

- Meetings may be viewed on the [City of Anacortes website](#), on the City of Anacortes [YouTube](#) Channel, or on TV [Channel 10](#).
- To watch, listen to, or participate in the meeting live, visit <https://us02web.zoom.us/j/84685300609> or telephone 1-253-215-8782 and enter Meeting ID 846 8530 0609.
- The public is encouraged to comment via email to pced@anacorteswa.gov, via written comment addressed to PCED, P.O. Box 547, Anacortes, WA 98221. 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.
- Complete guidelines for virtual participation in Anacortes Planning Commission meetings are available [here](#). View the quick video example for connecting to the meeting [here](#).

Anacortes Planning Commission
Municipal Building - Council Chambers
904 6th Street

August 11, 2026
6:00 PM

PRELIMINARY AGENDA
[Packet Materials](#) / [Watch Meeting](#)

1. **Roll Call**
2. **Pledge of Allegiance**
3. **Minutes**
 - a. Minutes of 07/14/2026 were submitted for approval
4. **Public Comment**
5. **Public Hearings**
6. **Other Business**
 - a. Critical Areas Regulations Periodic Update - Best Available Science Review
 - b. Shoreline Master Program Periodic Update - Updated Gap Analysis and Consistency Review
7. **Planning Department Update**
8. **Adjournment**

**Citizens wishing to comment on items not on the agenda may do so under Public Comment. Citizens wishing to comment during a public hearing may do so as those items are considered by the Planning Commission during the course of the meeting.*

The City of Anacortes is committed to making public meetings available and accessible to all members of the community. For assistance with special needs, please contact the City Clerk at 360-299-1960 in advance of the meeting.

Anacortes Planning Commission Minutes - July 14, 2026

Roll Call

Chairperson Frank Jeretzky called to order the Anacortes Planning Commission meeting of July 14, 2026, at 6:00 p.m. Commissioners Jill Underwood, William McCombs, Linda Martin, Tarn Ohana and Mike Mills were present.

Commissioner Chad Sage was absent.

Will McCombs motioned to excuse Chad Sage. Linda Martin seconded the motion.

All Ayes.

Pledge of Allegiance

The assembly joined in the Pledge of Allegiance.

Minutes

Minutes of 06/09/2026 submitted for approval

June 9th, 2026 minutes submitted for approval.

Linda Martin motioned to approve the minutes. Mike Mills seconded the motion.

All Ayes.

Public Comment

Chairperson Frank Jeretzky opened it up to the public to make comments at 6:02pm.

No public comments.

Closed the public comments at 6:03pm.

Public Hearings

No public hearing.

Other Business

Amendments to AMC Title 19 Unified Development Code – Permit Streamlining

Planning Manager, Libby Grage, presented to the Planning Commission the Amendments to AMC Title 19 Unified Development Code — Permit Streaming in a slide presentation. Libby went over the implementation of the Mayor's Executive Order on permit streamlining. This amendment is intended to improve the efficiency, predictability, and organization of the City's development review process.

Discussion Topics:

- Clarification on the reduced objective numeric standards
- Clarification of the term "project permit" definition
- Differences between Preliminary Projects and Site Plan Permits approvals with the benefits for each.
- Questions about Ongoing Compliance and whether it is being monitored.
- Removing Fence Permits as a requirement and how it will be enforced to follow code.
- Clarification on AMC19.20.040(2)(C) in waiving the timeline of the building/construction permit when permits are reviewed concurrently.
- When the 5-10% reduction decision is made in AMC19.21.200(C)(1).
- Word consideration changes
- AMC19.21.200(A) wording, making it broader.
- Clarification on why a Site Plan Review is needed for interior remodels that result in adding bedrooms.

- Clarification on AMC19.38.060 and whether that is already in the code somewhere else.
- AMC19.38.030 about engineered plans prepared.

Libby Grage advised that minor changes will be made to the code prior to it going to the public for comments.

No vote needed.

Planning Department Update

Planning, Community, and Economic Development Director John Coleman provided updates on previous projects and items that have been reviewed by the Planning Commission previously. He also went over the previous City Council meeting about the presentation of the "streetscape" plan for downtown. He then went over the next couple of meeting dates that were presented in the last meeting and what will be presented on those future dates.

Adjournment

Meeting adjourned at 7:53pm.

Planning Commission Agenda Bill

Meeting Date: August 11, 2026

Agenda Item: 6.a.

Subject: Critical Areas Regulations Periodic Update - Best Available Science Review

Staff Contact: Libby Grage, John Coleman

Approved for Submittal to Commission by

Libby Grage
John Coleman

Action Type

Presentation

Summary Statement: The Growth Management Act (GMA) requires cities and counties planning under the Act to review and, if necessary, revise their Critical Areas Regulations to ensure they continue to protect critical areas using the Best Available Science (RCW 36.70A.172).

To support the City's periodic update of the Critical Areas Regulations, the City retained an environmental consultant to evaluate the Best Available Science (BAS) related to wetlands, fish and wildlife habitat conservation areas, geologically hazardous areas, and critical aquifer recharge areas. The consultant reviewed the City's existing regulations against current scientific literature, state guidance, and applicable regulatory requirements to determine whether updates are warranted. Staff is currently reviewing BAS for frequently flooded areas. The findings and any associated recommendations will be presented at a future Planning Commission meeting.

No action is requested at this time. Following Planning Commission discussion and consideration of public input, staff will use the consultant's recommendations and Planning Commission's feedback to prepare draft amendments to the Critical Areas Regulations for future Planning Commission review and public hearing.

Staff requests that the Planning Commission:

- Review the Best Available Science reports and consultant recommendations.
- Identify any questions or issues that warrant additional evaluation.
- Provide feedback to staff to use in preparation of draft code amendments.

Background: See attached memo dated 8/6/26.

Previous Action:

Competing Viewpoints Considered:

Recommended Motion: N/A - Discussion Only

Alternative Actions: N/A

Attachments (listed in order presented):

1. Staff Memo (8/6/26)

2. Draft BAS Report - Wetland and Fish & Wildlife Habitat Conservation Areas
3. Draft BAS Report - Critical Aquifer Recharge Areas
4. Draft BAS Report - Geologically Hazardous Areas



Date: August 6, 2026

To: Planning Commission

From: Planning, Community & Economic Development (PCED) Department

Re: LEG-26-03 – Critical Areas Regulations Periodic Update
Best Available Science Review Summary

Purpose

The purpose of this memorandum is to provide the Planning Commission with an overview of the Best Available Science (BAS) review reports prepared by the City's contracted consultant, GeoEngineers, in support of the City's Critical Areas Regulations periodic update. The memorandum summarizes the major findings and recommendations for wetlands, fish and wildlife habitat conservation areas, critical aquifer recharge areas, and geologically hazardous areas. The memo is intended to facilitate discussion during the Planning Commission meeting. Detailed analyses and supporting documentation are provided in the attached BAS reports.

Background

The Growth Management Act (GMA) requires cities and counties planning under the Act to review and, if necessary, revise their critical areas regulations to ensure they continue to protect critical areas using the Best Available Science ([RCW 36.70A.172](#)).

