support public involvement throughout the cleanup. The Plan is intended to encourage coordinated and effective public involvement tailored to the community's needs at the Quiet Cove Site.

For additional copies of this document, please contact:

Washington State Department of Ecology
Arianne Fernandez, Site Manager
Toxics Cleanup Program
PO Box 47600
Olympia, WA 98504-7600
(360) 407-7209
Email: Arianne.Fernandez@ecy.wa.gov

If you need this publication in an alternate format, please call the Toxics Cleanup Program at (360) 407-7170. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call (877) 833-6341 (TTY).

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1.0: Introduction and Overview of the Public Participation Plan

This Public Participation Plan (Plan) explains how you can become involved in improving the health of your community. It describes public participation opportunities that will be available during this review period for a site connected to the Fidalgo/Padilla Bay waterfronts – the Quiet Cove Site (the Site). The Site is generally located at 202 O Avenue in Anacortes, Skagit County, Washington. These opportunities are part of a collaborative effort by the Washington State Department of Ecology (Ecology) and Port of Anacortes (Port) to decide on cleanup actions for the Site. Current documents for review include:

- Draft Agreed Order (AO), a legal agreement between Ecology and the Potentially Liable Person (PLP), the Port, in which the Port agrees to provide remedial action at the Site where there has been a release or threatened release of hazardous substances.

Cleanup actions, and the public participation process that helps guide them, are established in Washington’s Model Toxics Control Act (MTCA).¹ Under MTCA, Ecology is responsible for providing timely information and meaningful chances for the public to learn about and comment on important cleanup decisions before they are made. The goals of the public participation process are:

- To promote understanding of the cleanup process so that the public has the necessary information to participate.
- To encourage involvement through a variety of public participation opportunities.

This Plan provides a framework for open dialogue about the cleanup among community members, Ecology, and other interested parties. It outlines basic MTCA requirements for community involvement activities that will help ensure that this exchange of information takes place during the investigation and cleanup. These requirements include:

- Notifying the public about available reports and studies about the Site.
- Notifying the public about review and comment opportunities during specific phases of the cleanup investigation.

¹ The Model Toxics Control Act (MTCA) is the hazardous waste cleanup law for the State of Washington. The full text of the law can be found in Revised Code of Washington (RCW), Chapter 70.105D. The legal requirements and criteria for public notice and participation during MTCA cleanup investigations can be found in Washington Administrative Code (WAC), Section 173-340-600.

- Providing appropriate public participation opportunities to learn about cleanup documents, and if community interest exists, holding meetings to solicit input and identify community concerns.
- Considering public comments received during public comment periods.

In addition to these basic requirements, the Plan may include additional site-specific activities to meet the needs of your community. Based upon the type of proposed cleanup action, the level of public concern, and the risks posed by the Site, Ecology may decide that more public involvement opportunities are appropriate.

These opportunities form the basis for the public participation process. The intent of this Plan is to:

- Provide complete and current information to all interested parties.
- Let you know when there are opportunities to provide input.
- Provide opportunities to listen to and address community concerns.

Part of the Puget Sound Initiative

The Site is one of several Fidalgo/Padilla Bays waterfront sites and is part of a larger cleanup effort called the Puget Sound Initiative (PSI). Washington State established the PSI to protect and restore Puget Sound. The PSI includes cleaning up 50-60 contaminated sites within one-half mile of the Sound. These sites are grouped in several bays around the Sound for “baywide” cleanup efforts. As other sites in the Fidalgo/Padilla baywide area move forward into investigation and cleanup, information about them will be provided to the community as well as people and groups who are interested.

Roles and Responsibilities

Ecology will lead public involvement activities. Ecology maintains overall responsibility and approval authority for the activities outlined in this Plan. Ecology and the Port are responsible for cleanup at the Site. Ecology will oversee all future cleanup activities and ensure that contamination on the Site is cleaned up to concentrations that are established in state regulations and that protect human health and the environment.

Organization of this Public Participation Plan

The sections that follow in this Plan provide:

- Section 2: Background information about the Site.
- Section 3: An overview of the local community that this Plan is intended to engage.

- Section 4: Public involvement opportunities in this cleanup.

This Plan addresses current conditions at the Site, but it is intended to be a dynamic working document that will be reviewed at each phase of the cleanup and updated as needed. Ecology and the Port urge the public to become involved in the cleanup process.

2.0: Site Background

Site Description and Location

The Site is generally located at 202 O Avenue in Anacortes, Skagit County, Washington, along the east end of the Guemes Channel just northwest of Fidalgo/Padilla Bays (see Figure 1).

The Site is located between 2nd and 3rd Streets west of O Avenue, and it totals about 0.82 acres. The Site may extend across 2nd Street toward Curtis Wharf International Shipping Terminal and into the Guemes Channel to the northwest.

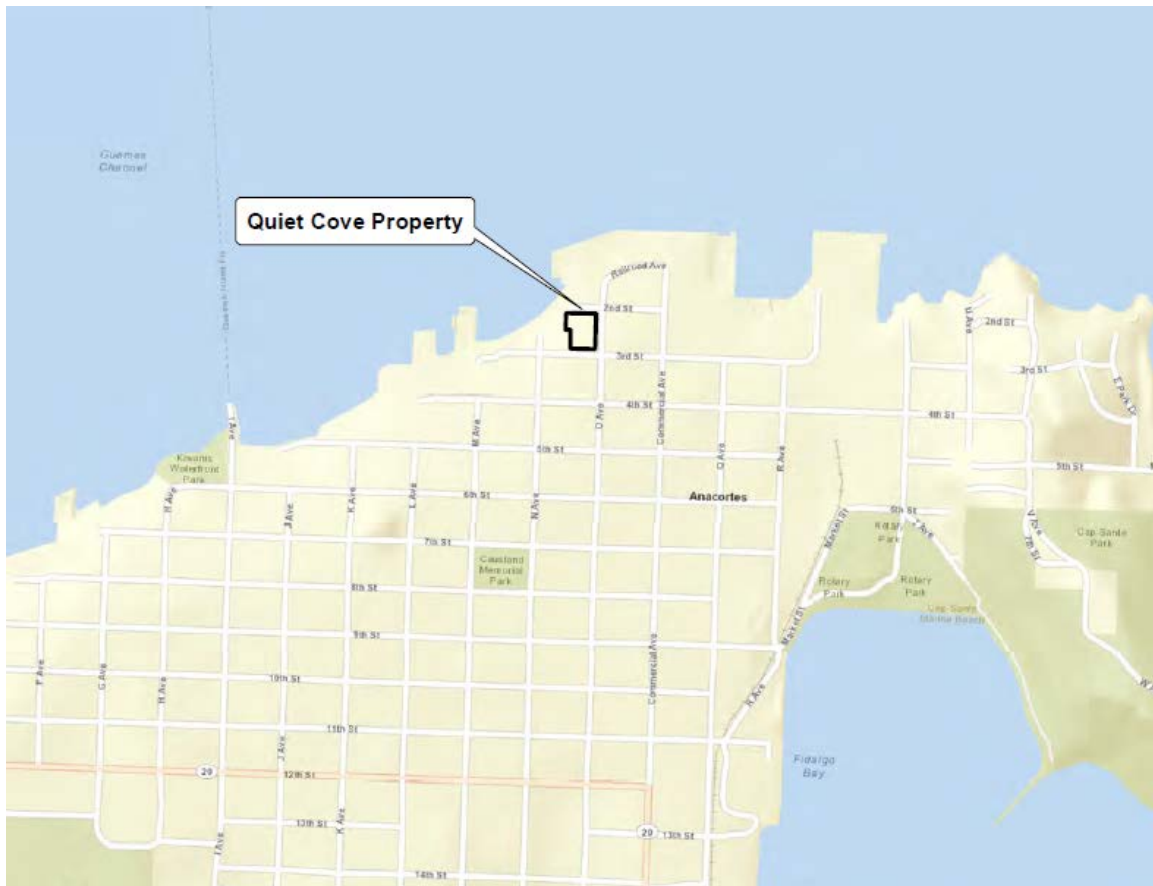


Figure 1: The Quiet Cove Site is shown in the above map, generally located at 202 O Avenue in Anacortes, Skagit County, WA.

General Site History and Contaminants

Quiet Cove sits along the east end of the Guemes Channel just northwest of Fidalgo/Padilla Bays. The Site began operating as a bulk fuel terminal and storage facility as early as 1909. The remnants from these operations (oil tanks, oil warehouse, filling shed, piping and more) were removed at an unknown date. Now, the Site's remaining buildings and pavement are used for storage space.

The Port purchased the upland area of the Site in July 2013 and performed an environmental investigation the following year.

This investigation found several contaminants exceeding accepted cleanup levels. Soil samples showed hydrocarbon and heavy metal contamination including:

- Benzene
- Toluene
- Ethylbenzene
- Xylenes
- Total petroleum hydrocarbons (TPHs)
- Carcinogenic Polycyclic Aromatic Hydrocarbons
- Naphthalenes
- Cadmium

Groundwater samples showed TPHs and arsenic.

In 2014, Ecology determined the Port is the PLP for the Site. Ecology and the Port will enter into an AO.

The Cleanup Process

Washington State's cleanup process and key opportunities for you to provide input are outlined in Figure 2 on page 12. The general cleanup process includes the following steps:

- Remedial Investigation (RI) – investigates the site for types, locations, and amounts of contaminants.
- Feasibility Study (FS) – identifies cleanup options for those contaminants.
- Cleanup Action Plan (CAP) – selects the preferred cleanup option and explains how cleanup will be conducted.

Each of these steps is generally documented in reports and plans that will be available for public review. Public comment periods of at least 30 calendar days are usually conducted for the following documents:

- Draft RI report
- Draft FS report
- Draft CAP

These comment periods may be conducted separately or combined.

Steps in the cleanup process and related documents are described in greater detail in the following subsections.

Interim Actions

Interim actions may be completed during the cleanup if required by Ecology. An interim action partially addresses the cleanup of a site, and may be conducted if:

- It is technically necessary to reduce a significant threat to human health or the environment.
- It corrects a problem that may become substantially worse or cost substantially more to fix if delayed.
- It is needed to complete another cleanup activity, such as design of a cleanup plan.

Overview of Draft Agreed Order

The Draft AO is a proposed agreement between Ecology and the PLP (the Port). It is a legal document between Ecology and the Port in which the Port agrees to provide remedial action at the Site where there has been a release or threatened release of hazardous substances.

The Draft AO describes studies the Port agrees to perform at the Site as well as guidance for future investigations and cleanup actions:

- **Draft Remedial Investigation/Feasibility Study (RI/FS)** – This document explains the work needed to identify and analyze contamination at the Site and provides an evaluation of cleanup alternatives for addressing residual contamination.
- **Draft Final Cleanup Action Plan (DCAP)** – This document uses RI/FS information to identify a preferred cleanup action at the Site and sets a schedule to remove and treat the contamination.

3.0: Community Profile

Community Profile

Anacortes is Skagit County's second largest city and its largest seaport. It is the principal city on Fidalgo Island. The current population is approximately 16,232 people (about 7,680 households)² situated within approximately 12 square miles. Located on Fidalgo/Padilla Bays, Anacortes has 12.5 miles of saltwater shoreline which support three Port of Anacortes marine terminals, a shipyard, several yacht and mid-size boat building and sales operations, and four private marinas. In addition to the City's modern educational and health care facilities, four freshwater lakes and 3,300 acres of city-owned forestland and parks create a rural character in the community. The City's 2013 labor workforce was more than 13,232, predominantly employed in manufacturing, accommodations/food service, retail and health care.³

Key Community Concerns

An important part of this Plan is to identify key community concerns for the cleanup Site. Many factors are likely to raise community questions, such as the amount of contamination, how much contamination has been cleaned up and what remains, and future use of the Site. Community concerns often change over time as new information is learned and questions are answered. Identifying site-specific community concerns at each stage of the cleanup process helps ensure that they are adequately addressed. On-going key community concerns will be identified for the Site through public comments and other opportunities, as detailed in Section 4.

² US Census Bureau, State & County QuickFacts, *available at* <http://www.census.gov/quickfacts/table/PST045214/5301990,00> (Accessed 09/22/15).

³ American Factfinder, City of Anacortes, Washington, *available at* <http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF> (Accessed 09/23/15).

4.0: Public Participation Opportunities

Ecology and the Port invite you to share your comments and participate in the cleanup in your community. As we work to meet our goals, we will evaluate whether this public participation process is successful. This section describes the public participation opportunities for the Site.

Measuring Success

We want this public participation process to succeed. Success can be measured, at least in part, in the following ways:

- Number of written comments submitted that reflect understanding of the cleanup process and the Site.
- Direct, in-person feedback about the site cleanup or public participation processes, if public meetings are held.
- Periodic updates to this Plan to reflect community concerns and responses.

If we are successful, this process will increase:

- Community awareness about plans for cleanup and opportunities for public involvement.
- Public participation throughout the cleanup.
- Community understanding regarding how their input will be considered in the decision-making process.

Activities and Information Sources

Ecology Contacts

Ecology is the lead contact for questions about the cleanup in your community. The Ecology staff person identified in this section is familiar with the cleanup process and activities at the Site. For more information about public involvement or the technical aspects of the cleanup, please visit our website at <https://fortress.wa.gov/ecy/gsp/Sitepage.aspx?csid=12482>, or contact:

Arianne Fernandez, Site Manager
Department of Ecology
Toxics Cleanup Program
PO Box 47600
Olympia, WA 98504-7600

Phone: (360) 407-7209
Email: Arianne.Fernandez@ecy.wa.gov

Ecology's Webpage

Ecology has created a webpage to provide convenient access to information. Documents such as the Draft AO are posted as they are issued during the investigation and cleanup process. Visitors to the webpage can find out about public comment periods and possible meetings; download, print, and read information; and submit comments via email. The webpage also provides links to detailed information about the MTCA cleanup process. The Quiet Cove webpage is available at the following address:

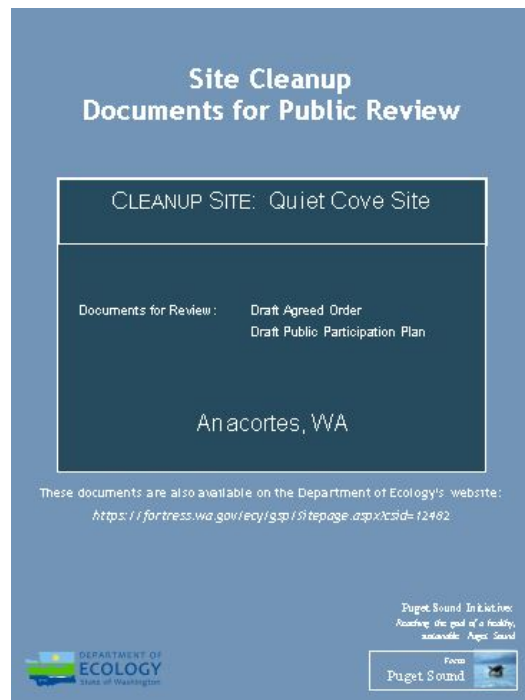
<https://fortress.wa.gov/ecy/gsp/Sitepage.aspx?csid=12482>

Information Centers/Document Repositories

The most comprehensive source of information about the Site is the information center, or document repository. Two repositories provide access to the complete list of site-related documents. All Site investigation and cleanup activity reports will be kept in print at those two locations and will be available for your review. They can also be requested on compact disk (CD). Document repositories are updated before public comment periods to include the relevant documents for review. Documents remain at the repositories throughout the investigation and cleanup. For the Site, the document repositories are:

- **Anacortes Public Library**
1220 10th Street
Anacortes, WA 98221
Phone: (360) 293-1910
Website: library.cityofanacortes.org
- **Department of Ecology Headquarters**
300 Desmond Drive
Lacey, WA 98503
By appointment. Please contact Carol Dorn
at (360) 407-7224 or
Carol.Dorn@ecy.wa.gov.

Look for document covers much like the illustration on the right.



Public Comment Periods

Public comment periods provide opportunities for you to review and comment on major documents, such as the Draft Consent Decree, Draft RI, Draft FS, Draft CAP and Draft Plan. The typical public comment period is 30 calendar days.

Notice of Public Comment Periods

Notices for each public comment period will be provided by local newspaper and by mail. These notices indicate the timeframe and subject of the comment period, and explain how you can submit your comments.

For the Site, a newspaper notice will be posted in the Anacortes American, Clamdigger, and Skagit Valley Herald.

Notices are also sent by regular mail to the local community and interested parties. The local community typically includes all residential and business addresses within one-quarter mile of the Site, as well as potentially interested parties such as public health entities, environmental groups, and business associations.

Fact Sheets

One common format for public comment notification is a fact sheet. Like the newspaper notice, fact sheets explain the timeframe and purpose of the comment period, but also provide background and a summary of the document(s) under review. Future fact sheets will be prepared at key milestones in the cleanup process.

MTCA Site Register

Ecology produces an electronic newsletter called the MTCA Site Register. This semi-monthly publication provides updates of the cleanup activities occurring throughout the state, including public meeting dates, public comment periods, and cleanup-related reports. Individuals who would like to receive the MTCA Site Register can sign up three ways:

- Call (360) 407-6848
- Send an email request to spre461@ecy.wa.gov
- Register online at http://www.ecy.wa.gov/programs/tcp/pub_inv/pub_inv2.html

Mailing Lists

Ecology maintains both email and regular mail distribution lists throughout the cleanup process. The lists are created from carrier route delineations for addresses within one-quarter mile of the Site; potentially interested parties; public meeting sign-in sheets; and

requests made in person or by regular mail or email. You may request to be on a mailing list by contacting the Ecology staff person listed earlier in this section.

Optional Public Meetings

A public meeting will be held during a comment period if requested by ten or more people, or if Ecology decides it would be useful. Public meetings provide additional opportunity to learn about the investigation or cleanup, and to enhance informed comment. If you are interested in a public meeting about the Site, please contact the Ecology staff listed earlier in this section.

Submitting Comments

You may submit comments by regular mail or email during public comment periods to the Ecology Site Manager listed earlier in this section.

Response to Comments

Ecology will review all comments submitted during public comment periods, and will modify documents as necessary. You will receive notice by regular mail or email that Ecology has received your comments, along with a general explanation about how the comments were addressed and where the revised document can be found.