To support the City's periodic update, the City retained GeoEngineers to evaluate the Best Available Science related to wetlands, fish and wildlife habitat conservation areas, geologically hazardous areas, and critical aquifer recharge areas. The consultants reviewed the City's existing regulations against current scientific literature, state guidance, and applicable regulatory requirements to determine whether updates are warranted.

The Best Available Science review provides the technical foundation for development of draft amendments to the City's Critical Areas Regulations.

Best Available Science Review

An executive summary of the Best Available Science reports is included as Attachment 1. Overall, GeoEngineers concluded that the City's Critical Areas Regulations generally remain consistent with

current Best Available Science and continue to provide an effective framework for protecting critical area functions and values.

The consultant's recommendations primarily focus on targeted refinements to improve clarity, consistency, implementation, mapping, and incorporation of current scientific guidance.

The attached executive summary (Attachment 1) provides an overview of the consultant's findings and recommendations for:

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

Requested Discussion

Staff requests that the Planning Commission:

- Review the Best Available Science reports and consultant recommendations.
- Identify any questions or issues that warrant additional evaluation.
- Provide feedback to staff prior to preparation of draft code amendments.

Next Steps

Following the study session, staff will:

- Consider Planning Commission feedback on the consultant findings.
- Prepare draft amendments to the Critical Areas Regulations.
- Conduct additional public outreach and agency coordination, as appropriate.
- Complete environmental review prior to adoption of the proposed amendments.
- Return to the Planning Commission with draft code amendments for review, public hearing, and recommendation to the City Council.

Attachment 1 – Executive Summary of BAS Review

The City retained GeoEngineers to conduct a Best Available Science (BAS) review in support of the periodic update to the City's Critical Areas Regulations, as required by the Growth Management Act (RCW 36.70A.172). GeoEngineers is an interdisciplinary earth science and engineering consulting firm with extensive experience in environmental planning and critical areas regulations. The project team includes specialists in wetlands, fish and wildlife habitat, hydrogeology, and geologic hazards.

GeoEngineers evaluated the City's regulations governing wetlands, fish and wildlife habitat conservation areas, geologically hazardous areas, and critical aquifer recharge areas against current scientific literature, state agency guidance, and applicable regulatory requirements. The resulting reports provide an independent technical assessment of the City's regulations and identify opportunities to improve consistency with Best Available Science, update references to current guidance, and enhance clarity and usability of the code for applicants, staff, and decision-makers.

Overall, GeoEngineers concluded that the City's Critical Areas Regulations generally remain consistent with current Best Available Science and continue to provide an effective framework for protecting critical area functions and values. The review found that the City's existing regulatory framework is scientifically sound and does not warrant substantial changes to its overall approach to critical area protection.

Rather than recommending broad policy changes, GeoEngineers identified targeted amendments intended to improve clarity, consistency, implementation, and alignment with current scientific guidance and regulatory practices. Recommendations primarily focus on updating technical references, improving code organization and usability, refining implementation standards, enhancing mapping resources, and addressing technical and administrative issues identified during the review.

The major findings for each critical area are summarized below:

- **Wetlands:** Existing wetland regulations are generally consistent with Best Available Science. Recommended updates focus on improving code clarity, updating references to current Ecology guidance, refining implementation of functionally separated buffers, and making minor administrative corrections.
- **Fish and Wildlife Habitat Conservation Areas:** Existing regulations are generally consistent with Best Available Science and continue to provide an effective framework for protecting riparian ecosystems and habitat functions. Recommended updates focus on improving clarity and consistency of Riparian Management Zone standards, updating habitat designations and regulatory references, and improving implementation of existing provisions.

- **Critical Aquifer Recharge Areas:** Existing regulations are generally consistent with Best Available Science and current regulatory practices. Recommendations are limited to administrative improvements, including reorganizing CARA designation provisions and enhancing GIS mapping to improve usability.
- **Geologically Hazardous Areas:** Existing regulations are generally consistent with Best Available Science and provide an appropriate framework for addressing geologic hazards. Recommended updates focus on refining landslide hazard provisions, addressing Anacortes-specific geologic conditions such as exposed bedrock, updating hazard mapping, and improving implementation of existing standards.

In summary, the BAS review confirms that the City's existing Critical Areas Regulations remain fundamentally sound and protective, with the recommended amendments focused on targeted refinements rather than significant changes to the City's regulatory approach.

The Best Available Science review provides the technical foundation for the next phase of the periodic update. Staff will use the consultant's recommendations, together with Planning Commission feedback and public input, to prepare draft amendments to the Critical Areas Regulations for future Commission review and recommendation.

Best Available Science Review

Critical Areas Regulations Update:
Wetlands and
Fish and Wildlife Habitat Conservation Areas
for
City of Anacortes
**Planning, Community &
Economic Development Department**

February 6, 2026

554 West Bakerview Road
Bellingham, Washington 98226
360.647.1510



Best Available Science Review

Critical Areas Regulations Update: Wetlands and Fish and Wildlife Habitat Conservation Areas

File No. 0382-030-05
February 6, 2026

Prepared for:

City of Anacortes
Planning, Community & Economic Development
P.O. Box 547
Anacortes, Washington 98221

Attention: John Coleman, Director of Planning, Community & Economic Development

Prepared by:

GeoEngineers, Inc.
554 West Bakerview Road
Bellingham, Washington 98226
360.647.1510

Beatrice S. Renaud, WPIT
Staff Biologist 2

Jennifer L. Dadisman, MS, PWS
Senior Biologist

Fiona M. McNair, MRM, PWS
Associate Biologist and Wetland Scientist

BSR:JLD:FMM:tlm

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.

Table of Contents

1.0 Introduction	1
2.0 Purpose and Background	1
3.0 BAS Review for Wetlands.....	2
3.1 Code Review and Comparison	2
3.1.1 WAC and RCW.....	2
3.1.2 Washington State Department of Commerce.....	3
3.1.3 City of Anacortes Critical Areas Regulations.....	4
3.1.4 Code Comparisons	9
3.2 Summary of Existing Wetlands in City of Anacortes	13
3.3 BAS Literature Review: Wetlands.....	13
3.3.1 Wetland and Buffer Functions BAS Evaluation	13
3.4 Conclusions and Recommendations: Wetlands	16
4.0 BAS Review for Fish and Wildlife Habitat Conservation Areas	18
4.1 Current Code Review and Comparison.....	18
4.1.1 WAC and RCW.....	18
4.1.2 Washington State Department of Commerce.....	21
4.1.3 City of Anacortes Critical Areas Regulations: FWHCAs.....	21
4.1.4 Code Comparisons	26
4.2 Summary Of Existing Fish And Wildlife Habitat Conservation Areas In Anacortes	36
4.2.1 Summary of Existing Conditions: Streams.....	36
4.2.2 Summary of Existing Conditions: Other FWHCAs.....	42
4.3 BAS Literature Review: Streams	46
4.3.1 Stream Buffers	46
4.3.2 Stream Channel Protection and Restoration/Mitigation	53
4.4 BAS Literature Review: Other FWHCA's.....	54
4.4.1 Critical Saltwater Habitats	54
4.4.2 Wildlife Habitat	55
4.5 Conclusions and Recommendations: FWHCAs.....	57
4.5.1 Riparian Management Zones - Watercourses and Riparian Areas	57
4.5.2 Other FWHCAs	63
5.0 Limitations.....	64
6.0 References.....	64

List of Appendices

Appendix A. Figures from Original Stream Buffer BAS Report

Figure A-1. Index Map

Figure A-2. Cranberry Creek

Figure A-3. Clyde Creek and Anaco Bourn

Figure A-4. Mitten Creek and Streams 1, 2, 3, and 4

Figure A-5a. Beaver Brook West and Morrison Run

Figure A-5b. Beaver Brook East

Figure A-6a. Ace of Hearts West

Figure A-6b. Ace of Hearts Middle and Cedar Springs

Figure A-6c. Ace of Hearts East

Figure A-7. Happy Valley Stream

Figure A-8. Whistle Creek West

Figure A-9. Miller Creek, Weaverling Rill, and Whistle Creek East

Figure A-10. Heart Bourn and Streams 5 and 6

Figure A-11. Toot Creek and Streams 7 and 8

Figure A-12. Summit Creek

Figure A-13. March's Run and Tumers Creek

1.0 Introduction

The City of Anacortes adopted an updated Comprehensive Plan on December 15, 2025, and is in the process of reviewing, and revising if needed, its Critical Areas Ordinance (CAO) as required by the Growth Management Act (GMA) (Washington State Legislature 1990) pursuant to Revised Code of Washington (RCW) 36.70A.130. We understand that the CAO update will be part of a greater code update that is currently underway by the City of Anacortes planning staff.

The City of Anacortes first adopted a CAO in 1992. The City of Anacortes' most recent periodic review and update was completed on July 26, 2021, with City of Anacortes Council adoption of Ordinance 3064 (CAO 2022). The CAO was subsequently amended via Ordinance 4015 (adopted 3/28/22) and Ordinance 4025 (adopted 10/17/22). The GMA requires the use of “best available science (BAS) in developing policies and development regulations to protect the functions and values of critical areas.” This report summarizes the results of our BAS review, presents discussion and conclusions related to potential updates to two specific critical areas regulations: Wetlands and Fish and Wildlife Habitat Conservation Areas (FWHCAs). The FWHCAs section presents an update to the City of Anacortes’ stream buffer BAS report entitled *Revised Stream Buffer Best Available Science Review and Buffer Recommendations* (GeoEngineers 2022) and includes added BAS review and code recommendations.

Our services for this review are described in our scope and fee estimate dated April 3, 2025, and City of Anacortes agreement number 25-139-PLN-001. Our services were authorized by the City of Anacortes on May 12, 2025. The scope of services was developed in collaboration with the City of Anacortes planning staff.

2.0 Purpose and Background

The purpose of this report is to provide technical evaluation, discussion and recommendations to City of Anacortes’ staff for purposes of updating the related portions of the CAO with regard to current BAS for the two specific critical areas (wetlands and FWHCA).

According to the Washington State Department of Commerce (formerly the Office of Community Development), BAS is defined as scientific information applicable to the critical area prepared by local, state or federal natural resource agencies, or qualified scientific professionals, that is consistent with criteria established in Washington Administrative Code (WAC) 365-195-900 through WAC 365-195-925 (Washington State Legislature 1990). The applicability of BAS and even particular critical area regulations are unique to each city and county depending on many factors including location; geography; hydrologic, geologic and hydrogeologic conditions; presence/absences and type of water bodies. GeoEngineers completed our review in accordance with the criteria specified in the referenced WAC sections while considering our understanding of the applicable attributes for the City of Anacortes.

- BAS must be involved in developing the policies and regulations related to the critical area; however, local jurisdictions also have the opportunity and responsibility to include context where proposed development regulations consider relevant mitigation strategies for impacts to, and possible impacts from, critical areas. These considerations are generally incorporated into critical area regulations by

using BAS in developing policies and development regulations to protect functions and values of critical areas, while recognizing the agency also has a responsibility to protect lives and property within the regulatory framework;

- requiring a valid scientific process to evaluate the effects of the policies and regulations; and consider how a valid scientific process can be incorporated in submittals related to the critical areas when assessing possible impacts to critical areas from proposed development activities; and
- incorporating non-science-based decisions with discussion of supporting information, rationale and potential risks to functions and values of critical areas.

BAS reviewed for this update of the City of Anacortes CAO in the two critical areas (wetlands and FWHCAs) of interest are described in separate sections of this report.

3.0 BAS Review for Wetlands

Within the City of Anacortes there are many types of wetlands including but not limited to freshwater wetlands with depressional, slope, riverine and lacustrine hydrogeomorphology and marine salt marsh habitats. The wetlands have been identified both through field investigations and by other means (i.e. mapped hydric soils, National Wetlands Inventory [NWI], etc.). GeoEngineers reviewed existing regulatory codes for the state and local jurisdictions for this BAS review. In addition, this BAS review focused on reviewing agency guidance literature from Washington state agencies with some review of research studies to identify new research and guidance developed since the City of Anacortes last updated their CAO.

3.1 CODE REVIEW AND COMPARISON

3.1.1 WAC and RCW

WAC 365-190-030 defines wetlands as follows:

“Areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include those artificial wetlands intentionally created from non-wetland sites, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. However, wetlands may include those artificial wetlands intentionally created from non-wetland areas to mitigate conversion of wetlands, if permitted by the county or city.”

WAC 365-190-090 (Wetlands) mandates in the designation of wetlands that the definition in RCW 36.70A.030 is used. WAC 365-190-090 also encourages cities and counties “to make their actions consistent with the goal of ‘protection of wetlands’ as described in Executive Orders 89-10 and 90-04 as it appeared in September 1, 1990. (Office of the Governor 1989, 1990)” This WAC also states that wetland protection guidance from the Washington State Department of Ecology (Ecology) should be considered in relation to management recommendations based on BAS and mitigation including options to utilize mitigation banks. Wetland designation via a wetland rating system is described as follows in WAC 365-190-090:

“3) Wetlands rating systems. Wetland functions vary widely.

- (a) When designating wetlands, counties and cities should use a rating system that evaluates the existing wetland functions and values to determine what functions must be protected.
- (b) In developing wetlands rating systems, counties and cities should consider using the wetland rating system developed jointly by the department of ecology and the United States Army Corps of Engineers.
- (c) If a county or city chooses to use an alternative rating system, it must include the best available science.
- (d) A rating system should evaluate, at a minimum, the following factors:
 - (i) Wetlands functions and values;
 - (ii) Degree of sensitivity to disturbance;
 - (iii) Rarity;
 - (iv) The degree to which a wetland contributes to functions and values of a larger ecosystem. Rating systems should generally rate wetlands higher when they are well-connected to adjacent or nearby habitats, are part of an intact ecosystem or function in a network of critical areas; and
 - (v) The ability to replace the functions and values through compensatory mitigation.”

Guidance on wetland buffers are not discussed in WAC or RCW. However, WAC 365-190-090 states that cities and counties are encouraged to utilize guidance from Ecology which does provide guidance on wetland buffers.

WAC 365-190-090 goes on to state that cities and counties may use mapped wetland and watershed characterization as information sources for identifying the distribution of wetland habitat. Cities and counties must also use the methodology for regulatory delineations of wetlands in the adopted state manual identified in RCW 36.70A.175 (WAC 365-190-090) which states that the manual must be consistent with the 1987 manual by the United States Army Corps of Engineers (USACE) and the United States Environmental Protection Agency (EPA). Cities and counties are encouraged to consider changes to delineation guidance if there are changes from the USACE or EPA (RCW 90.58.515).