Other

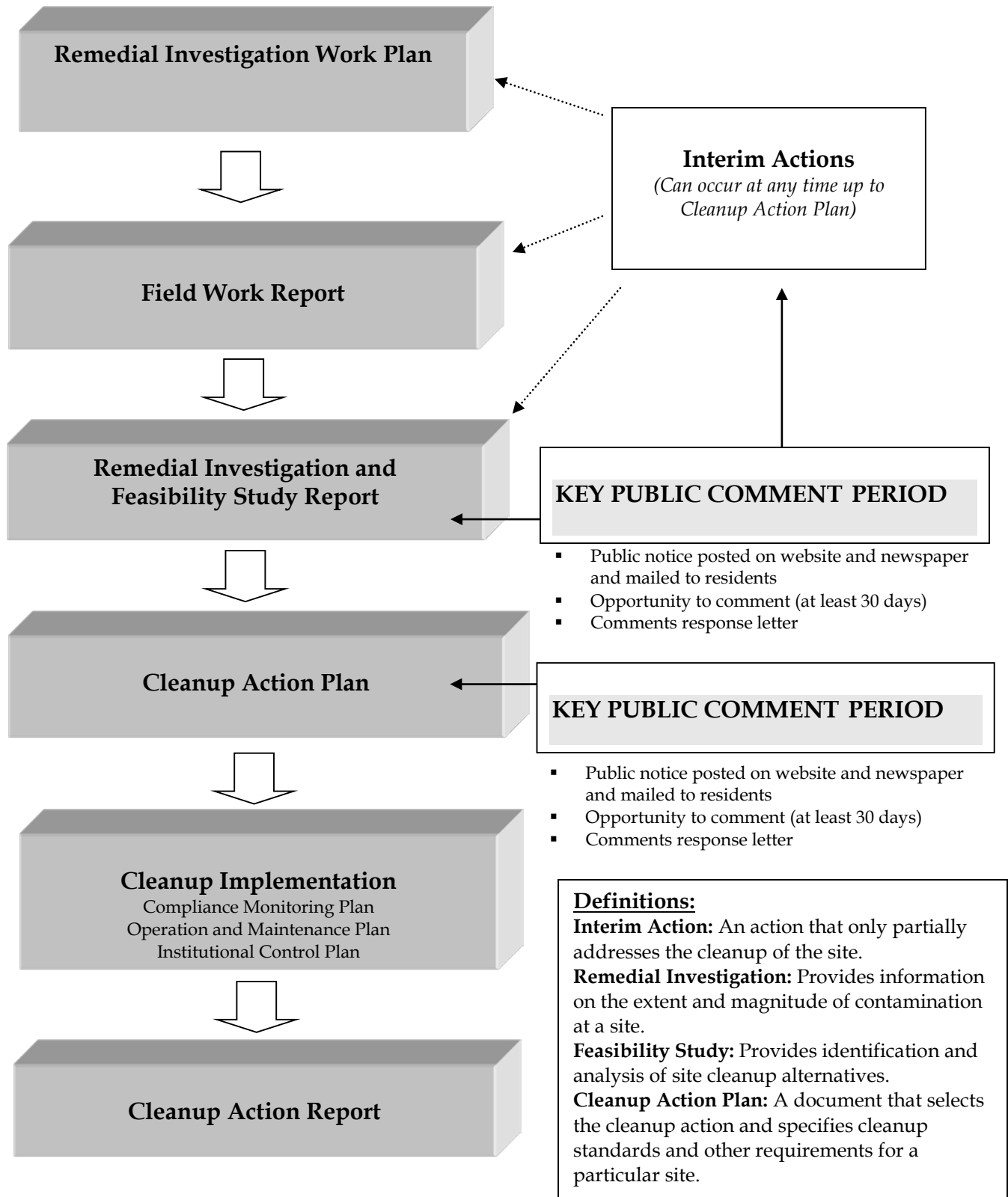
Ecology is committed to the public participation process and will consider additional means for delivering information and receiving comments, including combining public comment periods for other actions (such as those associated with the State Environmental Policy Act).

Public Participation Grants

You are eligible to apply for a Public Participation Grant from Ecology approximately every two years to provide funding for additional public participation activities. Those additional activities will not reduce the scope of the activities defined by this Plan. Activities conducted under this Plan would coordinate with the additional activities defined under the grant.

Visit www.ecy.wa.gov/programs/swfa/grants/ppg.html for more information about Ecology's Public Participation Grants.

Figure 2: Washington State Cleanup Process



Glossary

Cleanup: The implementation of a cleanup action or interim action.

Cleanup Action: Any remedial action except interim actions, taken at a site to eliminate, render less toxic, stabilize, contain, immobilize, isolate, treat, destroy, or remove a hazardous substance that complies with MTCA cleanup requirements, including but not limited to: complying with cleanup standards, utilizing permanent solutions to the maximum extent practicable, and including adequate monitoring to ensure the effectiveness of the cleanup action.

Cleanup Action Plan: A document that selects the cleanup action and specifies cleanup standards and other requirements for a particular site. The cleanup action plan, which follows the remedial investigation/feasibility study report, is subject to a public comment period. After completion of a comment period on the cleanup action plan, Ecology finalizes the cleanup action plan.

Cleanup Level: The concentration (or amount) of a hazardous substance in soil, water, air, or sediment that protects human health and the environment under specified exposure conditions. Cleanup levels are part of a uniform standard established in state regulations, such as MTCA.

Cleanup Process: The process for identifying, investigating, and cleaning up hazardous waste sites.

Consent Decree: A formal legal document that requires the PLP to carry out specifically identified cleanup actions.

Contaminant: Any hazardous substance that does not occur naturally or occurs at greater than natural background levels.

Feasibility Study: Provides identification and analysis of site cleanup alternatives and is usually completed within a year. The entire Remedial Investigation/Feasibility Study (RI/FS) process takes about two years and is followed by the cleanup action plan. Remedial action evaluating sufficient site information to enable the selection of a cleanup action plan.

Hazardous Site List: A list of ranked sites that require further remedial action. These sites are published in the Site Register.

Interim Action: Any remedial action that partially addresses the cleanup of a site. It is an action that is technically necessary to reduce a threat to human health or the environment by eliminating or substantially reducing one or more pathways for exposure to a hazardous substance at a facility; an action that corrects a problem that may become substantially worse or cost substantially more to address if the action is delayed; an action

needed to provide for completion of a site hazard assessment, state remedial investigation/feasibility study, or design of a cleanup action.

Model Toxics Control Act: Refers to RCW 70.105D. Voters approved it in November 1988. The implementing regulation is WAC 173-340 and was amended in 2001.

Public Notice: At a minimum, adequate notice mailed to all persons who have made a timely request of Ecology and to persons residing in the potentially affected vicinity of the proposed action; mailed to appropriate news media; published in the local (city or county) newspaper of largest circulation; and the opportunity for interested persons to comment.

Public Participation Plan: A plan prepared under the authority of WAC 173-340-600 to encourage coordinated and effective public involvement tailored to the public's needs at a particular site.

Release: Any intentional or unintentional entry of any hazardous substance into the environment, including, but not limited to, the abandonment or disposal of containers of hazardous substances.

Remedial Action: Any action to identify, eliminate, or minimize any threat posed by hazardous substances to human health or the environment, including any investigative and monitoring activities of any release or threatened release of a hazardous substance, and any health assessments or health effects studies conducted in order to determine the risk or potential risk to human health.

Remedial Investigation: Any remedial action that provides information on the extent and magnitude of contamination at a site. This usually takes 12 to 18 months and is followed by the feasibility study. The purpose of the Remedial Investigation/Feasibility Study is to collect and develop sufficient site information to enable the selection of a cleanup action.

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NOTICE OF APPLICATION including written comment period & PUBLIC HEARING

SCAN HERE TO VIEW
Application Materials:



File Number: SDP-2023-0002
Property Owner: Port of Anacortes
Applicant: Kevin Anderson, Port Environmental Specialist
100 Commercial Ave. – 360.770.5194 –
kevin.anderson@portofanacortes.com

Date of Application: February 27, 2023

Date of Completeness: March 10, 2023

Project Location: 2nd Street west of 'O' Avenue and north to Curtis Wharf - 116 'O' Ave (P55355 & P31510)

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City Contact: Grace Pollard, Senior Planner; Phone: (360) 588-8231

Email: gracep@cityofanacortes.org; City of Anacortes Planning Dept., P.O. Box 547, Anacortes, WA 98221
Written comments must be substantive and include the name and address of the commentor.

Appeal: Appeals of a final decision of the City of Anacortes or the Department of Ecology shall be filed within twenty-one days of the date of filing of the final permit and shall be heard by the Shorelines Hearings Board pursuant to the procedures and timelines of RCW 90.58.180.



April 5, 2023

Legend



County Boundary

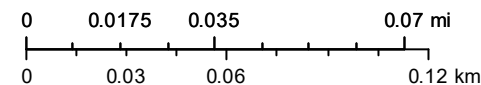
City Names

Road Labels

Hydro Labels

Regional Labels

1:2,257



Data Accuracy Warning: All GIS data was created from available public records and existing map sources. Map features have been adjusted to achieve a best-fit registration. While great care was taken in this process, maps from different sources rarely agree as to the precise location of geographic features. Map discrepancies can be as great as 300 feet.

PNumber	OwnerName	OwnerAddress	OwnerCity	OwnerState	OwnerZip	SitusStNo	SitusStName	SitusCSZ
P129811	PACIFIC DREAM SEAFOOD INC	830 KLINE I	BELLINGHAM	WA	98226	116	O AVE	ANACORTE WA 98221
P31510	PORT OF ANACORTES	100 COMMERCIAL AVE	ANACORTE	WA	98221	116	O AVENUE	ANACORTE WA 98221
P31511	TRIDENT SE	5303 SHILSHOLE AVE NW	SEATTLE	WA	98107			
P31512	CITY OF ANACORTES	PO BOX 547	ANACORTE	WA	98221			
P32866	PORT OF ANACORTES	100 COMMERCIAL AVE	ANACORTE	WA	98221	100	COMMERCIAL AVE	ANACORTE WA 98221
P55032	PORT OF ANACORTES	100 COMMERCIAL AVE	ANACORTE	WA	98221			
P55033	PORT OF ANACORTES	100 COMMERCIAL AVE	ANACORTE	WA	98221	1012	2ND ST	ANACORTE WA 98221
P55034	PORT OF ANACORTES	100 COMMERCIAL AVE	ANACORTE	WA	98221	100	COMMERCIAL AVE	ANACORTE WA 98221
P55035	PORT OF ANACORTES	100 COMMERCIAL AVE	ANACORTE	WA	98221	1008	3RD STREET	ANACORTE WA 98221
P55036	PORT OF ANACORTES	100 COMMERCIAL AVE	ANACORTE	WA	98221	1008	3RD STREET	ANACORTE WA 98221
P55037	PORT OF ANACORTES	100 COMMERCIAL AVE	ANACORTE	WA	98221	1008	3RD STREET	ANACORTE WA 98221
P55038	PORT OF ANACORTES	100 COMMERCIAL AVE	ANACORTE	WA	98221	1008	3RD STREET	ANACORTE WA 98221
P55039	PORT OF ANACORTES	100 COMMERCIAL AVE	ANACORTE	WA	98221	1008	3RD STREET	ANACORTE WA 98221
P55040	PORT OF ANACORTES	100 COMMERCIAL AVE	ANACORTE	WA	98221	1008	3RD STREET	ANACORTE WA 98221
P55341	SOROPTIMIST CLUB OF	PO BOX 654	ANACORTE	WA	98221	1101	3RD ST	ANACORTE WA 98221
P55342	SOROPTIMIST CLUB OF	PO BOX 654	ANACORTE	WA	98221	1107	3RD ST	ANACORTE WA 98221
P55343	MORRISON BRENT J	1109 3RD ST	ANACORTE	WA	98221	1109	3RD ST	ANACORTE WA 98221
P55345	PORT OF ANACORTES	100 COMMERCIAL AVE	ANACORTE	WA	98221	1111	3RD ST	ANACORTE WA 98221
P55346	PORT OF ANACORTES	100 COMMERCIAL AVE	ANACORTE	WA	98221	1117	3RD ST	ANACORTE WA 98221
P55354	PORT OF ANACORTES	100 COMMERCIAL AVE	ANACORTE	WA	98221	202	O AV	ANACORTE WA 98221
P55355	PORT OF ANACORTES	100 COMMERCIAL AVE	ANACORTE	WA	98221	100	O AV	ANACORTE WA 98221
P55357	GUEMES CHANNEL CO	PO BOX 409	ANACORTE	WA	98221	1110	3RD ST	ANACORTE WA 98221
P55358	PORT OF ANACORTES	100 COMMERCIAL AVE	ANACORTE	WA	98221			
P55359	PORT OF ANACORTES	100 COMMERCIAL AVE	ANACORTE	WA	98221			
P55360	GN OP PROP							
P55361	PORT OF ANACORTES	100 COMMERCIAL AVE	ANACORTE	WA	98221	116	O AVENUE	ANACORTE WA 98221
P55363	TRIDENT SE	5303 SHILSHOLE AVE NW	SEATTLE	WA	98107			
P55365	CITY OF ANACORTES	PO BOX 547	ANACORTE	WA	98221			
P55366	TRIDENT SE	5303 SHILSHOLE AVE NW	SEATTLE	WA	98107			
P55367	TRIDENT SE	5303 SHILSHOLE AVE NW	SEATTLE	WA	98107			
P55368	TRIDENT SE	5303 SHILSHOLE AVE NW	SEATTLE	WA	98107			

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CITY OF ANACORTES
PO BOX 547
ANACORTES, WA 98221

NOTICE OF APPLICATION including written comment period & PUBLIC HEARING

AD #	DESCRIPTION	START	STOP	TIMES	AMOUNT
357610	NOTICE OF APPLICATION	04/12/23	04/12/23	2	\$186.76

File Number: SDP-2023-0002

Property Owner: Port of Anacortes

Applicant: Kevin Anderson, Port Environmental Specialist

100 Commercial Ave. -
360.770.5194 - kevin.anderson@portofanacortes.com

Date of Application: February 27, 2023

Date of Completeness: March 10, 2023

Project Location: 2nd Street west of 'O' Avenue and north to Curtis Wharf - 116 'O' Ave (P55355 & P31510)

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SEPA Review: The Port of Anacortes, as lead agency, has determined that this project is categorically exempt from SEPA Review based on the criteria described in WAC 197.11

Payments:

Date	Method	Card Type	Last 4 Digits	Check	Amount
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Discount: **\$0.00**
Surcharge: **\$0.00**
Credits: **\$0.00**

Gross: **\$186.76**
Paid Amount: **\$0.00**

Amount Due: \$186.76

We Appreciate Your Business!

AD# 357610

scribed in WAC 197-11-800(2)(d)(vii) and (viii).

Existing Environmental Documents: Geotechnical Assessment, Remedial Investigation/Feasibility Study (RIFS) Work Plan, Cultural Resources Monitoring Report, SEPA determination.

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viewed at anacorteswa.gov/700.

City Contact: Grace Pollard, Senior Planner; Phone: (360) 588-8231 Email: gracep@cityofanacortes.org; City of Anacortes Planning Dept., P.O. Box 547, Anacortes, WA 98221

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**Published
April 12, 2023
AA-357610**

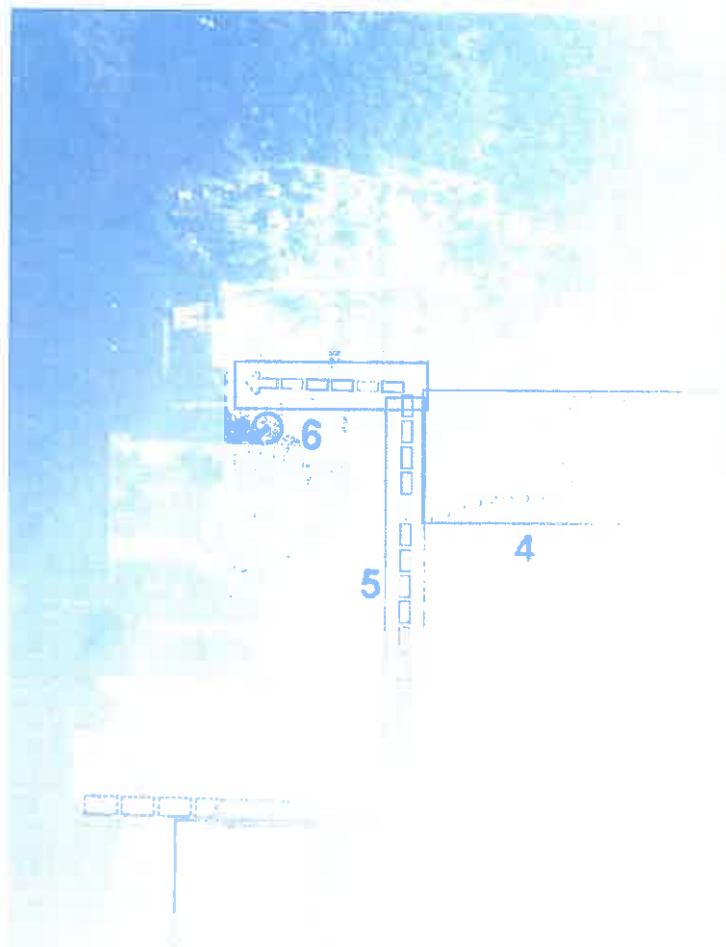
Libby Grage

From: stevel@cityofanacortes.org
Sent: Friday, May 12, 2023 9:33 AM
To: Grace Pollard; Libby Grage
Cc: Tim Hohmann
Subject: Port of Anacortes - Curtis Warf Project

Grace,

Per our internal meeting conversation regarding conditions of approval:

- Storm Water, including Water Quantity and Quality will need to comply with the City of Anacortes Drainage Code, Section 19.76 – Storm Water.
 - The project is encouraged to utilize Low Impact Development Techniques.
 - This project is located in Drainage Basin F4.
 - The applicant will need to use the Applicability Flow Chart to determine storm water requirements
 - In order to declare Flow Control Exemption, the project will be required to do a downstream analysis to determine sufficient capacity of the conveyance system utilizing the 2014 WWHM Model.
- Minimum Requirements 1 through 9 are subject to 3rd Party review and is paid for by the applicant.
- The Storm Drainage Report format (Dated 09-15-2022) can be found on the City of Anacortes Website. The report can be located in either Public Works sections of the website. For the word version, please contact Steven Lange at stevel@cityofanacortes.org.
- The intersection of 2nd Street and O Avenue will be paved with City participation. This work can be done with a Memorandum of Understanding, or the City can work directly with the General Contractor for the proposed. Work by using a City\Developer Agreement.
- Due to the paving of the 2nd Street and Q Avenue intersections, the sidewalk ramps will need to meet the most current requirements from the most recent ProAg Manual by FHWA.



Port of Anacortes

Integrated Approach to Marine Public Access

October, 2003

MAKERS Architecture + Urban Design

Port of Anacortes

Integrated Approach to Marine Public Access

October 2003

Prepared by:

MAKERS architecture and urban design

1425 Fourth Avenue, Suite 901

Seattle, Washington 98101

(206) 652-5080

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Introduction

This is the Port of Anacortes' (Port) plan for the location, schematic design and phasing of public access projects in and around its marine properties near downtown Anacortes. The Plan was prepared with Port and City of Anacortes (City) staff input and the involvement of numerous citizens concerned about the future of public access in Anacortes.

This Plan is intended to satisfy the public access requirements associated with development of the Port's marine properties identified in this plan. Implementation timing will be determined by the timing for development of the associated marine development project. Once the Port obtains the required permits for the marine project, construction will begin on both the marine and associated public access projects.



Figure 1.
Aerial View of
Central
Anacortes

Purpose

The Port is required to include public access as part of each development project within 200 feet of the shoreline, unless such access is shown to be incompatible due to reasons of safety, security, or impact to the shoreline environment. This requirement is included in Washington State's *Proposed Shoreline Management Guidelines*.

The Anacortes City Council adopted the City of Anacortes Shoreline Master Plan in June 1983. Like the State's guidelines, this plan encourages public access at port and industrial sites, if such access would not interfere with operations or endanger public health and safety. Together, the State's Shoreline Management Guidelines and the City's Shoreline Master Plan establish public access requirements that the Port must meet in order to develop its properties within the shoreline zone.

The City of Anacortes City Council adopted the Anacortes *Parks and Recreation Comprehensive Plan* in 1995. This plan describes the City's vision of a "City-in-a-Park" and highlights opportunities in the community to help achieve this vision. The Port's Public Access Plan is intended to support these goals and be consistent with the City's vision as articulated in its *Parks and Recreation Plan*.

Why an Integrated Approach?

The State's shoreline policies encourage public access planning, where planning will result in a more effective public access system and focus public access at the most desired locations. Creation of a public access system is especially appropriate in this case, where there is an opportunity to provide connections to Guemes Channel, Fidalgo Bay, and downtown while minimizing interference with existing industrial operations or future economic development opportunities. Because the Port plans to develop future projects that will require public access, it is also beneficial for the Port to plan for public access in a comprehensive manner. When implemented, this integrated approach to public access will result in public access opportunities at appropriate locations, meet all State and City public access requirements, and minimize interference with existing and future marine development.

Why Now?

Anacortes is at a crossroads – a time of significant activity planned in and around downtown and at the Port's properties along the Guemes Channel and Fidalgo Bay shorelines. Figure 2 illustrates the projects already in process, poised to begin, or being planned in this area. Each project will bring its individual benefits to Anacortes. But, if looked at as part of a bigger picture, these projects are an opportunity.

The Port believes public access planning is the way to harness the energy of these individual projects into a system that would:

- Improve pedestrian access to and within the Cap Sante Boat Haven.
- Improve the pedestrian link between Commercial Avenue and the Cap Sante Boat Haven.
- Enhance the native vegetation and provide pedestrian access to the wetland area just north of the Cap Sante Boat Haven.
- Improve connections to the Guemes Channel and Fidalgo Bay at "N" Avenue Park and "T" Avenue Street End.
- Enhance views into Port and Port-Tenants' activities at Pier 2.
- Interpret historic and current marine-related industry on Port property.

The Port has begun an "Integrated Approach to Public Access" based on its belief that it is time to explore "**What If?**" instead of "**Why Not?**". The intended result is a plan that, when implemented, will strengthen pedestrian connections, improve waterfront access, and educate the public regarding the community's maritime economy.



*Figure 2.
Projects Currently
Planned Around the
Study Area*

Contents and Organization

This document outlines the Port of Anacortes' public access plan linked to and coordinated with its maritime development projects. It also includes an implementation strategy, likely project phasing, and processes for amending the plan. The document is divided into the following sections: Introduction, Background Study, Public Access Plan, Design Elements for Public Access Plan, and Plan Implementation.

Plan Summary

The Plan includes a total of seven public access sites. Improvements at each site vary and include such things as constructing walkways, adding pedestrian amenities and landscaping. Public access improvements contained in this plan are conceptual only and may evolve during design. The intent of the improvements and general site locations will remain as stated in the plan. This plan is coordinated with several other planning efforts occurring in parallel, including planning at the Cap Sante Boat Haven and the Supplemental Environmental Impact Statement for the Pier 1 Redevelopment Project.

The cost of all public access improvements specified in the Plan is estimated to be approximately \$430,000 in 2003 dollars. Marine projects at specific sites and associated public access improvements are summarized on page 4.

Annual site maintenance costs are estimated at between 4 percent and 5 percent of project costs. Port and City responsibility for maintaining public access improvements will be determined as individual projects are permitted.

Public Access Sites & Program Elements		Associated Marine Development	
		Cap Sante Boat Haven Esplanade a. Extend the esplanade to B-Dock b. Connect north and south esplanade with a painted pathway	Cap Sante Boat Haven West Basin entrance and turn-around
		11th Street Connection a. Add vertical design elements b. Coordinate special paving c. Highlight marina gateway	Cap Sante Boat Haven West Basin entrance and turn-around
		Tommy Thompson Parkway (TTP) a. Realign and improve TTP between 9 th & 11 th Streets	Development of the area between 9 th and 11 th Streets at the Cap Sante Boat Haven
		Wetland Area a. Enhance wetland area b. Link to the Boat Haven c. Buffer surrounding uses d. Consider property swap with the City	Cap Sante Boat Haven North Basin development
		4th Street Corridor a. Create a pedestrian link on south side of 4 th Street b. Improve the sidewalk with planting strip and street trees c. Enhance the buffer landscaping on the south side of Pier 2	Pier 1 Redevelopment Project
		"T" Avenue Street End a. Add sidewalk on west side of "T" Avenue b. Buffer western edge of Pier 2 with landscaping c. Treat the noise wall surface with landscaping and/or mural d. Incorporate a Pier 2 and aquatic mitigation site viewing area e. Incorporate Guemes Channel viewing area where appropriate	Pier 1 Redevelopment Project Property east of Pier 2 development
		"N" Avenue Beach Connection a. Identify the gateway intersection b. Upgrade the 3 rd Street sidewalk and add pedestrian amenities	Curtis Wharf Redevelopment

Table 1



Project Implementation Summary

The development of each public access site is triggered by the development of one of the specific marine projects listed on the facing page. For example, the table shows that improvements to the Fourth Street Corridor and projects a-d of the “T” Avenue Street End will be developed when the Port and its tenant implement the Pier 1 Redevelopment Project.

The first phase of public access improvements are expected to be implemented as the Port moves forward with the Pier 1 Redevelopment Project and with improvements to the Cap Sante Boat Haven West Basin entrance and turn-around. However, modifications may be made to the phasing scheme should the order of Port development projects change. In addition, as business opportunities emerge, the Port may change the improvements now slated for their marine properties. However, these changes in use will not affect the public access to be provided. The Port will remain committed to developing the public access improvements as specified in this plan as Port marine development proceeds. It is recognized, however, that circumstances can arise which call for modification or changes in the Plan provisions. Detailed procedures for handling these departures from the Plan are described in the Implementation chapter.

Once approved, this plan is intended to satisfy the City’s public access requirement for shoreline permits and street vacations associated with marine development projects on the properties indicated in the Plan. It is also intended to constitute full compensation to the City for the street vacations required to implement marine projects in this Plan. It should be pointed out that approval of this Plan does not change the procedural requirements of street vacations or provisions of the Shoreline Master Plan for any matters except public access.

The plan, when implemented, will enhance the quality of public access in central Anacortes, and at the same time facilitate the Port’s marine development in this area.

Background Study

Planning Considerations

Balance of Uses

The City of Anacortes Shoreline Master Plan encourages public access at Port sites, as long as this access does not interfere with operations or endanger public health and safety. As part of its integrated approach, the Port is committed to balancing health, safety, and access to the waterfront.

Coordination with City Planning

The City's vision for a "City-in-a-Park" is contained in the *City of Anacortes Parks and Recreation Plan* (1995), which describes the City's vision. As stated in this plan, City goals include:

■ **Guemes Channel Waterfront and Territorial Views.**

The City identifies signing the area to identify views, businesses and activities as an opportunity along the Guemes Channel waterfront. These improvements could contribute to the development of a larger walking trail system.

■ **Rail Corridor/Linear Park.** Based on the successful preservation of the Burlington Northern Railroad line, which enters the city from the east along Fidalgo Bay, the City would like to develop the old rail line into a linear park. This linear park would include pedestrian/bike trails, planting of native trees and shrubs, view points, mini-parks, signage, benches, and access points to streets and public facilities, a causeway developed as a fishing pier, view point, and trail connections to March Point and east into Skagit County.

■ **Marina/Harbor.** The City would like to improve the connection between the marina at the Cap Sante Boat Haven with the central business district in order to enhance visibility and patronage for both sides. As stated in the *Parks and Recreation Plan*, "Extending strong street connections from the west businesses and neighborhoods to the marina will improve pedestrian and vehicular access. The marina area will also serve as a terminus to the linear park and 'Rails to Trails' project."

■ **Connections: Loop Trails, Walks and Pathways.** The Comprehensive Plan proposes to connect the wealth of parks, open spaces, school grounds, and other public facilities and city land by means of open space corridors, walkways, trails, and other accessible means. Such connections would enhance the benefit and function of each park and public property as well as providing safe park access.

The *Parks and Recreation Plan* also identifies ways for the Port of Anacortes to participate in creating the City-in-a-Park vision. These are listed below:

- Create views into Port activity.
- Allow water access, visual and physical.
- Create an interpretive program to explain and make recognizable the Port and port-sponsored activity.
- Continue interactive programs and community sponsorship.

Study Area

The plan's study area, shown in Figure 3, encompasses the Port's marine properties on Guemes Channel and Fidalgo Bay. Specifically, the study area is bounded by the Guemes Channel on the north, the Port's property lines east of Pier 2 and at the Cap Sante Boat Haven on the east and south, and the Curtis Wharf property line on the west. Where appropriate, the plan includes connections to shoreline or park areas immediately outside the study area.

The study area contains a high percentage of publicly owned land. (See Figure 4.) This public ownership creates a unique opportunity to coordinate public access and connections to the shoreline without impacting private property. There are numerous cases throughout the plan where there are real estate implications of plan improvements. The Port and City will need to cooperatively address these real estate implications in order to facilitate plan implementation. Where known, these areas have been highlighted in the Plan.

The study area is close to several existing parks, numerous individual viewpoints, destinations, attractions, and accessible waterfront. These existing amenities are illustrated in Figure 5.

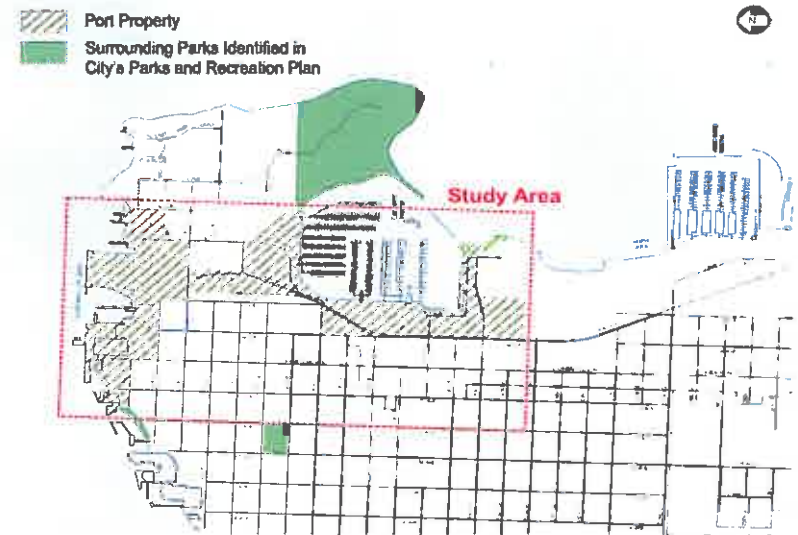


Figure 3. Study Area

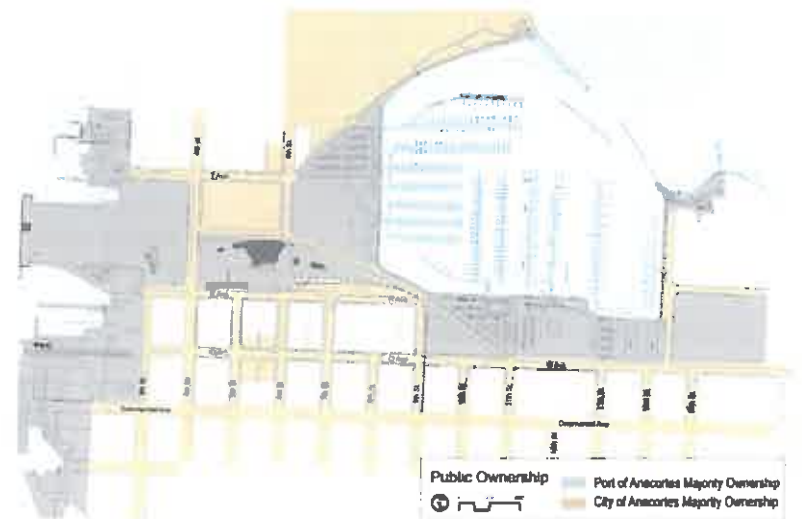


Figure 4. Public Ownership

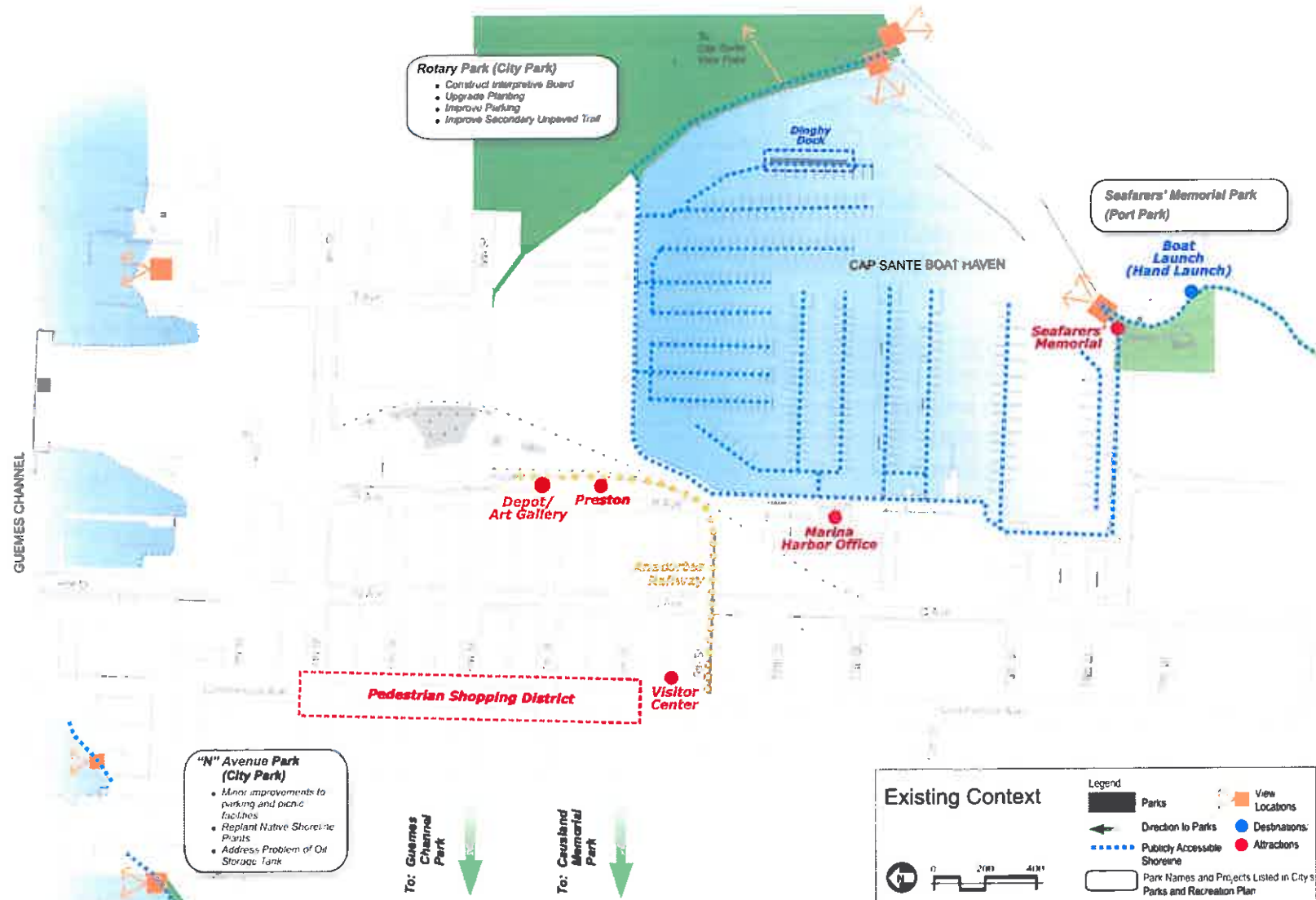


Figure 5. Site Analysis Map

Planning Process

Public access planning began in early 2002. After examining the area context and existing City plans, the Port and its planning team met with or interviewed individual project stakeholders to brainstorm ideas and discuss concerns. An initial public access concept resulted from these interviews.

The Port presented its initial concept to the community at an Open House on August 1, 2002, held in conjunction with a Scoping Meeting for the Pier 1 Redevelopment Project. This Open House provided a forum for interested community members and project stakeholders to discuss their ideas and concerns, to ask questions about the initial concept, and to make suggestions for incorporation into the plan.

Attendees were also given an opportunity to prioritize elements of the initial concept. Participants were asked to rate each element as: “Very Important,” “Important, Pursue Aggressively,” “Good Idea, Do when Opportunity Arises,” “Neutral or Unsure,” or “Bad Idea.” Items rated as “Very Important” or “Important/Pursue Aggressively” by the most attendees were considered high-priority projects for analysis in this plan.

Participants identified the following projects as high priorities:

- Enhancing the wetland area just west of the City’s wastewater treatment plant.
- Improving the old Burlington Northern rail corridor between the existing wetland area and the wastewater treatment plant as a public walkway.
- Landscaping a buffer around the Dakota Creek Industries shipyard.
- Creating a symbolic “Gateway to the Port” at the 3rd Street and Commercial Avenue intersection.
- Providing some type of platform for viewing the shipyard and Guemes Channel.
- Rerouting and improving the Tommy Thompson Parkway where it diagonally bisects a portion of the Cap Sante Boat Haven.

Where appropriate, these projects have been analyzed and are incorporated in the recommended public access plan.

The planning team and Port staff then refined the initial concept, with the goal of balancing community priorities, safety concerns, functional issues, and economic feasibility. The following section contains the result of this refinement: the Port’s Public Access Plan.