3.1.2 *Washington State Department of Commerce*

The Washington State Department of Commerce and the GMA provide guidance for jurisdictions to consider the designation and protection of wetlands (Washington State Department of Commerce 2023). According to the Washington State Department of Commerce, wetlands for regulatory purposes are to use the wetland definition in RCW 36.70A.030(21) (Washington State Department of Commerce 2023) which is the same as in WAC 365-190-030. The *Washington State Department of Commerce Critical Areas Handbook* (Washington State Department of Commerce 2023) goes on to state that “Counties and cities should consider using Ecology’s wetland rating system and recommended buffers. If a County or City chooses not to use the state wetland rating system, the rationale for the decision needs to be included in its legal record and it must include best available science. A rating system should evaluate, at a minimum, the following factors:

- Wetlands functions and values
- Degree of sensitivity to disturbance

- Rarity
- The degree to which a wetland contributes to functions and values of a larger ecosystem. Rating systems should generally rate wetlands higher when they are well connected to adjacent or nearby habitats, are part of an intact ecosystem or function in a network of critical areas
- The ability to replace the functions and values through compensatory mitigation”

3.1.3 *City of Anacortes Critical Areas Regulations*

The City of Anacortes’ critical areas regulations include the following definition of wetland (or wetlands) per Anacortes Municipal Code (AMC) 19.70 (Definitions):

“those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. “Wetlands” generally include swamps, marshes, bogs, and similar areas. “Wetlands” do not include those artificial wetlands intentionally created from nonwetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. “Wetlands” include those artificial wetlands intentionally created from nonwetland areas to mitigate conversion of wetlands.”

The City of Anacortes’ critical areas regulations include the following requirement for wetland ratings per AMC 19.70.215 (Designation and rating):

“Rating. Wetlands must be rated by a qualified professional according to the Washington State Department of Ecology Wetland Rating System for Western Washington – 2014 Update (Ecology Publication No. 14-06-029, October 2014), or as revised. Wetland rating categories will be applied as the wetland exists on the date of adoption of the rating system by the city, as the wetland naturally changes in accordance with permitted activities.”

Wetland categories (i.e., I, II, III and IV) are described in AMC 19.70.215.B. Of note is that the Wetland Rating System for Western Washington was updated in 2023 and is the current manual for rating wetlands (Hruby and Yahnke 2023).

According to AMC 19.70.220 (mapping and delineation), wetland extent is depicted on the City of Anacortes’ geographic information system (GIS) database which depicts approximate locations. These maps are to be used as a guide but do not provide a final critical area designation. In addition, this code chapter states that wetland identification and delineation should be completed in accordance with “the adopted federal wetland delineation manual and applicable regional supplements per WAC 173-22-035.”

3.1.3.1 **REQUIRED BUFFER AREAS**

Required wetland buffers are described in AMC 19.70.235. Wetland buffers are based on the category of the wetland, surrounding land use intensity (i.e., high, moderate and low as described in Table 19.70.235.A) and the habitat score using the Wetland Rating System for Western Washington. Wetland buffers stipulated by Anacortes are presented in Table 1 below. Wetland buffers are measured horizontally from the edge of the wetland boundary. The required wetland buffer presumes the existence

of a dense vegetation community in the buffer that is adequate to protect the wetland functions and values. When a buffer lacks adequate vegetation, the decision-maker may increase the standard buffer, require buffer planting or other enhancements, and/or deny a proposal for buffer reduction or buffer averaging.

TABLE 1. ANACORTES WETLAND BUFFERS

LAND USE INTENSITY	CATEGORY I BUFFER WIDTH (FEET)	CATEGORY II BUFFER WIDTH (FEET)	CATEGORY III BUFFER WIDTH (FEET)	CATEGORY IV BUFFER WIDTH (FEET)
HIGH HABITAT FUNCTION (8 OR 9 POINTS)				
High	300	300	300	50
Moderate	225	225	225	40
Low	150	150	150	25
MODERATE HABITAT FUNCTION (6 OR 7 POINTS)				
High	150	150	150	50
Moderate	110	110	110	40
Low	75	75	75	25
LOW HABITAT FUNCTION (3 TO 5 POINTS)				
High	100	100	80	50
Moderate	75	75	60	40
Low	50	50	40	25

The buffers listed above are the standard buffers for the City of Anacortes. According to AMC 19.70.235, there are ways to reduce the buffer widths: buffer reduction and buffer averaging. Buffers can be reduced if the wetland and site meet certain criteria; based on habitat functions scores on the wetland rating form and existing vegetated corridor around the wetland. The buffers can also be reduced using buffer averaging which is allowed on a case-by-case basis when the following criteria are met:

- there is no feasible alternative to the site design that could be accomplished without buffer averaging;
- the buffer averaging improves the functions or values of the wetland;
- the total area contained in the buffer area after averaging is the no less than that which would be contained in the standard buffer;
- the wetland contains variation in sensitivity due to existing physical characteristics; and
- the buffer width at the narrowest point is not reduced to less than 75 percent of the standard width.

3.1.3.2 WETLAND AND BUFFER MITIGATION.

According to AMC 19.70.245 (Compensatory Mitigation Performance Standards and Requirements), a compensatory mitigation plan needs to be prepared when a project involves wetland and/or buffer impacts. According to AMC 19.70.125 projects must demonstrate mitigation sequencing before impacting any critical areas; mitigation sequencing includes:

1. Avoiding the impact altogether by not taking a certain action or parts of actions;

2. Minimizing impacts by limiting the degree or magnitude of the action and its implementation by using appropriate technology, or by taking affirmative steps, such as project redesign, relocation, or timing to avoid or reduce impacts;
3. Rectifying the impact by repairing, rehabilitating or restoring the affected environment, or by restoring or stabilizing the critical area through natural, engineering or other methods;
4. Reducing or eliminating the impacts or hazard over time by preservation and maintenance operations during the life of the action;
5. Compensating for the impact by replacing, enhancing or providing substitute resources or environments; and/or;
6. Monitoring, measuring and reporting the impact to the decision maker and taking appropriate corrective measures.

Mitigation requirements and plans should be developed in accordance with Wetland Mitigation in Washington State: Parts 1 and 2 (Ecology 2021 and 2006) and meet the additional following standards:

- Description of existing wetland and buffer areas to be impacted including size, water regime, vegetation, soils functions and surrounding conditions.
- Description of mitigation site and rationale for selection. Also include a description of anticipated future conditions.
- Description of the proposed mitigation actions. The overall goals and objectives of the mitigation should be listed.
- Description of construction activities and the timing of activities.
- Description of anticipated ongoing management practices that will protect the wetlands after the site has been developed, including the proposed monitoring and maintenance programs.
- Provide proof of establishment of notice on title for the wetlands and buffers on the project site.
- Provide scaled plan sheets that contain information for the proposed mitigation site.

According to AMC 19.70.245.K, buffer impacts must be mitigated at a 1:1 ratio. Per AMC 19.70.245.F “Compensatory mitigation actions must be conducted within the same sub-basin or on the site of the alteration” unless specific criteria are met. The mitigation should also ensure that the wetland and buffer functions and values are not diminished due to the impacts, per AMC 19.70.235.J. Maintenance of buffers in the mitigation site is required for the duration of the mitigation bond, per AMC 19.70.235.I.

Wetland mitigation is used for impacts that cannot be avoided or minimized and must achieve equivalent or greater biologic functions. Mitigation requirements may also be determined using the credit/debit tool created by Ecology (Hruby 2012). Mitigation must address the functions and values affected by the project with the intention to achieve functional equivalency or improvement of functions and values. The goal for mitigation must be to provide similar wetland functions and values as those lost except when either the lost wetland provides minimal functions and values or out of kind replacement of wetland type or functions and values will best meet watershed goals formally identified by the City of Anacortes (AMC 19.70.245.C). The City of Anacortes lists preferred mitigation actions in the following order:

- Restoration (including Reestablishment and Rehabilitation)
- Creation
- Enhancement
- Preservation
- Wetland Bank or Advanced Mitigation

AMC 19.70.245.E states that unless it is demonstrated that a higher level of ecological functioning would result from an alternative mitigation approach, compensatory mitigation for ecological functions should be in kind and on site or in kind and within the same stream reach, subbasin or drift cell. There are exceptions for this if certain conditions are met. If a wetland mitigation bank is used to compensate for wetland impacts, then the impact area must be in the service area of the bank and ratios and credits will be consistent with the certified mitigation bank instrument (AMC 19.70.245.F). In-Lieu Fee may be used when it would provide environmentally appropriate compensation for impacts; when the credits and debits are applied according to the approved instrument for the in-lieu fee program; and when the impacts are located within the service area (AMC 19.70.245.G). AMC 19.70.245.I states that an alternative wetland mitigation plan may be allowed if it is based on BAS and provides equivalent or better level of protection of wetland functions and values.

Wetland mitigation ratios are specified in Table 19.70.245 Wetland Mitigation Ratios in AMC 19.70.245.J. The ratios for Category I wetlands based on score for functions, Category III and Category IV wetlands are listed below to provide examples of the ranges of ratios.

TABLE 2. WETLAND MITIGATION RATIOS

CATEGORY OF WETLAND	CREATION OR RE-ESTABLISHMENT	REHABILITATION ONLY	RE-ESTABLISHMENT (R) OR CREATION (C) AND REHABILITATION (RH)	RE-ESTABLISHMENT OR CREATION AND ENHANCEMENT (E)	ENHANCEMENT ONLY
Category I (based on functions score)	4:1	8:1	1:1 R/C and 6:1 RH	1:1 R/C and 12:1 E	16:1
Category III	2:1	4:1	1:1 R/C and 2:1 RH	1:1 R/C and 4:1 E	8:1
Category IV	1.5:1	3:1	1:1 R/C and 1:1 RH	1: 1R/C and 2:1 E	6:1

As stated in AMC 19.70.245.M, the following design standards must be incorporated into mitigation plans; however, these standards can be modified if they are consistent with Ecology guidance (Ecology 2006).

- Plants native to the region must be used.
- Plant species selection must be consistent with the existing or projected hydrologic regime, including base water levels and stormwater event fluctuations.

- Plant species selection must be consistent with the site environmental conditions such as slope, aspect, soils and exposure to the sun, wind and rain.
- Plants should be commercially available or available from local sources.
- Native plant species high in food and cover value for fish and wildlife should be prioritized as appropriate for the site.
- Plant selection must be approved by a qualified professional.
- The following standards apply to wetland design and construction:
 - For wetland creation sites, preliminary investigations of existing hydrology at the site must be completed to confirm that the site has adequate source hydrology to support wetland conditions.
 - Water depth in areas of seasonal or occasional inundation must not exceed 3 feet unless the proposed mitigation is compensating for impacts to unvegetated/open water areas.
 - If creating or rehabilitating a slope wetland, the grade or slope within the wetland must not exceed 6 percent, unless otherwise approved.
 - Slopes within the wetland contributing basin and the buffer zone must not be steeper than 3H:1V (horizontal to vertical).
 - The wetland (excluding the buffer area) should not contain more than 20 percent unvegetated/open water areas as measured at the seasonal high water mark, unless the mitigation is compensating for vegetated.
 - Site soils must be free of contamination and/or hazardous materials and must have adequate organic content and porosity to support the proposed native plant community.
 - Planting densities and placement of plants should be determined by a qualified professional and shown on the design plans.
- The planting plan must be approved by the City of Anacortes
- Stockpiling soil and construction materials should be confined to upland areas and contract specifications should limit stockpiling of earthen materials to durations in accordance with City of Anacortes clearing and grading standards, unless otherwise approved by the City of Anacortes.
- Planting instructions must be submitted which describe placement, diversity and spacing of seeds, tubers, bulbs, rhizomes, sprigs, plugs and transplanted stock.
- Controlled release fertilizer (if required) must be used in upland areas only and must be installed into the planting hole only at the time of planting. No fertilizer must be applied to the ground surface.
- An irrigation system must be installed or watering afforded by trucks or hoses to provide water for installed plants and seeded areas to supplement rainfall to ensure that plants receive approximately ½ inch of water per week during the dry season of the first 2 years after plant installation.
- All construction specifications and methods must be approved by a qualified professional and the City of Anacortes.
- Construction management provided must be provided by a qualified professional. Ongoing work onsite must be inspected by the City of Anacortes.

3.1.4 Code Comparisons

A review of surrounding jurisdictions' (Cities and Counties) CAO policies and regulations was conducted and includes: City of Bellingham Wetlands Critical Areas Code (Bellingham Municipal Code 16.55); City of Mount Vernon Wetlands Critical Areas Code (MVMC 15.40); City of Burlington Wetlands Critical Areas Code (Burlington Municipal Code 14.15); King County Wetlands Critical Areas Code (KCC 21A.24); and City of Seattle Wetlands Critical Areas Code (SMC 25.09).

Wetland definitions are relatively consistent throughout all the jurisdictions and match the WAC definition. In addition, the CAOs reviewed all required the use of the Ecology Wetland Rating System for Western Washington (Hruby and Yahnke 2023). Wetland mapping and delineation methods were also consistent throughout the codes.

Wetland buffers differed slightly between the jurisdictions. Across jurisdictions, wetland buffers are based on Wetland Category and on land use intensity and/or habitat score from the Ecology wetland rating form for western Washington (Hruby and Yahnke 2023). For ease of comparison, Category I, Category III and Category IV wetland buffers were compared between the different jurisdictions. The City of Anacortes requires 50- to 300-foot buffers for Category I wetlands, which matches King County regulations and exceeds Bellingham's range of 50- to 200-foot buffers for Category I wetlands. For Category III wetlands the City of Anacortes requires between a 40- and 300-foot buffer. This matches King County regulations and exceeds the Bellingham requirements of 50 to 150 feet. The cities of Seattle, Mount Vernon and Burlington stipulate 100- to 300-foot buffers for Category I systems, 60- to 200-foot buffers for Category III systems and 50-foot buffers for Category IV wetlands. Category I, Category III and Category IV wetland buffers for several different jurisdictions are presented below in Tables 3 and 4.