Public Access Plan

The public access plan builds upon the numerous amenities, viewpoints, and projects existing or planned for the study area. It provides a coordinated pedestrian link to Fidalgo Bay, downtown Anacortes, and the Guemes Channel. It also highlights a maritime gateway at the entrance of the Cap Sante Boat Haven. The public access plan and its components are illustrated in Figure 7 on page 11.

Plan recommendations are divided into seven focus areas. These areas are illustrated in Figure 6. The background, goals, and specific recommendations for each focus area are described and illustrated on the following pages.

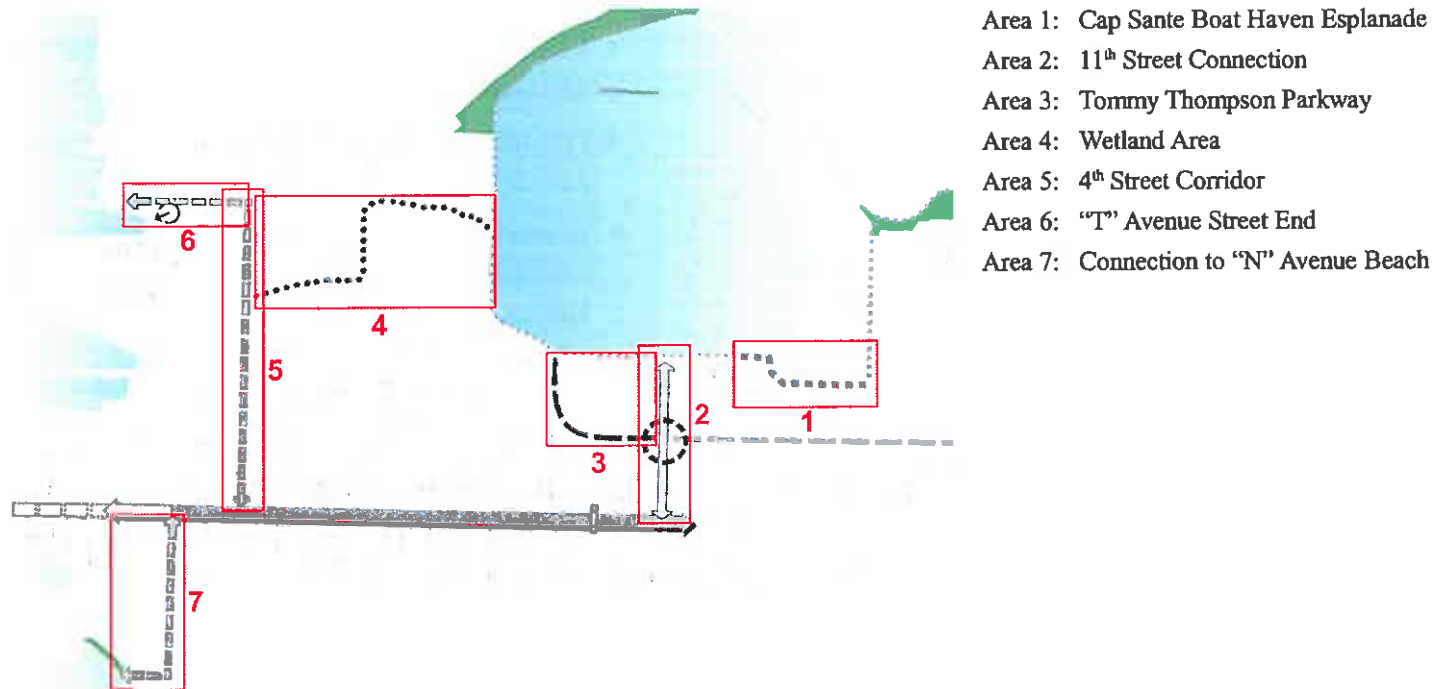


Figure 6. Public Access Focus Areas

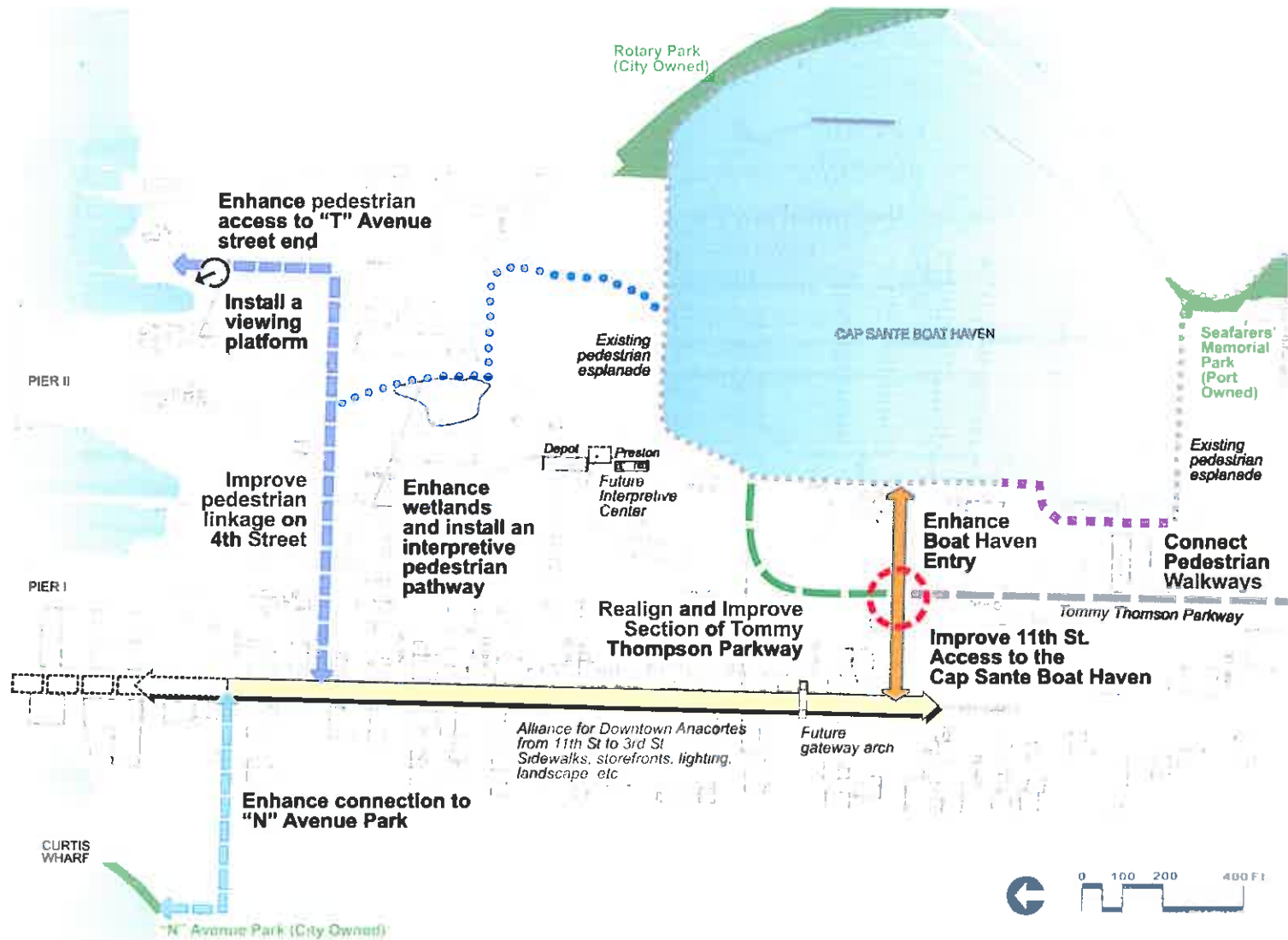
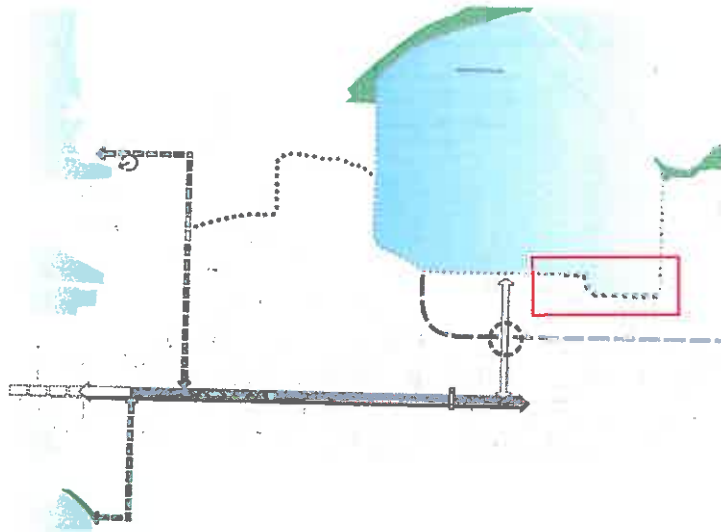


Figure 7. Public Access Plan Components

Area 1: Cap Sante Boat Haven Esplanade



*Figure 8.
Aerial View of the
Southwest Basin*



*Figure 9.
View of Web Lockers
and Working Area*



Background

The Cap Sante Boat Haven offers ample public access opportunities, since the marina and its docks are open to the public. Additionally, there is a pedestrian esplanade, which allows the public to stroll along the water and view boating activities and Fidalgo Bay. The esplanade consists of a north and south portion separated by an unimproved portion between the existing travel lift dock and Seafarers' Way. This area between the esplanades is currently home to a variety of maritime activities, including commercial fishing, pallet-sized cargo loading, and boat repair.



*Figure 10. Area without the Esplanade near
the Web Lockers and "T" Dock*

Goals

- Provide a continuous walkway adjacent to the water at the Cap Sante Boat Haven, coordinated with improvements to the West Basin as envisioned in the Cap Sante Boat Haven Master Plan.
- Minimize disruption to users of B- and T-docks.

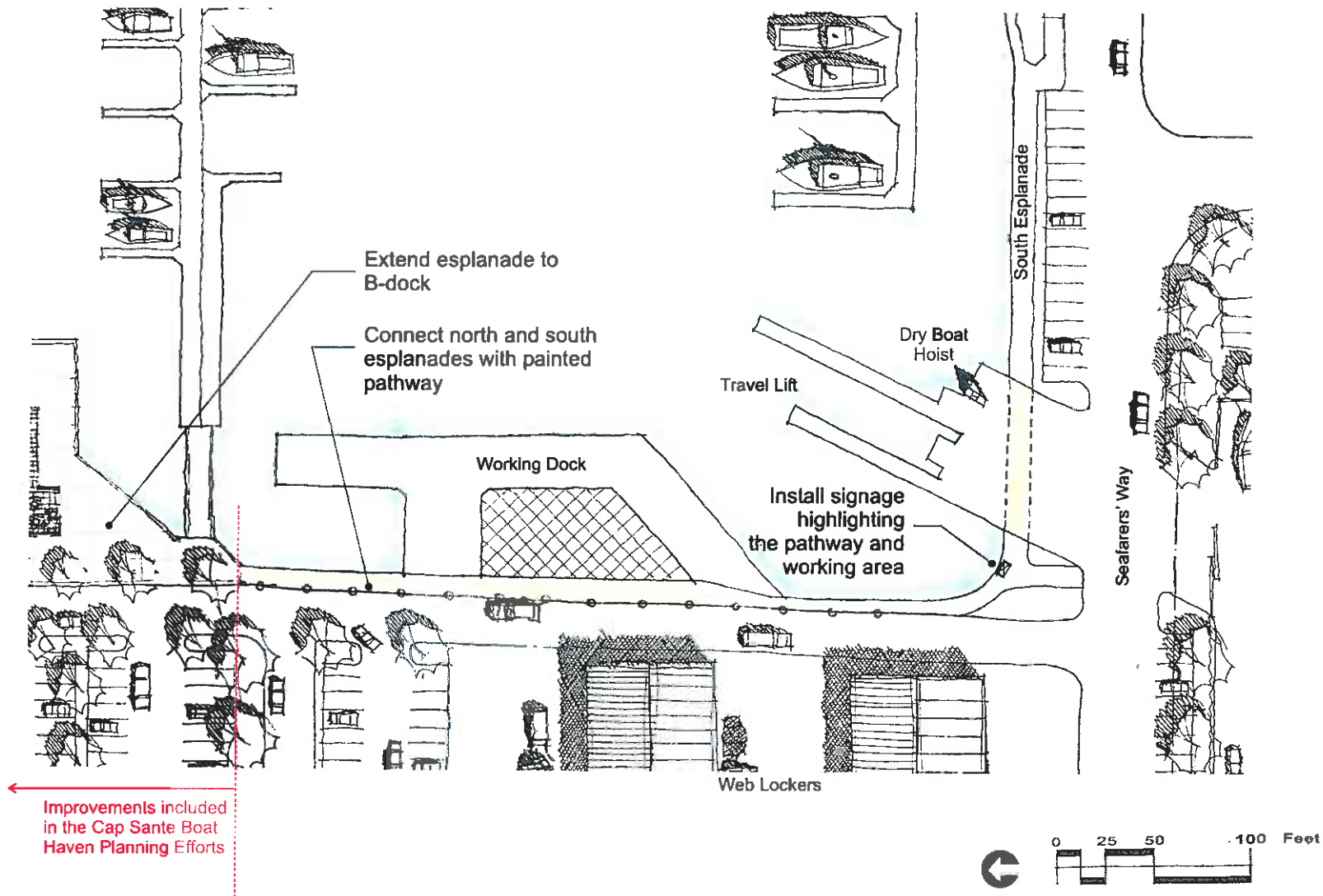


Figure 11. Cap Sante Boat Haven Esplanade Improvements Plan

Recommendations

Extend the Esplanade to B-Dock

Extending the existing pedestrian esplanade south to B-dock will provide a pleasant and consistent walking environment all the way from Rotary Park. The design, railings, and lighting used for this portion will be consistent with the design standards being developed as part of the Cap Sante Boat Haven Master Plan. These improvements are not included in the conceptual cost of this public access element, as they are included in Port's Cap Sante Boat Haven project budget.

Connect North and South Esplanades with a Painted Pathway

Painting a pathway and installing the plastic markers from the south side of B-dock to the south esplanade along Seafarers' Way will subtly guide the public through a working area and maintain direct waterfront access. In addition, installing signage will help alert pedestrians to the commercial activity and guide them to the formal esplanade.

Conceptual Cost

\$4,300

Detailed construction cost estimates are included in the Appendix.



Figure 12.
Existing Esplanade in the
West Basin

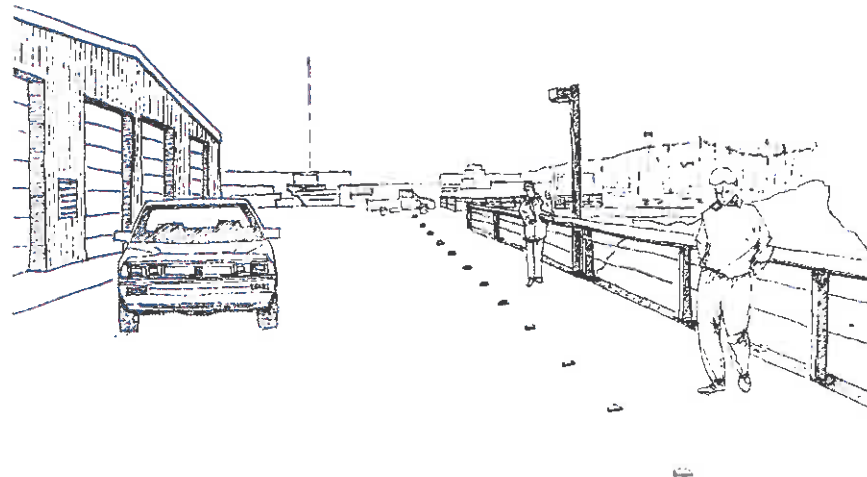
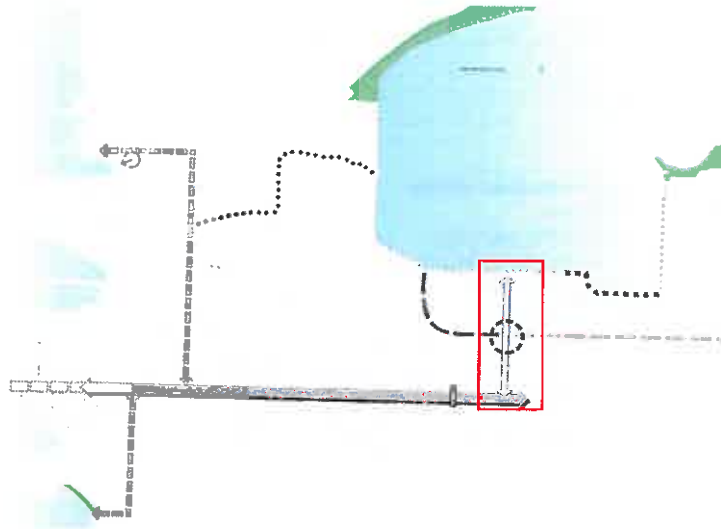


Figure 13.
Conceptual View of Painted Pathway

Area 2: 11th Street Connection



*Figure 14.
Existing 11th Street
Looking West from "Q"
Avenue*



*Figure 15.
Existing Cap
Sante Boat
Haven Entry Sign*



Background

Eleventh Street links Commercial Avenue, Anacortes' downtown commercial zone, and the main entrance to the Cap Sante Boat Haven. The street lacks pedestrian amenities and does not encourage pedestrian traffic between Commercial Avenue and the marina.



Figure 16. Existing Cap Sante Boat Haven Entry

Goals

- Encourage pedestrian traffic between downtown Anacortes and the Cap Sante Boat Haven.
- Create a gateway entry to the Cap Sante Boat Haven that is recognizable from Commercial and "Q" Avenues.
- Coordinate improvements with the planning at the Cap Sante Boat Haven.
- Encourage the City to provide a pedestrian crosswalk across "Q" Avenue on the north side of 11th Street.

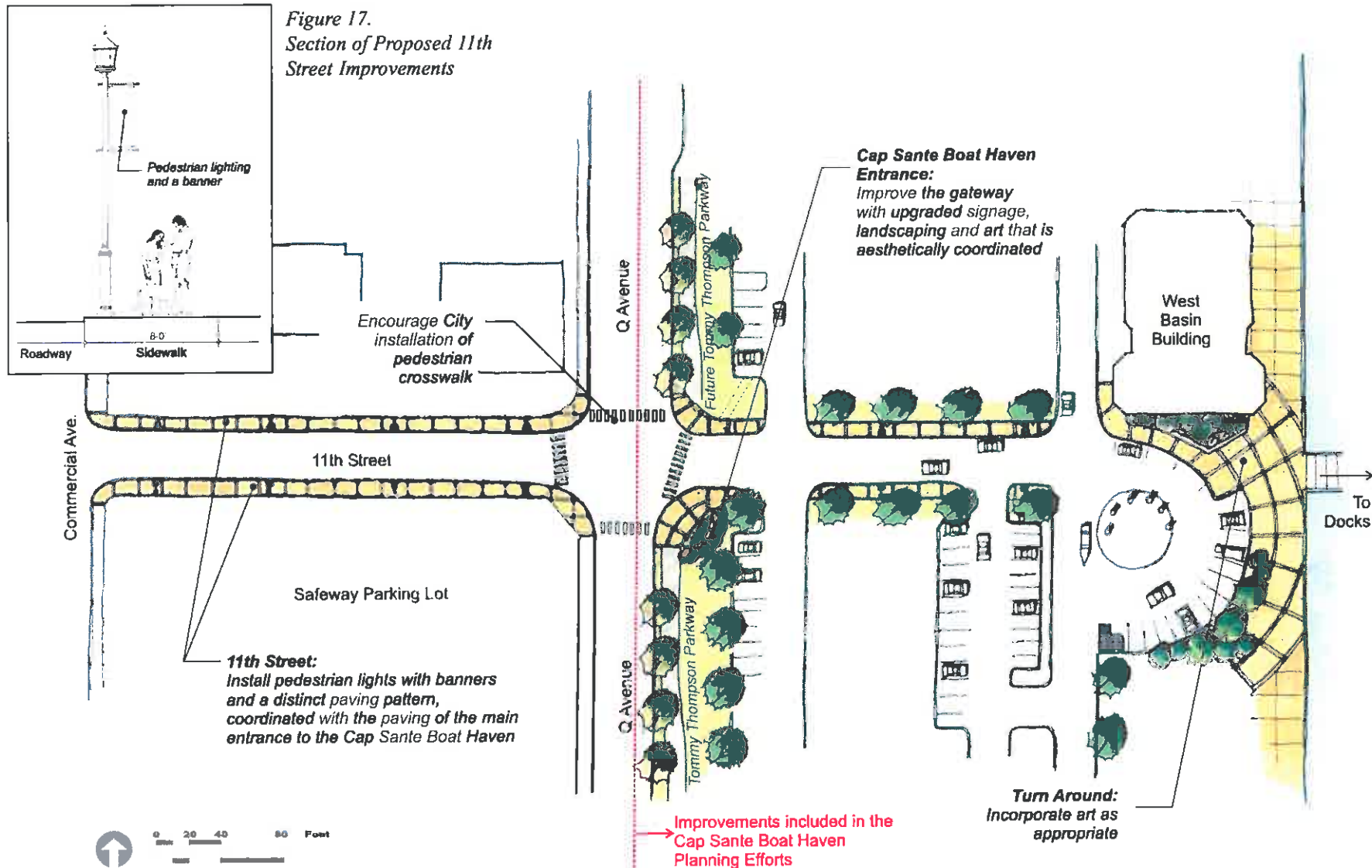


Figure 18. 11th Street Connection Improvements Plan

Recommendations

Add Vertical Design Elements

The existing sidewalk on 11th Street is narrow. The use of distinctive vertical design elements would create a visual gateway without taking up additional ground area. The installation of pedestrian lights with banners on 11th Street between Commercial Avenue and the Cap Sante Boat Haven is recommended to provide this visual statement. Lighting should be consistent with the fixtures recently installed by the City of Anacortes on Commercial Avenue. There are real estate implications of this project as these improvements would occur on City right-of-way.

Coordinate Special Paving

Establishing a unique paving pattern for the sidewalk between Commercial Avenue and the Guemes Channel would create a sense of continuity between the marina and Commercial Avenue and subtly attract pedestrians between these two destinations. As stated above, there are potential real estate implications to this project on City right-of-way.

Highlight Marina Gateway

Improving the marina gateway with landscaping, signage, and aesthetically coordinated public art will create a distinct and inviting entrance to the Cap Sante Boat Haven. These improvements are not included in the conceptual cost of this public access element, as they are included in the Port's Cap Sante Boat Haven project budget.

Incorporate Art at Marina Turn Around

The Port should incorporate art, as appropriate, when it rebuilds the West Basin entrance and turn around. Suggestions include a kiosk that highlights events and includes a map of downtown and walkable cultural resources, incorporating tiles done by Anacortes youth into a wall area, or installing a pedestrian shelter/architectural feature.

Safe Crossing

Clearly marking the pedestrian crossing at the intersection of 11th Street and "Q" Avenue is in keeping with the goal of improving the area's pedestrian linkages. Encourage the City to provide a designated pedestrian crossing between "T" Avenue and 4th Street.

Conceptual Cost

\$86,000

Detailed construction cost estimates are included in the Appendix.

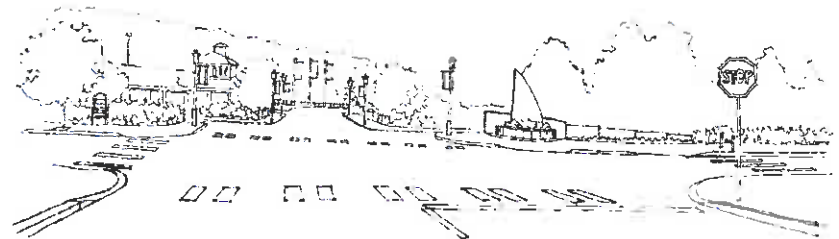
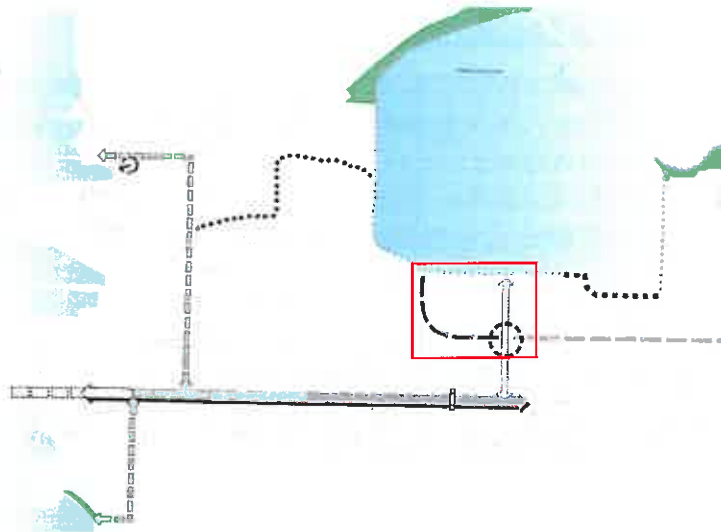


Figure 19. Conceptual Sketch of Marina Gateway Improvements

Area 3: Tommy Thompson Parkway



Background

The parcel east of “Q” Avenue between 9th and 11th Streets at the Cap Sante Boat Haven is bisected by a railroad right-of-way. The Port examined the background, current status, and plans for this right-of-way in the 1998 report: *Vacated Market Street Railroad Right Of Way, September 1999*, prepared by Reid Middleton. Due to its complex legal history, there may be real estate implications or potential ownership issues surrounding this return to the service corridor. Information regarding ownership issues, the City’s guidelines, and the City’s stated intention to allow an extension of an adjacent narrow gauge franchise “Tommy’s Train” along this standard gauge right-of-way can be found in the Reid Middleton report. Its recommendations have been incorporated in this public access plan and are summarized below.



Figure 20.
Existing Narrow
Gauge Rail



Figure 21.
Return to Service
Corridor

Figure 22.
Aerial View of
Rail Corridor
Bisecting Cap
Sante Boat
Haven



Goals

- Maximize the flexibility of future use for this parcel of land.
- Meet the City’s guidelines and policies as stated in the *Railroad Corridor Guidelines* adopted by the City in 1998.
- Accommodate extension of the adjacent narrow gauge franchise.

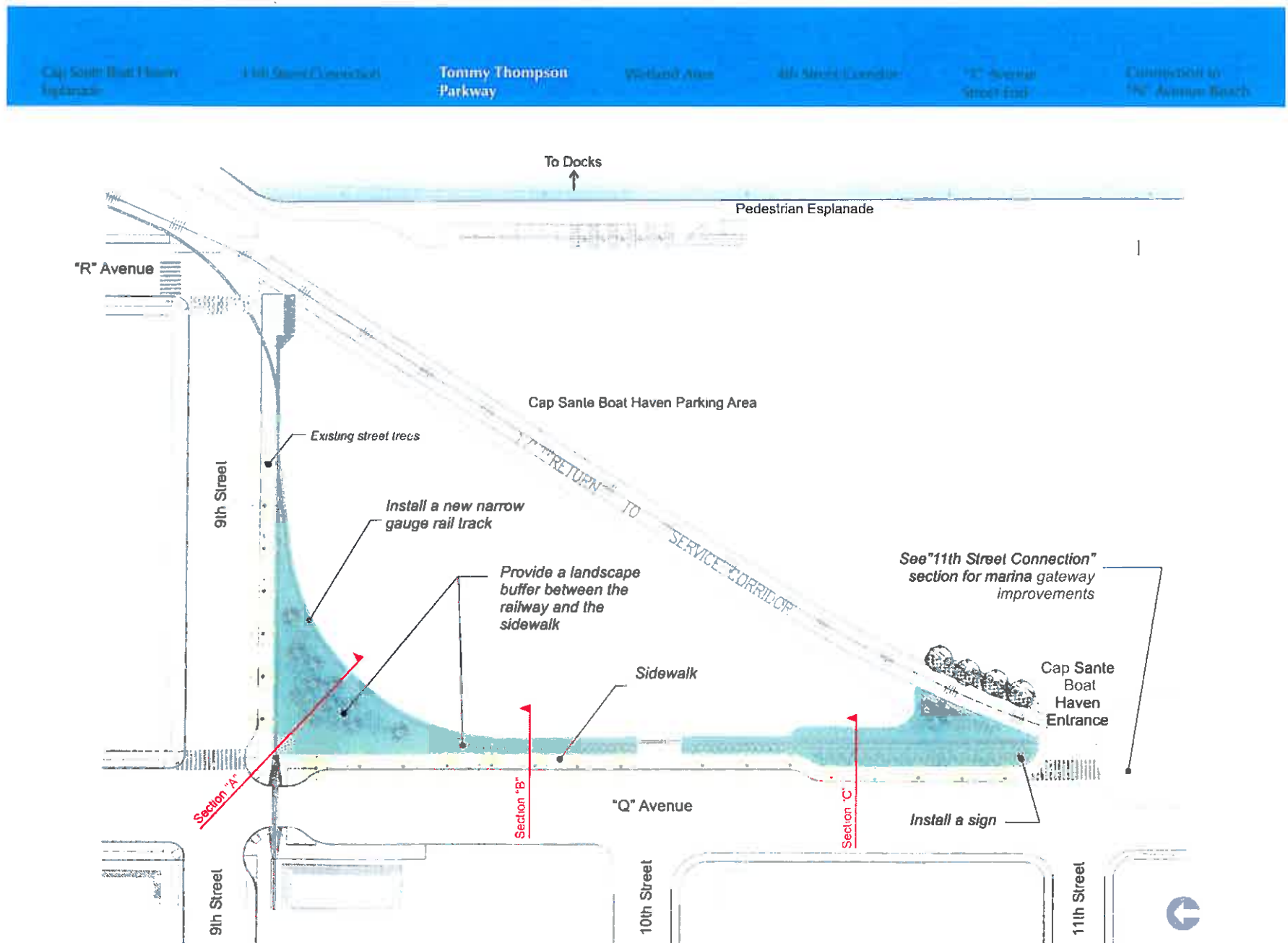


Figure 23. Tommy Thompson Parkway Improvements Plan

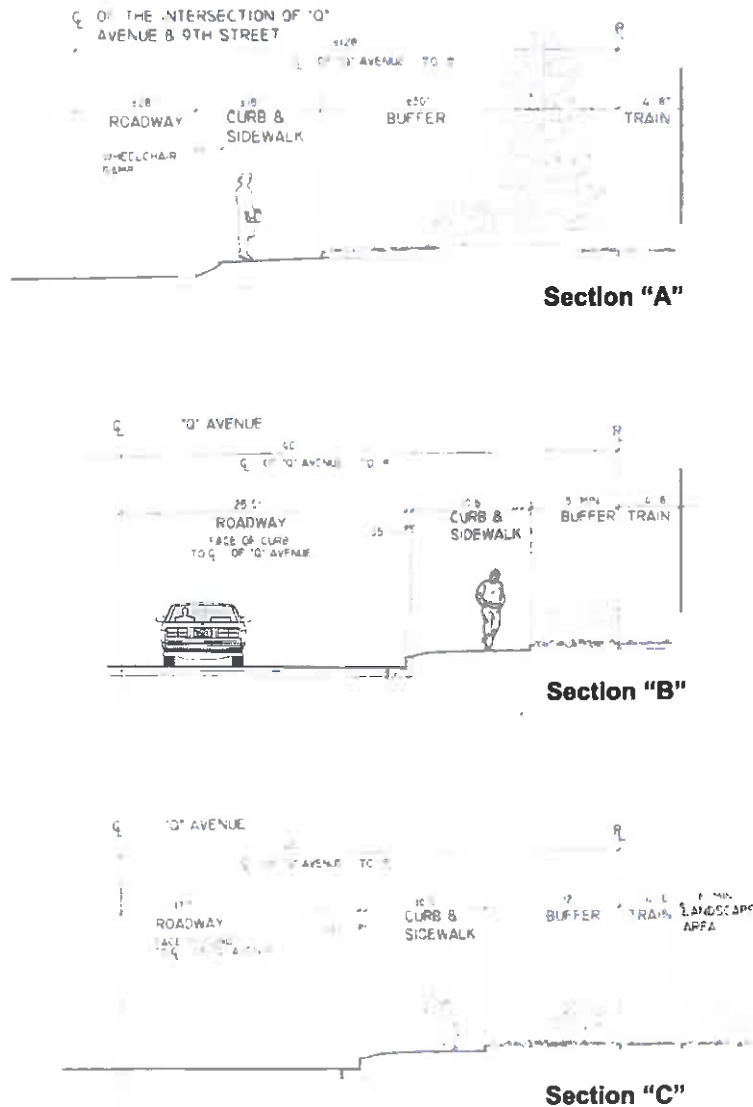


Figure 24. Tommy Thompson Parkway Improvements Sections

Recommendations

Realign and improve a one-block segment of the proposed Tommy Thompson Parkway

Realigning and improving a one-block segment of the proposed Tommy Thompson Parkway will result in a paved pedestrian/bicycle trail, landscaped buffer, and maintenance of the required right-of-way for the narrow gauge railway consistent with City requirements. As part of the realignment, the Port will grant the City of Anacortes an easement for trail and narrow gauge railway purposes on the corridor and will agree to maintain a "return to service corridor" over the existing railroad right-of-way.

There may be issues where the narrow gauge track crosses the marina entrance, this track, however, will be installed in accordance with narrow gauge safety standards.

Text and graphics used in this section are from the *Vacated Market Street Railroad Right Of Way, September 1999* report by Reid Middleton.

Conceptual Cost

\$66,300

Detailed construction cost estimates are included in the Appendix.



Figure 25.
Existing Tommy Thompson
Parkway on "Q" Avenue South of
11th Street

Area 4: Wetland Area

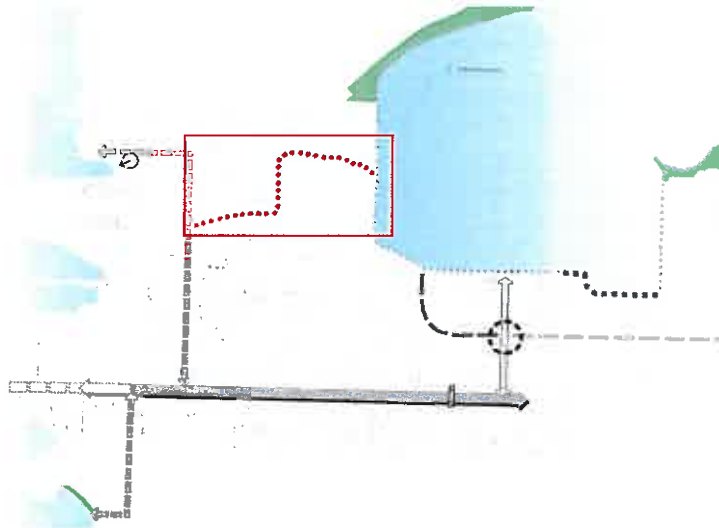


Figure 26.
Aerial View of the
Wetland Area

Figure 27.
View of the Wetland
Looking Northwest



Background

The wetland area is located within a triangular site bounded by “R” Avenue, Market Street, 4th Street, and 9th Street. The City of Anacortes owns the portion of this property that contains the Depot, a historic railroad station converted to community use, and the *Preston*, a historic paddle wheel steamer. Some residents utilize this area as an informal access route to the Cap Sante Boat Haven. Improving the wetland area as part of a public access plan was identified as a high-priority objective by many community members.

The site has three distinct amenities: 1) the cultural attractions of the Depot and the *Preston*, 2) the undeveloped green space between the Depot and Market Street (which houses community events and the Farmers Market), and 3) the wetland area on the northeast portion of the site. The wetlands have been recently delineated, as is described in the Port of Anacortes, Depot Property Wetland Delineation. An abandoned railway corridor runs north-south through the site. The City’s wastewater treatment plant and Dakota Creek Industries’ (DCI) fabrication building and some employee parking are located on the east and west sides of the wetland.

Goals

- Highlight the existing natural elements of the site.
- Improve public access to the wetland area.
- Provide a pedestrian connection from 4th Street to the Cap Sante Boat Haven through the wetland area.