TABLE 3. WETLAND BUFFER CODE COMPARISON JURISDICTIONS THAT USE LAND INTENSITY AND HABITAT FUNCTION SCORE

JURISDICTION	HABITAT FUNCTION SCORE ¹	CATEGORY I BUFFER WIDTH (FEET)			CATEGORY III BUFFER WIDTH (FEET)			CATEGORY IV BUFFER WIDTH (FEET)		
		HIGH	MEDIUM	LOW	HIGH	MEDIUM	LOW	HIGH	MEDIUM	LOW
City of Anacortes ²	High (8-9)	300	225	150	300	225	150	50	40	25
	Moderate (6-7)	150	110	75	150	110	75	50	40	25
	Low (below 3-5)	100	75	50	80	60	40	50	40	25
City of Bellingham	High (8-9)	200	190	150	150	110	75	50	40	25
	Moderate (5-7)	150	110	75	150	100	60	50	40	25
	Low (below 3-4)	100	75	50	80	60	50	50	40	25
King County	High (8-9)	300	225	15	300	225	150	50	40	25
	Moderate (6-7)	150	110	75	150	110	75	50	40	25
	Low (below 3-5)	100	75	50	80	60	40	50	40	25

Notes:

1. Habitat score from the Ecology Wetland Rating form for Western Washington (Hruby and Yahnke 2023).
2. City of Anacortes bases wetland buffers on habitat function, land use intensity and size. The decision maker may allow small (less than 1,000 square feet) and hydraulically isolated wetlands to be exempt from the buffer requirements as long as the following conditions are met:
 - a. The remaining mitigation sequencing actions of AMC 19.70.125(A)(2) through 19.70.125(A)(6) are followed;
 - b. The wetland is less than 1,000 square feet in area;
 - c. The wetland does not have unique characteristics that would be difficult to replace through standard compensatory mitigation practices;
 - d. The wetland is a low-quality Category IV wetland with a habitat score of less than five points in the adopted rating system;
 - e. The wetland does not provide significant suitable breeding habitat for native amphibian species. Suitable breeding habitat may be indicated by adequate stable and seasonal inundation that is persistent from February to at least through April and presence of thin-stemmed emergent vegetation and/or clean water;
 - f. The wetland does not contain habitat identified as essential for local populations of priority species identified by the Washington Department of Fish and Wildlife or species of local importance which are regulated as fish and wildlife habitat conservation areas in Part 3 FWHCA;
 - g. The wetland is not associated with shorelines of the state or their associated buffers;
 - h. The wetland is not associated with riparian areas or buffers;
 - i. The wetland is not part of a wetland mosaic; and
 - j. A mitigation plan to replace lost wetland functions and values is developed, approved and implemented consistent with AMC 19.70.130, Mitigation plan requirements.

TABLE 4. WETLAND BUFFER CODE COMPARISON JURISDICTIONS THAT USE OTHER METHODS

JURISDICTION	BUFFER BASED ON	HABITAT FUNCTION SCORE ²	CATEGORY I BUFFER WIDTH (FEET)	CATEGORY III BUFFER WIDTH (FEET)	CATEGORY IV BUFFER WIDTH (FEET)
City of Seattle	Wetland Category, Size and Habitat Function Score ¹	High (8-9)	200	200	50
		Moderate (5-7)	110	110	
		Low (3-4)	100	60	
City of Mt. Vernon	Wetland Category only		200	75	50
City of Burlington	Wetland Category only		300	150	50

Notes:

1. City of Seattle bases wetland buffers based on size and habitat functions. Category I and III wetlands greater than 100 square feet in size or of any size that abuts a stream have the buffers listed above. Category IV wetlands that are at least 1,000 square feet in size or of any size that abuts a stream has the buffer listed in the table above.
2. Habitat score from the Ecology Wetland Rating form for Western Washington (Hruby and Yahnke 2023).

According to BMC 16.55.340, buffer widths can be modified. Similar to the City of Anacortes regulations, buffer widths can be reduced or buffer averaging applied. City of Anacortes buffer reduction allowances vary by habitat function score and also conditions of the wetland and development; however, the City of Bellingham allows for buffer reductions based on wetland category if functions and values of the wetland are not adversely affected and measures such as directing lights away from wetlands and buffers are implemented. Buffer averaging requirements are similar between the two cities but in the City of Bellingham, the buffer cannot be reduced in any location to less than 50 percent of the standard width or 35 feet, whichever is greater except for buffers of Category IV wetlands and low intensity land uses (BMC 16.55.340.C). City of Bellingham Mitigation Requirements (BMC 16.55.240) stipulate that all adverse impacts to critical areas and buffers be mitigated for using BAS so to result in no net loss of critical area functions and values. Site selection for the mitigation site focuses on the site's ability to sustain a critical area over long-term and the mitigation design should focus on replacing functions and values in the context of the watershed in order to compensate for loss and acknowledges that sometimes onsite mitigation may not be the preferred location. The City of Bellingham requires mitigation sequencing similar to the City of Anacortes; however, it also includes one more step for sequencing: minimizing or eliminating the hazard by restoring or stabilizing the hazard through engineered or other methods. Mitigation plan requirements (BMC 16.55.260) are similar to the City of Anacortes' mitigation plan requirements. The City of Bellingham also allows for the use of the Credit/Debit method (Hruby 2012). The City of Bellingham has a preference of mitigation actions in the following order: Restoration; Creation; Enhancement; and Preservation. The City of Bellingham also allows for use of Mitigation Banks and in-lieu fee programs. Mitigation ratios are similar between the City of Bellingham and the City of Anacortes; however, the City of Bellingham provides mitigation ratios for enhancement only and preservation only which the City of Anacortes does not. The City of Bellingham also provides provisions for increasing or decreasing the ratios.

According to MVMC 15.40.090.F wetland buffers can be reduced through buffer averaging; they do not have a standard buffer reduction as do the Cities of Anacortes and Bellingham. Buffer width averaging regulations are similar to the City of Anacortes. The City of Mount Vernon also allows maintenance in the buffer for mitigation areas. Wetland mitigation within the City of Mount Vernon should achieve equivalent or greater biologic functions and should be consistent with ecology Guidance (Ecology 2006 and 2021). In addition, the City of Mount Vernon also requires projects to complete mitigation sequencing and is

consistent with City of Anacortes (MVMC 15.40.090.G). Also, similar to the City of Anacortes, mitigation is preferred to be onsite and in kind unless there is no other alternative, the offsite mitigation area has a greater likelihood of providing equal or improved wetland functions or there is a strongly justified reason for an offsite mitigation area. MVMC 15.40.090.G does allow for state certified wetland mitigation banks to be used. Table 15.40.090(B) within MVMC provides wetland creation ratios for categories and is consistent with ratios in the City of Bellingham and the City of Anacortes. However, Mount Vernon does not provide ratios for other types of mitigation and states that enhancement must be used in conjunction with restoration and/or creation; also, it must be adequately described how the mitigation compensates for loss of wetland area and function.