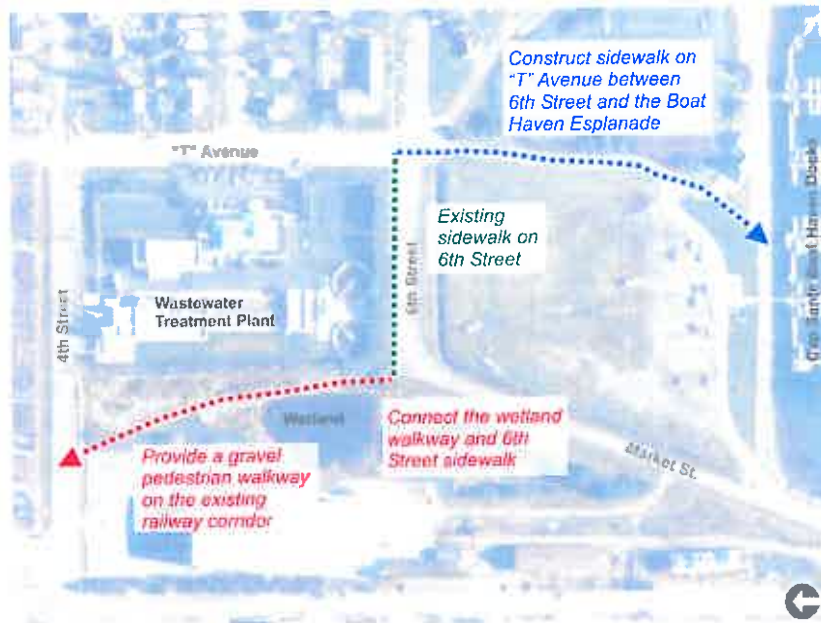


Figure 28.
Pedestrian Connection from 4th Street to the Cap Sante Boat Haven

Figure 29.
"T" Avenue between
6th Street and the Cap
Sante Boat Haven
North Basin



Figure 30.
Existing Sidewalk on
6th Street



Figure 31.
View of the Wetland
and the Waste Water
Treatment Plant



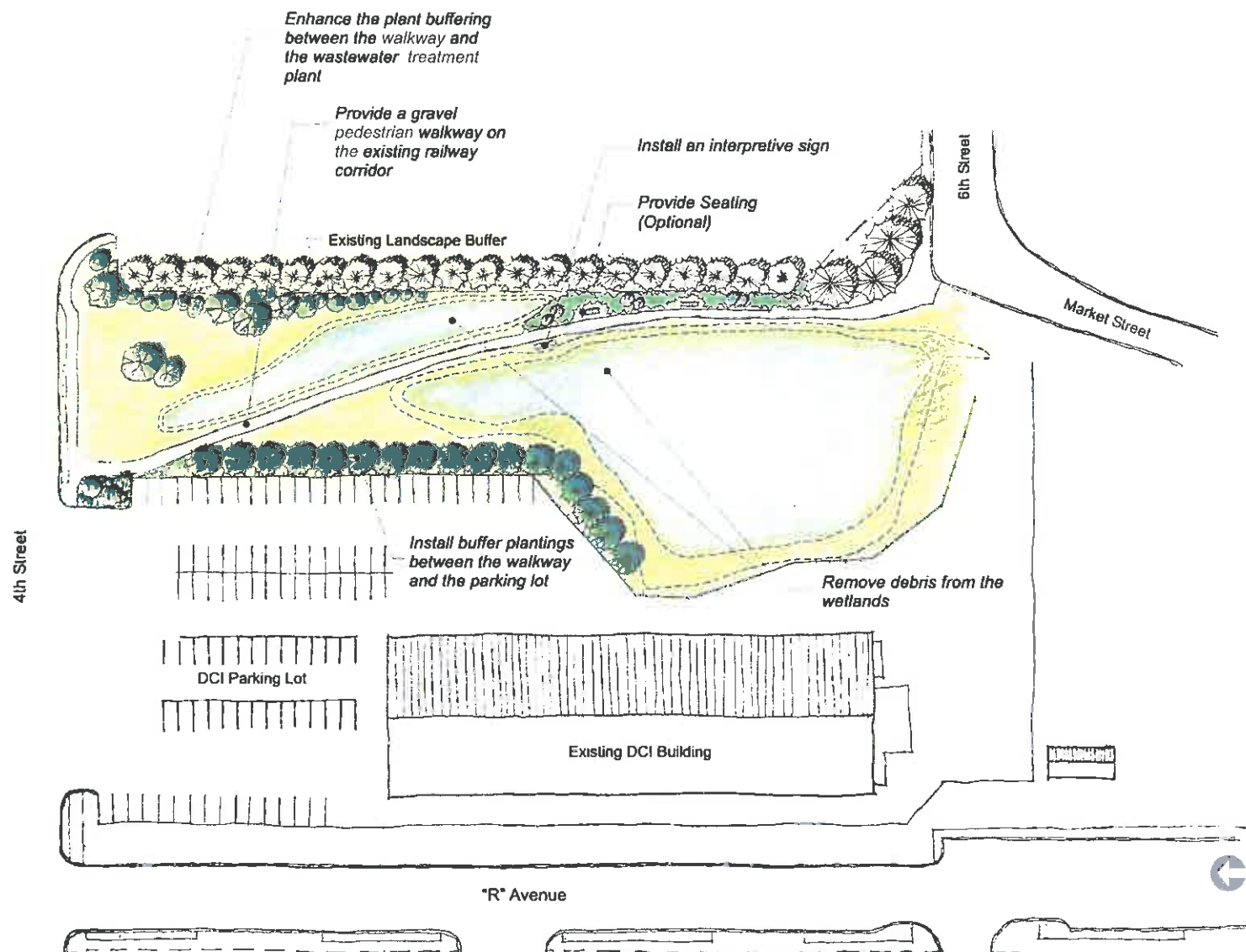


Figure 32. Wetland Area Improvements Plan

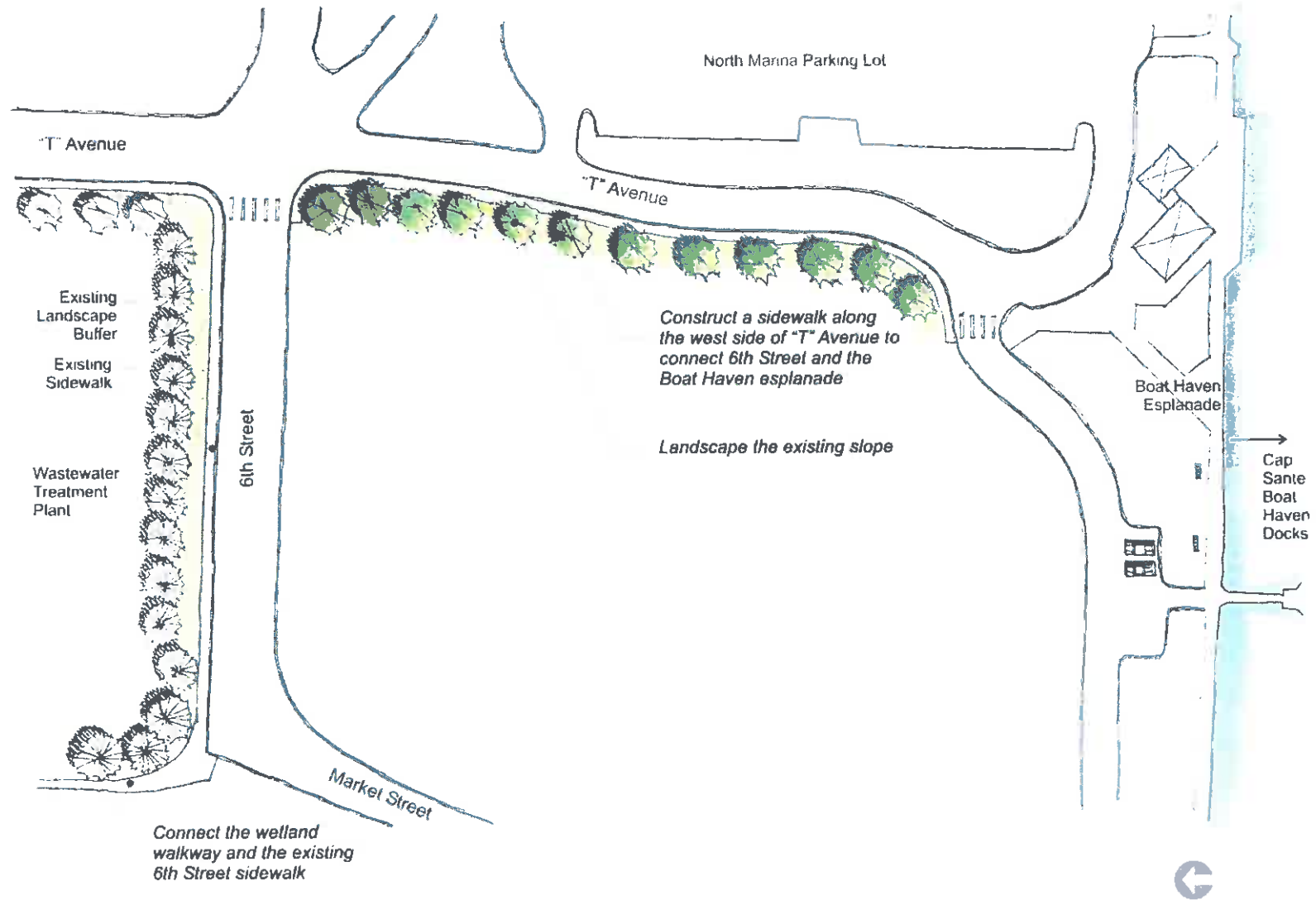


Figure 33. "T" Avenue Improvements Plan

Recommendations

Enhance The Wetland Area

Selective removal of non-native vegetation, enhancement of existing wetland vegetation, providing a public access pathway, and installing interpretive signage are recommended to enhance and protect the wetland area. Installing a gravel pathway on the abandoned rail corridor would provide pedestrian access to the wetland that both blends with and helps protect the area's natural environment. This pathway would avoid the existing buffer zone as established in the 2002 wetland delineation. Although not anticipated, there may be ownership issues or real estate implications of this project. In addition, although not expected to be a problem, the Port should consider mosquito abatement methods if this becomes an issue.

Link to the Cap Sante Boat Haven Esplanade

Link the south terminus of the wetland walkway and the Cap Sante Boat Haven Esplanade by routing pedestrians north on the existing 6th Street sidewalk and west on "T" Avenue. Constructing a sidewalk on west side of "T" Avenue, accompanied by landscaping the existing slope along the north basin property, is recommended to create a pleasant pedestrian environment.

Buffer Surrounding Uses

Landscaping between the wetland walkway, the wastewater treatment plant, and the DCI parking lot will buffer the pathway from adjacent ship repair operations and the wastewater treatment plant. Plantings should be mature wetland vegetation.

Property Swap

Consider swapping the property with the City in return for street vacation and/or public access mitigation credit.

Conceptual Cost

\$79,800

Detailed construction cost estimates are included in the Appendix.

Area 5: 4th Street Corridor

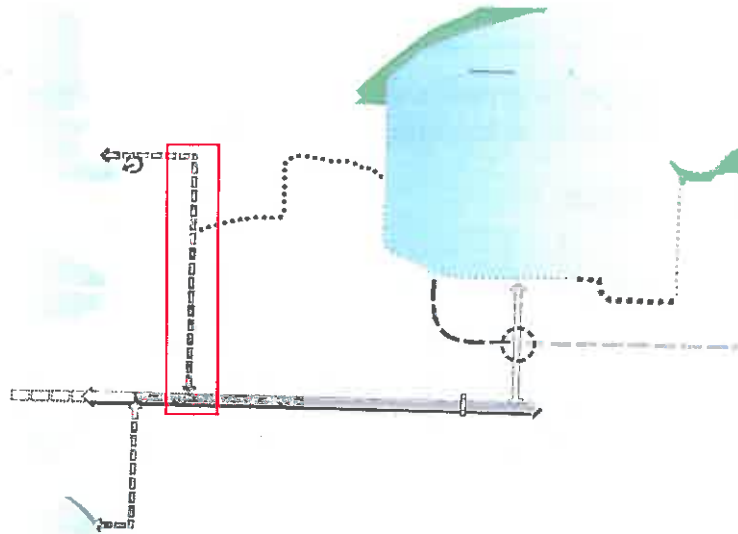


Figure 34.
4th Street Looking
East from "Q"
Avenue



Figure 35.
Sparse Planting
along the Pier 2
Fence Line



Background

Fourth Street is the main link between downtown and the Cap Sante neighborhood. The section of 4th Street between "Q" and "T" Avenues is the southern boundary of Piers 1 and 2. These piers support Dakota Creek Industries' ship building and repair operations, and the Port's bulk product shipping business. Fourth Street also generally functions as the southern project boundary of Pier 1 Redevelopment Project, an initiative to improve in-water and upland shipbuilding capacity.

Figure 36.
4th Street Looking
East from
Commercial
Avenue



Goals

- Create an attractive pedestrian pathway from downtown to the Guemes Channel east of Pier 2 and a connection to the Cap Sante Boat Haven through the wetland area. (See the "Wetland Area" description.)
- Coordinate with the Pier 1 Redevelopment Project to ensure that public access improvements on 4th Street are compatible with this project.

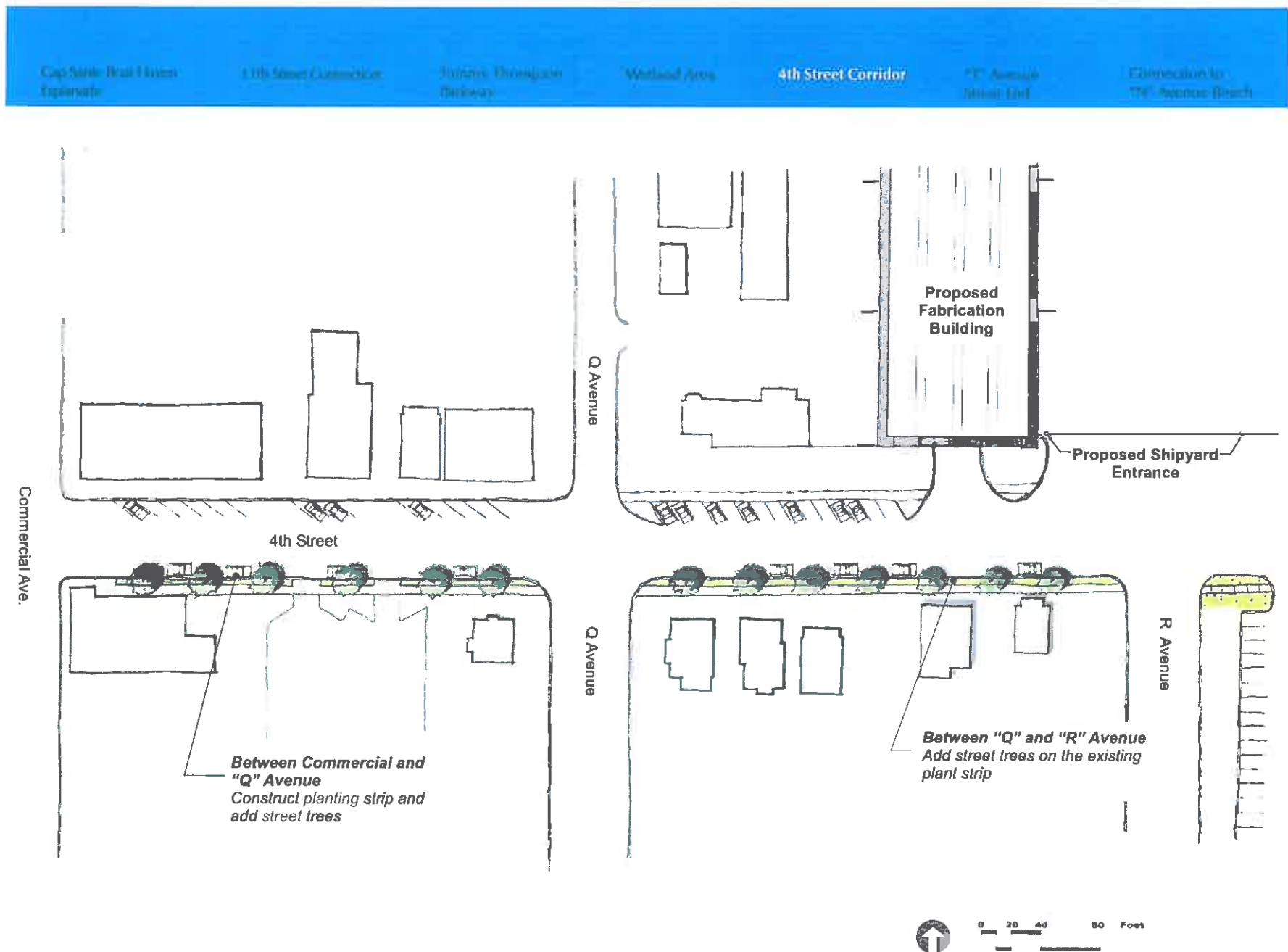


Figure 37. 4th Street Corridor Improvements Plan - West Section

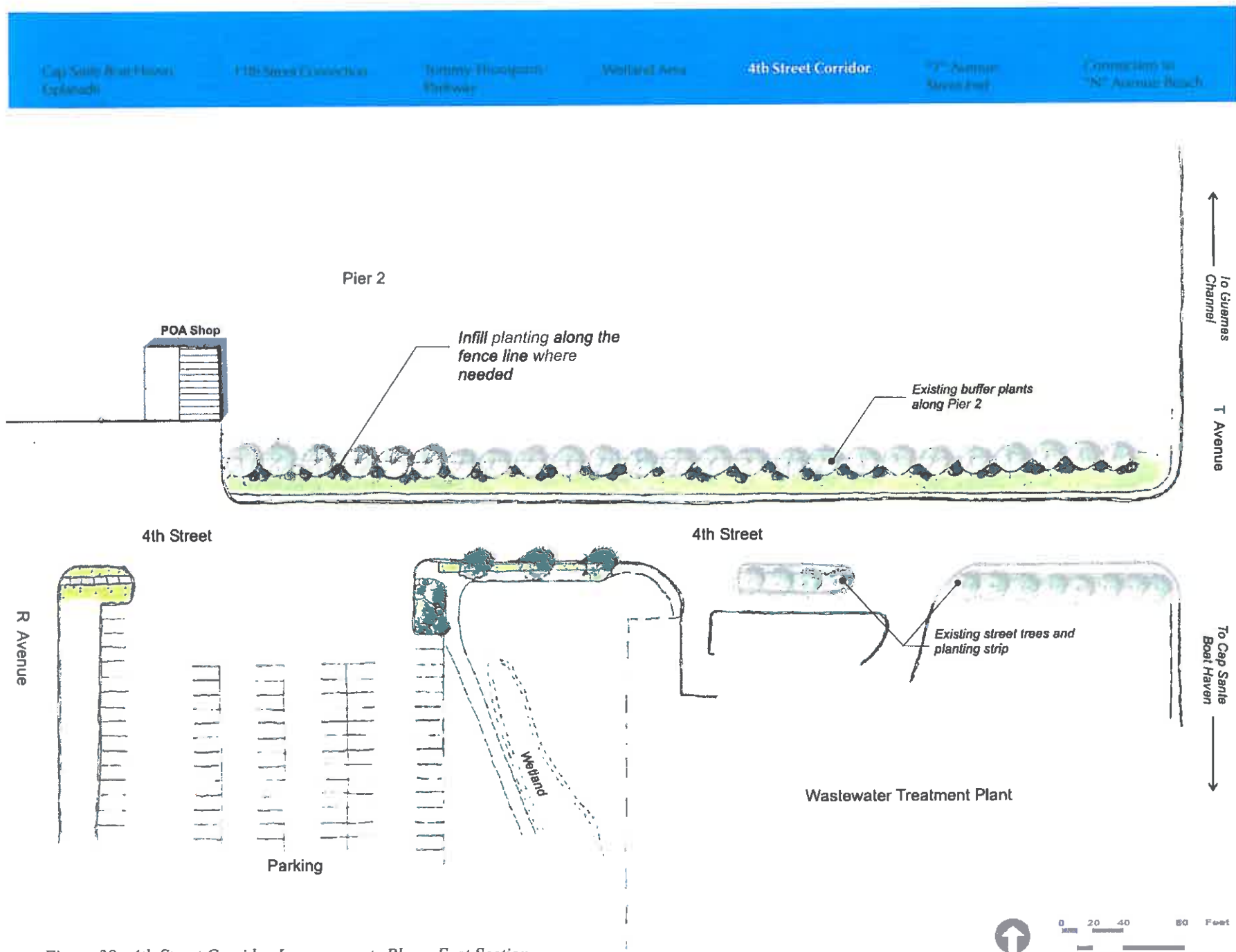


Figure 38. 4th Street Corridor Improvements Plan - East Section

Recommendations

Create a Pedestrian Link on the South Side of 4th Street

Improving 4th Street as a pedestrian corridor will include creating a planting strip with trees between Commercial and "Q" Avenues, and adding street trees on the existing planting strip between "Q" and "R" Avenues.

Add Infill Plants Where Needed

A line of poplar trees and low shrubs exists along the southern border of the Pier 2 fence line on the north side of 4th Street. These plantings are less developed along the western edge of the Pier 2 fence and should be filled in where appropriate.

Add Decorative Treatment to Noise Wall

Break up visual bulk by incorporating trellis landscaping, murals, or a combination on the noise wall.

Conceptual Cost

\$56,100

Detailed construction cost estimates are included in the Appendix.



Figure 39.
Conceptual View of 4th Street Improvements



Figure 40.
Illustration of the Noise Wall and Landscaping on 4th Street

Area 6: "T" Avenue Street End

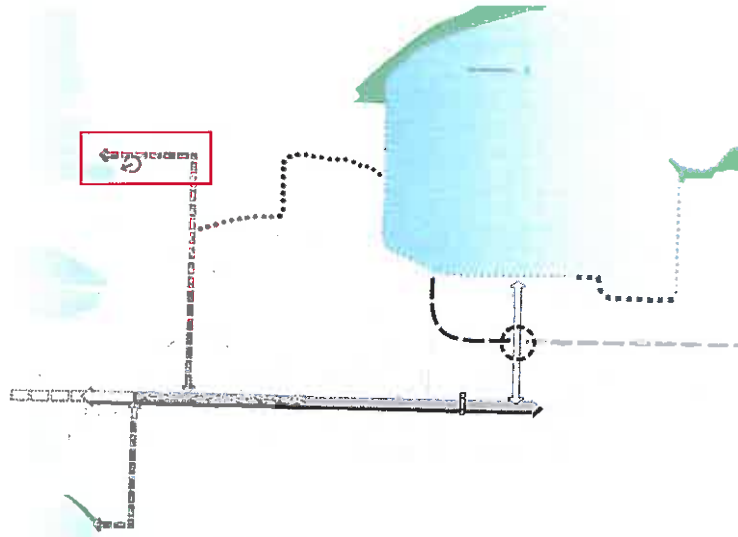


Figure 41.
"T" Avenue Looking
South from the Street
End



Figure 42.
North End of "T"
Avenue

Background

The Port owns property on the Guemes Channel just east of Pier 2. Per its 2000 Comprehensive Plan, the Port's planning objective is to facilitate development of this property with a mix of uses that help buffer the adjacent neighborhood from the more industrial operations to the west. Currently, Randy's Pier 61 Restaurant is the primary user of this property. Specific future plans to develop this property are unclear at this time.

The property offers views of Guemes Channel and adjacent industrial activities and an opportunity to incorporate a public access amenity into future development. Current pedestrian access is poor, as "T" Avenue the site's primary access, lacks sidewalks, curbs, and gutters. The gravel shoulder along the Pier 2 fence line is City right-of-way and currently used for parking.

Goals

- Improve the pedestrian-orientation and condition of "T" Avenue.
- Allow viewing of Pier 2 activity at this location.
- Plan to incorporate a destination feature at the "T" Avenue street end into future development without limiting flexibility to respond to a variety of potential development opportunities.



Figure 43. View of Pier 2 from "T" Avenue

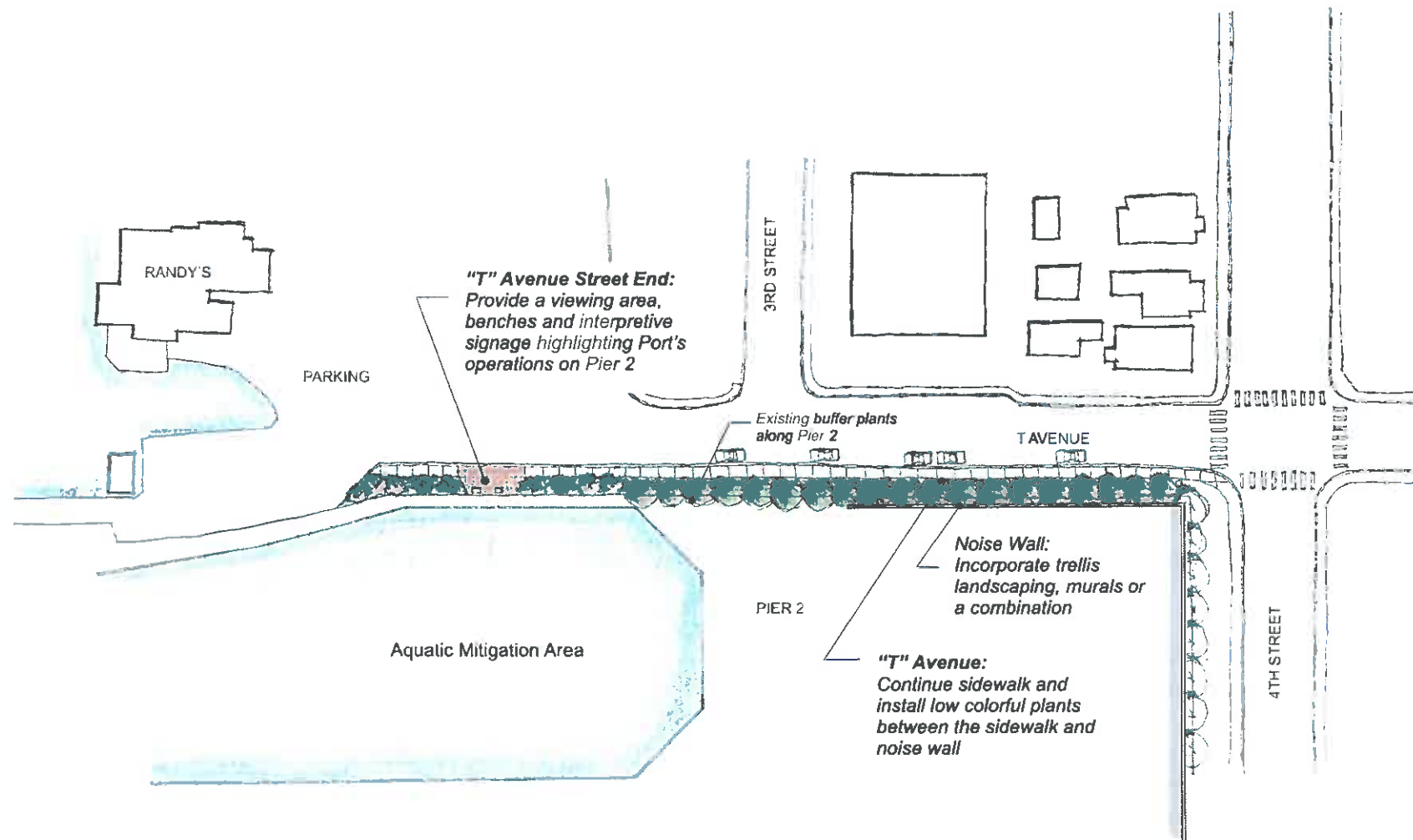


Figure 44. "T" Avenue Street End Improvements Plan

Recommendations

Add Sidewalk

Construct a sidewalk on the west side of "T" Avenue to establish safe pedestrian access from the 4th Street to a pedestrian viewing area near the aquatic mitigation area. There may be real estate implications of improving this area over City right-of-way.

Enhance Pier 2 Buffer Landscaping

Improve the existing poplar tree buffer landscaping along the western edge of Pier 2 by incorporating some low colorful plants between the sidewalk and the fence line. This will both buffer the adjacent uses and enhance the visual enjoyment for pedestrians and local residents.

Noise Wall Landscaping

See the 4th Street Corridor section for description

Pier 2 Viewing

Providing a viewing area with interpretive signage near the proposed aquatic mitigation area will create a destination element at this location, improve waterfront access potential, and complement the site's Guemes Channel views. The interpretive signage should highlight aquatic habitat mitigation and describe the industrial operations on Pier 2.

Incorporate Guemes Channel Viewing Amenity

Incorporate an appropriate viewing element, as near to the Guemes channel as is practical, coordinated with future development of Port property.

Safe Crossing

Clearly marking the pedestrian crossing at the intersection of 4th Street and "T" Avenue is in keeping with the goal of improving the area's pedestrian linkages. Encourage the City to provide a designated pedestrian crossing between "T" Avenue and 4th Street.

Concept Cost

\$51,100

Detailed construction cost estimates are included in the Appendix.

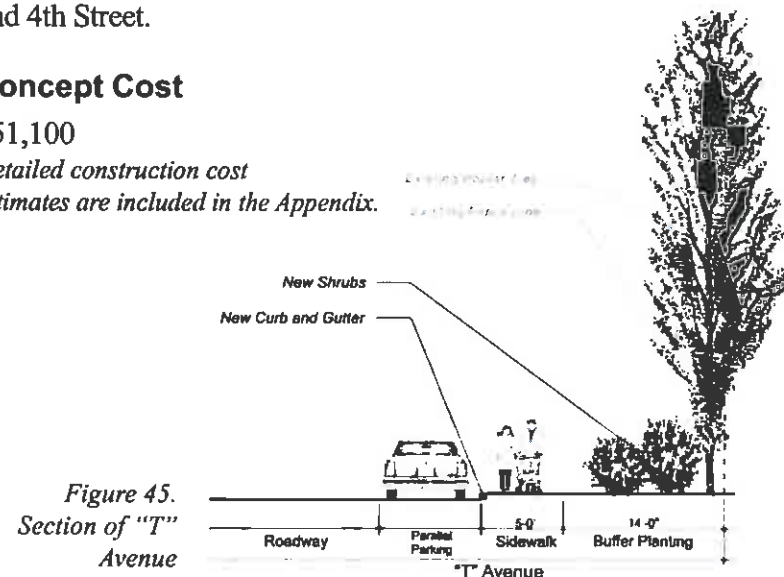


Figure 45.
Section of "T"
Avenue

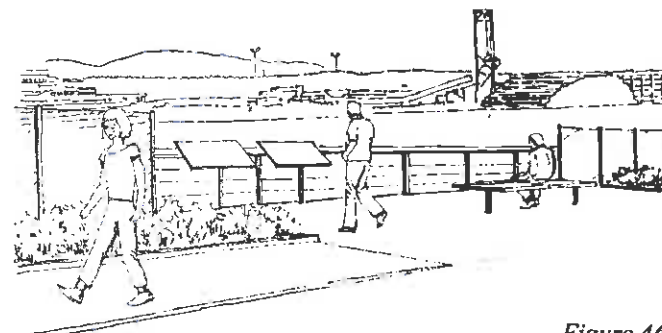
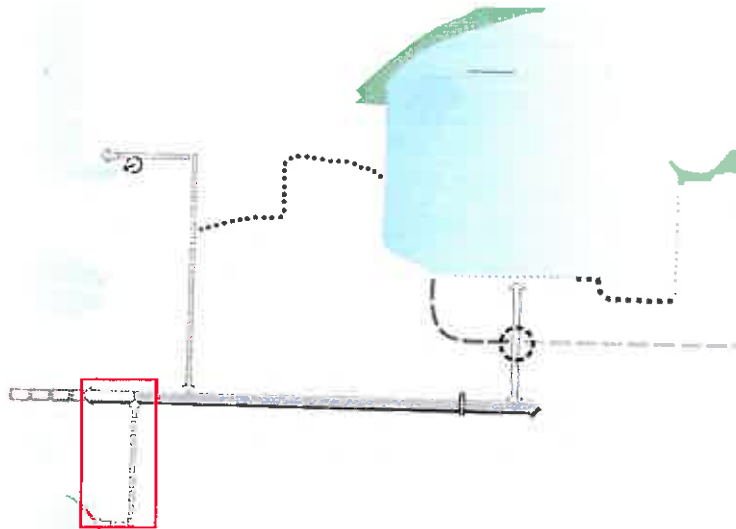


Figure 46.
Conceptual Sketch of Pier 2 Viewing Area at "T" Avenue

Area 7: "N" Avenue Beach Connection



*Figure 47.
Existing 3rd Street
Sidewalk between
Commercial and "O"
Avenues*



*Figure 48.
Existing 3rd Street Sidewalk
between "O" and "N" Avenues*



Background

Publicly accessible areas on the Guemes Channel waterfront are limited in and around downtown Anacortes. However, the street-end beach at the end of "N" Avenue offers a unique opportunity for access close to downtown. The "N" Avenue Park is 0.4 acres of undeveloped street end park land with views to Guemes Channel (*City of Anacortes Parks and Recreation Plan, 1995*).



*Figure 49. Northwest Corner of 3rd
Street and Commercial Avenue*

Goals

- Provide a pedestrian-friendly link between the Maritime Industrial Gateway and the Guemes Channel beach at "N" Avenue.

*Figure 50.
"N" Avenue Beach*





Figure 51. Connection to "N" Avenue Beach Improvements Plan

Recommendations

Install a Curb Bulb at 3rd Street and Commercial Avenue

Provide a curb bulb at the northwest corner of 3rd Street and Commercial Avenue to draw attention to this “N” Avenue Park connection.

Upgrade 3rd Street Sidewalk and Add Pedestrian Amenities

Guide pedestrians from Commercial Avenue via 3rd Street to the “N” Avenue beach with improved walking surfaces, landscaping, and pedestrian lighting:

■ Between Commercial and “O” Avenues

Since the existing sidewalk does not have a planting strip, providing street trees with tree grates is recommended.

■ Between “O” and “N” Avenues

The street block already has a wide planting strip without trees. Installing street trees and the low shrubs will enhance the aesthetics of the streetscape.

There may be real estate implications of this project as these improvements would occur entirely on City right-of-way.

Concept Cost

\$84,800

Detailed construction cost estimates are included in the Appendix.

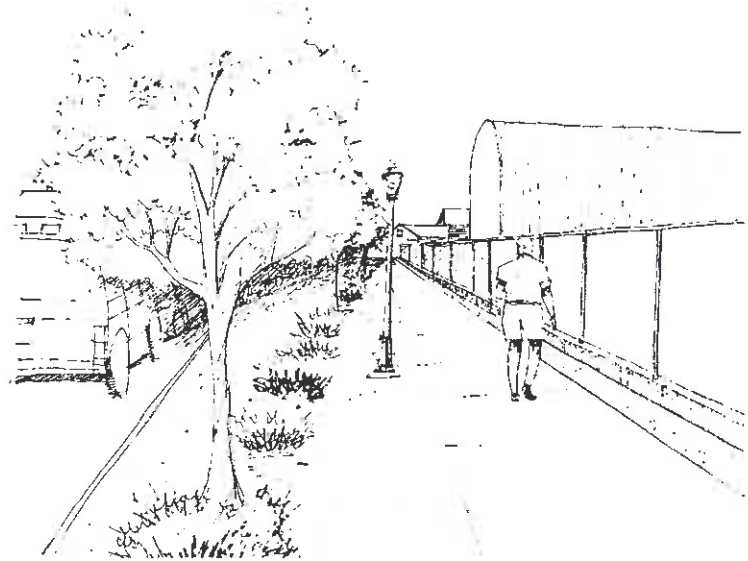


Figure 52.
Conceptual Illustration of 3rd Street
Improvements



Figure 53.
Illustration of a Typical Curb Bulb

Design Elements for Public Access Plan

Strategy

Design elements are the building blocks of the public access plan. The plan recommends pedestrian improvements and suggests various design elements that will help pedestrians identify the public access connections and navigate on them safely and comfortably. The design elements utilized in this Plan are summarized below:

Walkway Construction

- Sidewalk Paving (Typical Concrete)
- Special Sidewalk Paving (Unit Paver)
- Special Paving (Brick)
- Curb Bulb
- Curb Bulb - Paving (Typical Concrete)
- Gravel Path

Landscaping

- Trees (street, landscape, and buffer trees)
- Shrubs
- Planting Bed
- Shrubs and Ground Cover (with Irrigation)
- Planting Strip

Pedestrian Amenities

- Pedestrian Lighting
- Banners with Brackets
- Benches
- Interpretive Sign
- Cap Sante Boat Haven Entry Sign
- Directional Sign

Strategic use and placement of design elements perform a variety of functions, including:

- Provides for the safety and comfort of pedestrians, motorists, and other persons using the street.
- Accentuates or calls attention to a particular location or district.
- Visually unifies or organizes a streetscape or district.
- Adds an amenity or attraction.
- Enhances a street or district's identity.

The following pages illustrate examples of the successful use of design features similar to those recommended in this Plan.

Walkway Design



Curb bulbs at street intersections and specially paved crosswalks can provide a safe and comfortable walking environment for pedestrians.



Special surface material and design patterns can be incorporated into sidewalk designs.



A typical concrete sidewalk can be enhanced by providing street trees and planting beds.

Street Landscaping



Bare concrete walls can be aesthetically improved by applying trellis landscaping and lighting.



Street trees can be planted on planting strips or in tree grates, depending on street conditions and available space



Planting strips and curb bulbs can be landscaped with low-height plant material.

Pedestrian Amenities - Lighting

*Custom-designed
pedestrian lights with
maritime design features*



*Classic street light designs with
hanging baskets and a banner*



*Modern pedestrian
light fixtures*

Pedestrian Amenities - Signage and Signature Features



Banners can be used to mark special areas, blocks, or districts.



Examples of artistic pedestrian signs



Custom-designed signage can enhance gateways or landmarks



Interpretive signs can be installed to highlight culturally, historically, or environmentally significant areas.



A covered viewpoint with seating can draw and shelter pedestrians.