According to City of Burlington MC (14.15.185.C), wetland buffers can be reduced through buffer averaging and similar to City of Mount Vernon do not allow for standard reductions. Buffer width averaging regulations are similar to the City of Anacortes and the City of Burlington also allows maintenance in the buffer for mitigation areas. Wetland mitigation in the City of Burlington should achieve equivalent or greater biologic functions (City of Burlington MC 14.15.220) and should be consistent with ecology Guidance (Ecology 2006 and 2021). Mitigation sequencing should be applied to the project, and the sequencing steps are similar to the City of Anacortes. The City of Burlington also allows the Ecology Credit/Debit method to be used (Hruby 2012). City of Burlington preferred mitigation actions also allow for preservation. Preference for mitigation is to be in kind and onsite. Wetland mitigation ratios are consistent with the City of Anacortes. The City of Burlington also allows for use of advanced mitigation, mitigation banks and in-lieu fee programs.

King County mitigation requirements are different than the cities reviewed; however, there are some similarities. KCC 21A.24.325 allows for buffer reductions through buffer averaging and buffer reductions; there are conditions that apply for both of these strategies. King County prefers onsite and in-kind mitigation to offsite which is only allowed when onsite is not feasible (KCC 21A.24.133). Mitigation ratios are consistent with the City of Anacortes for permanent impacts; however, King County also has mitigation ratios listed for temporary and conversion impacts to wetlands (KCC 21A.24.335). King County also allows impacts to be compensated for using King County's Mitigation Reserves Program (KCC 21A.24.137) and through mitigation banking (KCC 21A.24.345).

According to SMC 25.09.160 wetland buffers can be reduced through a standard reduction and buffer averaging. Buffer averaging conditions are similar to the City of Anacortes. The buffer reductions are based on wetland category; Category I, II and III wetlands may have a buffer reduction of 20 percent if a vegetated corridor at least 100 feet wide is protected between the wetland buffer and other priority habitats. SMC 25.09.160.F allows for land disturbing activities that result in increased size or ecological function of a wetland and/or buffer if the project uses Ecology guidance (Ecology 2006 and 2021). SMC also allows for small project waivers where the director can approve additions to existing structures or temporary disturbances for installation of utility lines in a wetland buffer if no construction occurs over or in a riparian watercourse, water body or wetland. According to SMC 25.09.065 all projects must use mitigation sequencing, and these sequencing measures are similar to the City of Anacortes. The City of Seattle also prioritizes onsite and in-kind mitigation but does allow for exceptions to this. The required mitigation plan shall also demonstrate that there will be no impact to the ecological functions of the critical area. Mitigation plans must be consistent with Ecology guidance (Ecology 2006). Mitigation ratios (SMC Table A for 25.09.065) are consistent with the City of Anacortes although Seattle provides ratios for enhancement only mitigation.

3.2 SUMMARY OF EXISTING WETLANDS IN CITY OF ANACORTES

The City of Anacortes Interactive GIS Map (CAIGM) and geographic data supplied by the City of Anacortes were viewed to assess the extent of wetlands within the City of Anacortes (City of Anacortes GIS 2025). The CAIGM displays both delineated and non-delineated wetlands. There are approximately 22 delineated wetlands and approximately 72 non-delineated wetlands mapped. Most of the non-delineated wetlands were identified via windshield survey (City of Anacortes GIS 2025). The two largest delineated wetlands are in the northwest corner of the City of Anacortes (City of Anacortes GIS 2025). The Ship Harbor Wetland and the Shannon Point Road Wetland are both Category II systems (City of Anacortes GIS 2025). There are several non-delineated wetlands throughout the Anacortes Community Forest North and South and a large non-delineated wetland to the northeast within Volunteer Park (City of Anacortes GIS 2025). There are also several non-delineated wetlands to the north of Similk Bay and south of Highway (Hwy) 20 (City of Anacortes GIS 2025).

According to the geographic data supplied by the City of Anacortes there are approximately 117 wetlands within the city limits, 22 of these wetlands have habitat and species symbology and approximately 16 wetlands are within a habitat of local importance. There is a total of approximately 422.4 acres of wetlands mapped within the City of Anacortes, occupying approximately 5.5 percent of the City of Anacortes' area.

3.3 BAS LITERATURE REVIEW: WETLANDS

Literature and guidance from Washington State agencies, the USACE, EPA and research literature were reviewed for guidance regarding wetlands and associated buffers. Wetlands provide significant benefits to humans in the form of a variety of ecosystem goods and services such as provisioning food and water, water storage, flood protection, pollutant and nutrient retention and erosion reduction (Hattermann et al. 2008). The buffer size necessary to provide a particular level of protection for wetlands depends on the level of functions a wetland provides, the characteristics (size, vegetation coverage, topography, etc.) of the buffer, the intensity of adjacent land use and watershed characteristics (Hruby and Yahnke 2023). Functions that a wetland provides depend on multiple factors including hydrogeomorphic class, hydraulic characteristics, vegetation structure, hydroperiods, proximity to pollution and connectivity to other wetland and upland habitats (Hruby and Yahnke 2023). A buffer that can protect a wetland should be sized to protect the functions a wetland provides that are identified as being locally important. The literature review below focuses on the water quality, hydrology and wildlife functions provided by wetlands and buffers.

3.3.1 Wetland and Buffer Functions BAS Evaluation

In Washington State wetland functions are rapidly assessed using a rating system (WAC 365-190-090). The current BAS-based rating system for Western Washington is the Washington State Wetland Rating System for Western Washington: 2014 Update Version 2.0 (Hruby and Yahnke 2023). Within this system, the functions of a wetland are grouped into three categories: water quality, hydrology and habitat (Sheldon et al. 2005; Hruby and Yahnke 2023). Direct and indirect impacts, including changes in water flow, pollution and habitat fragmentation, can diminish the ecological functions of wetlands (Sheldon et al. 2005).

3.3.1.1 WETLAND WATER QUALITY FUNCTIONS

Wetlands improve water quality by trapping and retaining sediment, nutrients, metals and pathogens and preventing them from entering downstream surface and groundwater (Sheldon et al. 2005). Water quality

functions of wetlands vary based on how long water remains in the wetland, the type and density of the vegetation and the composition of the soil (Hruby and Yahnke 2023). A recent study by Leibowitz et al. in 2023 explored how wetlands are connected to streams and how this affects water quality. Among their findings, the study showed that regardless of how directly connected the wetlands were to a stream, their presence helped reduce levels of nitrogen and sediment in the water. Additional studies have shown that constructed wetlands are effective at remediating pharmaceuticals and personal care products from water (Pei Wang et al. 2019; Dongqing Zhang et al. 2014).

3.3.1.2 WETLAND HYDROLOGIC FUNCTIONS

Wetland hydrological functions include reduction in peak flows, reduction of erosion and recharging groundwater (Sheldon et al. 2005). The presence of impervious surfaces within a watershed alters the hydrological processes and subsequently impacts aquatic habitats. Impervious surfaces prevent water infiltration into the soil and cause all precipitation to remain surface water and flow downgradient (Sheldon et al. 2005). A study conducted in Vancouver, British Columbia (Hamilton et al. 2021) examined the effects of increased impervious surfaces on water runoff. The study showed that over time, both the depth of runoff and inundation increased, with a notable 51 percent increase in regions submerged by at least 5 centimeters of water. The findings highlighted that flat, low-lying areas or those with a high concentration of impervious surfaces are particularly vulnerable to these effects.