Art



Examples of vertical art elements



Examples of art incorporated into pavement

Implementation

Implementation of this Plan is intended to satisfy public access requirements associated with development of the Port's marine properties. The following sections describe procedures for administering, implementing, and updating the Plan. Topics include:

- Intended Use
- Code Compliance in Design
- Costs and Funding
- Phasing
- Permanence of Access
- Updating the Plan

Intended Use

The Port's Mission Statement reads:

"In partnership with public agencies and private business, develop and manage facilities and services which stimulate private job creation and commerce, while protecting the quality of life, needs, and desires of area residents."

Public access projects will be implemented in concert with capital projects that help stimulate private job creation and commerce, as a means to help protect the area's quality of life and respond to the desires of area residents.

Implementation is intended to satisfy the City's public access requirement for shoreline permits and provide compensation for street vacations associated with marine development projects. This Plan does not alter the procedural requirements of street vacations or provisions of the Shoreline Master Plan.

Code Compliance in Design

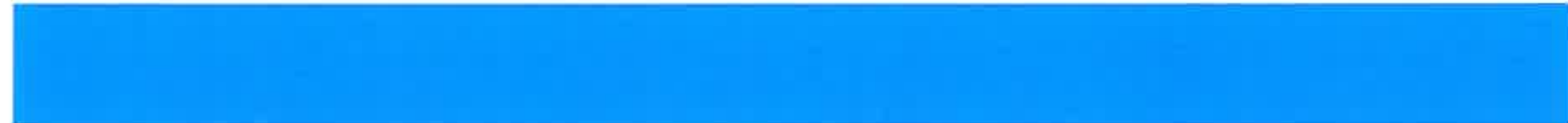
The final design of each public access site will be in conformance with all applicable City code requirements and public health and safety standards. Appropriate environmental review will occur as permit applications for projects and their associated public access elements are submitted.

Costs and Funding

Public access projects generate construction, ongoing maintenance/administration, and opportunity costs.

Construction Costs

The total cost to develop public access as recommended in this Plan is projected at approximately \$430,000 in 2003 dollars. Costs are order-of-magnitude estimates and do not include maintenance, utility, security, and other overhead associated with ongoing administrative costs. Construction budgets do include taxes and design contingency. In practice, the contingency will vary from element to element, depending upon the complexity of the work and the number of unknowns affecting the design. A detailed listing of the cost projections is provided in the Appendix.



Maintenance and Administration Costs

The cost to maintain public access improvements is estimated at between 4 percent and 5 percent of construction costs. Based on this assumption, total annual maintenance costs, once all projects have been constructed, would be between approximately \$17,000 and \$22,000 (2003 dollars).

Port and City responsibility for maintaining public access improvements will be determined as individual projects are permitted. It is assumed that the Port will maintain the public access improvements and landscaping on all sites where primarily Port property is involved (Cap Sante Boat Haven Esplanade, Tommy Thompson Parkway, and the Guemes Channel Viewing Area). The Port believes it reasonable for the City to maintain the sites developed primarily on City property (11th Street Connection, 4th Street Connection, and “N” Avenue Beach Connection). The Wetland Area and “T” Avenue Street End projects span both Port and City property. For these sites, the Port believes it reasonable to share maintenance responsibility with the City. The Port will work with the City to determine maintenance procedures and funding on a project-by-project basis.

There will be an additional cost at both the Port and City to manage and administer ongoing maintenance of public access improvements.

The chart on the following page lists the public access projects and their associated marine project, their potential construction cost, and their estimated annual cost to maintain.

Land Cost

The Port is contributing land to public access that could otherwise potentially be used to create jobs or generate revenues in support of the Port mission. A dollar value has not been estimated to account for this lost opportunity cost.

Funding

Although the Port expects to fund a majority of public access projects, monies for construction or maintenance could also potentially be provided from: state and federal grants; individual, nonprofit group, or club contributions; or private developer matching funds/construction contributions.

Public Access Sites & Program Elements	Associated Marine Development	Construction Cost Estimate	Annual Maintenance Cost Est.
Cap Sante Boat Haven Esplanade a. Extend the esplanade to B-Dock b. Connect north and south esplanade with a painted pathway	Cap Sante Boat Haven West Basin entrance and turn-around	\$4,300	\$170-\$220
11th Street Connection a. Add vertical design elements b. Coordinate special paving c. Highlight marina gateway	Cap Sante Boat Haven West Basin entrance and turn-around	\$86,000	\$3,400-\$4,300
Tommy Thompson Parkway (TTP) a. Realign and improve TTP between 9 th & 11 th Streets	Development of the area between 9 th and 11 th Streets at the CSBH	\$66,300	\$2,700-\$3,300
Wetland Area a. Enhance wetland area b. Link to the Boat Haven c. Buffer surrounding uses d. Consider property swap with the City	North Basin Development	\$79,800	\$3,200-\$4,000
4th Street Connection a. Create a pedestrian link on south side of 4 th Street b. Improve the sidewalk with planting strip and street trees c. Enhance the buffer landscaping on the southern side of Pier 2	Pier 1 Redevelopment Project	\$56,100	\$2,200-\$2,800
"T" Avenue Street End a. Add sidewalk on west side of "T" Avenue b. Buffer western edge of Pier 2 with landscaping c. Treat the noise wall surface with landscaping and/or mural d. Incorporate a Pier 2 and aquatic mitigation site viewing area	Pier 1 Redevelopment Project	\$51,100	\$2,000-\$2,600
e. Incorporate Guemes Channel Viewing Area where appropriate	Property east of Pier 2 Development	TBD	TBD
"N" Avenue Beach Connection a. Identify the gateway intersection b. Upgrade the 3 rd Street sidewalk and add pedestrian amenities	Curtis Wharf Redevelopment	\$84,800	\$3,400-\$4,200

Table 2

Phasing

The development of each public access site is triggered by the marine development project as shown in the table on Page 4. When the Port Commission approves a marine project budget, the costs for the associated public access improvements will generally be authorized at the same time. Once the Port obtains all of the required permits for the marine project, construction will begin on both the marine and associated public access projects.

The first phase of public access improvements is expected to be implemented as the Port moves forward with the Pier 1 Redevelopment Project and with improvements to the Cap Sante Boat Haven West Basin entrance and turn-around. Of the public access sites described in the Plan, four will likely be accomplished within the next five-year funding cycle based on the Port's Capital Improvement Program, excepting the Guemes Channel Viewing Area project. Timing for implementation of the other three public access sites and the Guemes Channel Viewing Area is uncertain at this time, as timing to implement the corresponding marine project is unknown.

Permanence of Access

It is intended that adoption of this Plan by the Port Commission, together with implementing permit conditions and street vacation agreements on a project-by-project basis, provide the mechanism for committing the projects identified in the Plan to permanent public access.

Updating the Plan

The Public Access Plan has been designed based on the Port's current vision to improve its marine properties. However, due to unforeseeable shifts in business opportunities, community priorities, or operating budgets, these plans for marine projects may change.

The Public Access Plan can and should be adjusted in response to these changing conditions or plans for marine improvements. This process will allow this Plan to remain a meaningful document for the community, Port Staff, and Commission.

It is desirable to have an appropriate balance between the scale of a development project and the scale of the public access improvement(s) associated with that project. Table 2 reflects this balance wherever possible. In several cases, the scale of the marine project is unknown (North Basin, Curtis Wharf, and Property East of Pier 2). Public access projects identified at these sites are intended to be flexible to respond to the size of the eventual marine project. The Port will strive to appropriately balance marine projects at the North Basin, Curtis Wharf, and Property East of Pier 2 with appropriate public access improvements.

Minor Plan Changes

Public access improvements in the Plan are illustrated and described in concept only. Refinement of plan elements during the design process is expected and does not require any Plan modification. However, if the scale of a marine project changes



moderately, this could warrant an appropriate adjustment in public access provided. These “minor changes” would be clarified during the permitting process within shoreline permit documents or street vacation petitions.

Major Plan Changes

A major increase in marine project scale, decrease in public access scale, or deletion of a public access project will require an amendment to the Plan approved by the Port Commission. The following would qualify as a major change:

- A marine development project significantly increases in size so that its related public access improvements are no longer in balance.
- The location of an access site changes by more than 200 feet.
- The size of an access site is reduced by more than 10 percent.
- A public access element is deleted.



May 30, 2023

VIA EMAIL

gracep@cityofanacortes.org

City of Anacortes Planning, Community & Economic Development Department
Attn: Grace Pollard – Senior Planner
904 6th Street
PO Box 547
Anacortes, WA 98221

RE: Request to Modify Conditions Presented in City Staff Report

Permit: SDP-2023-0002
Applicant: Port of Anacortes (the “Port”)
Project Title: MRT-64 2nd Street and Curtis Wharf Improvements (the “Project”)
Project Location: 2nd Street west of the east side of O Avenue and the Curtis Wharf access to the north, adjacent to 166 O Avenue (the “Project Site”)

Dear Ms. Pollard,

Thank you for sharing the Shoreline Substantial Development Permit (SSDP) Staff Report on the above reference Project with Port staff. The Port appreciates the Planning Commission’s postponement of a decision to its’ next meeting as the Port wanted to take an opportunity to share some feedback on City staff’s recommended conditions to clarify the Port’s responsibilities and ensure the conditions align with the Port and City Right of Way Use Agreement for 2nd Street – From “O” Avenue to Shoreline, dated February 16, 2022 (the “2nd Street ILA”).¹

The Port requests that City Staff recommend, and the Planning Commission adopt, revisions to two of the recommended conditions in the City Staff Report. The City Staff recommended condition, the Port’s proposed revised condition, and the reasoning for the changes are discussed in turn below.

Recommended Condition No. 1 in the Staff Report - The Port shall provide and submit an Alternative Public Access Improvement Plan for review and approval by the Planning Department to include but not be limited to provisions for wayfinding and improvements to the pedestrian link between Commercial Avenue and Guemes Channel at Q’elech’ilhch Park (“N” Avenue Beach). Improvements to the pedestrian connection to Q’elech’ilhch Park should include items such as street trees, pedestrian scale lighting, public art, etc.

¹ Skagit County AF No. 202206240050 - see Exhibit 6 on the Staff Report.

Revised Condition No. 1 Proposed by the Port – The Port shall provide wayfinder signage to the pedestrian link between Commercial Avenue and Guemes Channel at Q’elech’ilhch Park (“N” Avenue Beach) consistent with the requirements in the Right of Way Use Agreement 2nd Street – from “O” Avenue to Shoreline, Skagit County AF No. 202206240050.

Reasoning for the Change – It is unclear in the recommended condition if the requirement that the Port submit an “Alternative Public Access Improvement Plan” means that the Port must amend the Public Access Plan identified in *the Port of Anacortes’ Integrated Approach to Marine Public Access*, October 2003, which is adopted by reference in the City’s SMP. This request is problematic because it could be interpreted as a requirement for the Port to amend or alter an adopted planning document within the SMP. In addition, and perhaps more important with respect to the Project under review, the Project does not propose a new industrial use or development, or otherwise trigger the development regulations or requirements in the SMP to improve an existing alternative access to Q’elech’ilhch Park (“N” Avenue Beach).

The Staff Report cites SMP DR-8.6.8 as the authority for the Condition No. 1. SMP DR-8.6.8 provides as follows (underline emphasis added):

Public Access DR-8.6.8 - Port and industrial facilities shall provide public access to shoreline areas in accordance with Chapter 7, Public Access, taking into consideration constitutional and statutory limitations, public safety, health, and security. Where industrial use is proposed for location on land in public ownership, public access shall be required in the general vicinity of the impact. Such provisions could be the preservation of shoreline views, the establishment of public access easements across and to the shoreline, enhancement of an adjacent street-end or park or other consideration commensurate with the degree of impact caused by the development. In this regard *the Port of Anacortes’ Integrated Approach to Marine Public Access*, October 2003 is incorporated by reference into this SMP.

The Project is a resurfacing of approximately 18,500 square feet of the section of the 2nd Street ROW that the City previously agreed to restrict to the Port’s exclusive use in the 2nd Street ILA. Access to the 2nd Street ROW became limited when the City executed the 2nd Street ILA in 2022, not by this Project. Accordingly, this Project is not a new proposed “industrial use” that limited public access such that it triggers DR-8.6.8. This conclusion is further supported by DR-8.6.8’s references to the public access policies in Chapter 7 of the SMP, specifically (underline emphasis added):

Public Access Policies - Policy 7.3.5 Require new development that impacts public access to mitigate through the provision of on-site visual and physical public access, unless such access is shown to be incompatible due to reasons of safety, security, or impact to the shoreline. In lieu of on-site improvements, the Shoreline Administrator may allow for off-site improvements if said improvements would provide a greater public benefit.

If the City wanted require the Port, as part of the closure of the 2nd Street ROW, to develop the Public Access Plan according to *the Port of Anacortes’ Integrated Approach to Marine Public Access* referenced in the SMP, then this requirement should have been specifically negotiated as part of the terms to the 2nd Street ILA – the authorization from the City that closed the 2nd Street ROW to general public access. As one of the co-contributors, the Port remains committed to *the Port of Anacortes’*

Integrated Approach to Marine Public Access, October 2003 that is incorporated by reference into the SMP, including the Public Access Plan for the Connection to “N” Avenue Beach. The Port, however, does not believe that the Project is the kind of development that triggers a permit condition requiring the Port to undertake the proposed improvements in the Public Access Plan by itself. Not all of the properties along the 3rd Street between Commercial and N Avenue are part of the Project and some of these properties are not even owned by the Port (The Port does not own 1110 3rd Street (Parcel P55357)² or 220 Commercial Avenue (Parcel P134591)³.

Accordingly, the Port requests Condition No. 1 be revised to reflect the impacts associated with the Project consistent with the 2nd Street ILA.

Recommended Condition No. 2 in the Staff Report - The required Alternative Public Access Plan shall be submitted to the Planning Department prior to subject project completion and shall be installed within one (1) year of plan approval.

Revised Condition No. 2 Proposed by the Port – The signage referred to in Condition No. 1 shall be installed within (1) year of issuance of this Approval.

Reasoning for the Change – The removal of the Alternative Public Access Plan requirement in Condition No. 1 necessitated the changes to Condition No. 2. The reasoning here is largely the same as discussed above.

The Port recognizes that the timeline between production of the Staff Report and the public hearing does not necessarily afford the City and the Port a meaningful opportunity to discuss the City Staff recommended conditions in detail. The Port does, however, desire to work collaboratively with City staff to revise the proposed conditions in a manner that best reflects the Project and is consistent with the City SMP, development regulations, and the 2nd Street ILA. The Port asks that this letter be made part of the record for the Planning Commission. Thank you for your consideration and ongoing efforts to partner with the Port to improve our City.

Sincerely,



Brenda Treadwell,
Director of Planning, Properties & Environment

² Parcel P55357 is owned by Guemes Channel Corp.

³ Parcel P134591 is owned by the Anacortes Housing Authority, Inc.

REVISED RECOMMENDATIONS 6.6.23

Based upon the application, Findings of Fact, and Conclusions of the staff report, staff recommends that the Planning Commission approve the shoreline substantial development permit subject to the following conditions of approval:

1. The Port shall produce and submit a Phase 1 design proposal of the *“N” Avenue Beach Connection* referenced in the Port of Anacortes’ *Integrated Approach to Marine Public Access, October 2003* and adopted by reference in the Anacortes Shoreline Master Program for review and approval by the Planning, Community, and Economic Development (PCED) Department to include but not be limited to provisions for wayfinding and improvements to the pedestrian link between Commercial Avenue and Guemes Channel at Q’elech’ilhch Park (*“N” Avenue Beach*). Considerations for improvements to the pedestrian connection to Q’elech’ilhch Park should include items such as landscaping and an aesthetic treatment to existing Port owned privacy fencing along 3rd Street adjacent to the public sidewalk by way of additional landscaping, art installation(s), or a similar proposed effect approved by the PCED Department.
2. Per Condition of Approval No. 1, the required Phase 1 plan of *“N” Avenue Beach Connection* shall be submitted to the Planning, Community, and Economic Development Department prior to subject project completion and shall be installed within one (1) year of plan approval.
3. The Port shall produce and submit the complete *“N” Avenue Beach Connection* plan to the Planning, Community, and Economic Development Department for review and permit approval prior to or concurrently with the establishment of a new or expanded use or development on Curtis Wharf, the 2nd Street right-of-way, or within the Port’s adjacent Quiet Cove laydown lot (P55354), or within 5 years of subject project completion, whichever is sooner.
4. The Port shall obtain a fence permit for the proposed rolling gate at 2nd Street as well as the additional chain-link fencing along the shoreline. Permit application shall show the fence and gate designed to preserve visual access down 2nd Street to the shoreline and shall be constructed to meet the standards of AMC 19.66.040.
5. The Port shall obtain construction permits for the street improvements and stormwater facility, shall comply with all applicable codes, manuals, and standards, and shall be reviewed and approved by the Public Works Engineering Division.
6. The Port and the subject project shall comply with all applicable state law requirements regarding preservation of archaeological and historic resources, including provisions to stop work and notify the appropriate agencies should protected resources be uncovered during excavation.
7. Removal of or relocation of all discarded materials including concrete blocks in upland areas beyond the fenced enclosure must be complete prior to completion of the subject project.
8. The scope of the project shall not exceed that as set out in the shoreline permit application and shall be valid only for the improvements described within the application materials, except as modified by this decision or other jurisdictional agencies. This permit does not include review or approval of any use.
9. All applicable permits (local, state, & federal) shall be secured before any construction activities begin onsite and copies provided to the City of Anacortes’ PCED. This includes a local City of Anacortes Flood Development Permit.

10. The applicant/landowner shall comply with federal statutes including but not limited to: Endangered Species Act, Clean Water Act, Marine Mammal Protection Act, and other federal statutes.
11. The project shall comply with all applicable Shoreline Master Program regulations, including but not limited to those listed above.
12. Development shall comply with AMC 18.16.130 regulating the time limit for shoreline permits as follows:
 - 9.1. *Construction, or substantial progress toward completion, must begin within two (2) years after approval of the permit. Substantial progress toward construction shall include, but not limited to, the letting of bids, making of contracts, purchasing of materials involved in development, but shall not include development or uses which are inconsistent with the Shoreline Management Act or the city's master program. In determining the running two-year period hereof, there shall not be included the time during which development was not actually pursued by construction and the pendency of litigation reasonably related thereto made it reasonable not to so pursue; provided, that the city may, in its discretion, extend the two-year time period for a reasonable time based on factors, including the inability to expeditiously obtain other governmental permits which are required prior to the commencement of construction.*
 - 9.2. *5-Year Permit Authorization: If construction has not been completed within five years of approval by the City of Anacortes, the city will review the permit, with prior notice to parties of record, and, upon showing of good cause, either extend the permit for one additional year, or terminate the permit. Prior to the city authorizing any permit extensions, it shall notify any parties of record and the Department of Ecology. Note: Only one single extension is permitted.*