3.3.1.3 WETLAND WILDLIFE HABITAT FUNCTIONS

Wetland habitat supports and maintains elements of the life cycle of many flora and fauna. This includes habitat for invertebrates, amphibians, anadromous and resident fish, birds and mammals. Additionally, wetlands support habitat for native plants and food webs (Sheldon et al. 2005). Buffer width and condition, vegetation structure, habitat interspersions, hydroperiods and landscape setting all impact wetland habitat functions (Hruby and Yahnke 2023). A study conducted in 2022 investigated the potential of water quality functions provided by wetlands to mitigate habitat loss in an agricultural setting. The study found that inclusion of wetlands created for the purpose of improving water quality in agricultural drainage may mitigate losses of amphibian habitat loss as well as increasing bird and pollinator habitat (Mitchell et al. 2022).

3.3.1.4 BUFFERS

Wetland buffers are intended to protect and maintain the functions and values of wetlands. Buffers are particularly important for protecting and enhancing the habitat functions of a wetland. Buffers provide habitat connectivity, cover and food for animals utilizing the habitat as well as providing water quality benefits (sediment, nutrient and toxin removal) and screening nearby disturbances (noise and light) (Sheldon et al. 2005). Several physical attributes determine the effectiveness of a buffer at reducing human impacts and providing habitat. These attributes include slope, soils, vegetation and width (Sheldon et al. 2005).

A study conducted in the Wucun watershed in China investigated the effectiveness of riparian reforestation looking at how different buffer widths reduced nutrient loading into aquatic environments (Jiang et al. 2019). The study found that as buffer widths increased, so did the efficiency of nutrient removal. For example, a buffer zone with a width of 20 meters (approximately 66 feet) achieved a reduction in nitrogen concentrations by 23.21 percent and in phosphorus concentrations by 18.16 percent (Jiang et al. 2019). When the buffer zone width increased to 40 meters (about 131 feet), the reductions in nitrogen and phosphorus levels rose to 50.39 percent and 45.93 percent, respectively (Jiang et al. 2019).

The most substantial reductions occurred with a 60-meter (approximately 197 feet) wide buffer zone, where nitrogen levels dropped by 56.20 percent and phosphorus levels by 52.14 percent (Jiang et al. 2019).

Ecology Best Available Science for Wetlands Volume 2: Guidance for Protecting and Managing Wetlands states (Granger et al. 2005):

“Authors who synthesized the literature on the effectiveness of buffer widths suggest buffers between 25 and 75 feet for wetlands with minimal wildlife habitat functions and adjacent low-intensity land uses; 50 to 150 feet for wetlands with moderate habitat functions or adjacent high-intensity land uses; and 150 to 300 feet for wetlands with high habitat functions. Effective buffer widths for protecting water quality ranged from 25 to 50 feet for 60% removal of pollutants, to 150 to 200 feet for 80% removal of pollutants.”

3.3.1.5 MITIGATION

Below is a BAS review of wetland mitigation focused on federal and state agency guidance and regulations. Sources from Ecology (Ecology 2006, 2021, 2022) the USACE and EPA (73 FR 19594) and Washington State regulations were reviewed in regard to mitigation.

Ecology: Ecology has prepared several guidance documents for wetland mitigation. *Wetland Guidance for Critical Areas Ordinance (CAO) Updates* (2022) states that applicants are required by state and federal agencies to follow mitigation sequencing (Avoid, Minimize, Rectify, Reduce or eliminate the impact over time, compensate and monitor). In addition, this 2022 guidance document allows for buffer averaging. There are also two potential mitigation approaches that can be used to provide compensatory mitigation: programmatic mitigation (mitigation banks and in-lieu fee programs) and permittee responsible mitigation (the permittee retains full responsibility to compensate for impacts) (Ecology 2022). The Ecology CAO Update document (Ecology 2022) references the joint Ecology guidance documents (Ecology 2021 and 2006) should be used and states that wetland functions should be analyzed at the proposed impact area and mitigation area. Buffer impacts should be mitigated with a ratio of at least 1:1 for area (Ecology 2022). The City of Anacortes code is consistent with this Ecology document (Ecology 2022).

Ecology also has prepared joint guidance (Ecology 2021 and 2006) for wetland mitigation in Washington State. Most of the jurisdictions reviewed, including the City of Anacortes, reference these documents when preparing a mitigation plan. Part 1 guidance (Ecology 2021) discusses reducing widths of perimeter buffers on mitigation sites; these criteria are consistent with the City of Anacortes guidelines for reducing wetland buffers. Mitigation ratios listed in the City of Anacortes code are consistent with mitigation ratios listed in the Ecology joint guidance (Ecology 2021).

USACE and EPA: The final rule on mitigation (73 FR 19594) was reviewed. The rule establishes performance standards and criteria for use of permittee responsible compensatory mitigation, mitigation banks and in lieu fee programs to improve the quality and success of compensatory projects. The rule also requires regular monitoring for mitigation projects and establishes a preference for the use of mitigation bank credits. The City of Anacortes does allow for use of mitigation banks and in-lieu fee programs and is consistent with this document.

Washington State regulations: In Washington, wetlands are protected by several state laws. Ecology has the authority to regulate wetlands under the state's Water Pollution Control Act and Shoreline Management Act. Ecology provides support to local governments on CAOs under the state Growth Management Act. The

State Environmental Policy Act (SEPA, Revised Code of Washington [RCW] 43.21C and WAC 197-11) stipulates a process to identify potential wetland-related concerns early in the environmental review and permitting process. According to the Washington Administrative Code (WAC 197-11-768) mitigation means avoiding the impact altogether; minimizing impacts; rectifying the impact by repairing, rehabilitating or restoring the affected environment; Reducing or eliminating the impact over time by preservation and maintenance; compensating for the impacts; and/or monitoring the impact and taking appropriate corrective measures. This is consistent with the City of Anacortes mitigation sequencing requirements.

3.4 CONCLUSIONS AND RECOMMENDATIONS: WETLANDS

The City of Anacortes code for wetlands is in general accordance with the BAS. Wetland buffers are well within the recommended widths by Ecology and some of the buffer widths are high compared to surrounding jurisdictions. It should be noted that some of the jurisdictions reviewed for this BAS are also in the process of being updated. As part of the code review process, we received input from the City of Anacortes on feedback they have received on interpreting and following the wetlands critical areas code. Based on our review and research the following are recommended changes to code text to make the code align with the BAS and/or to provide clarity. Underlined text (e.g., text) is recommended to be added, and strikethrough text (e.g., ~~text~~) is recommended to be removed.

- In AMC 19.70.230 Specific Wetland Category Development standards: wetlands and wetland buffers are included in subsection A but not in B. A majority of the surrounding jurisdictions include the wetland buffers in the development standards regardless of the wetland category. Therefore, it is recommended to add wetland and wetland buffers to subsection B.
- AMC 19.70.230 discusses alterations to wetlands and buffers that, according to AMC 19.70.045, require a permit. For clarity, it is recommended that a reference to AMC 19.70.045 is added to this section.
- AMC 19.70.230(B)(3)(d) states “The wetland is a low-quality Category IV wetland with a habitat score of less than five points in the adopted rating system”. However, Ecology’s Wetland Rating System habitat score ranges are 3 to 5, 6 to 7 and 8 to 9. For clarity it is recommended that the language is changed from “less than five” to “three to five”.
- AMC 19.70.235.D.1.a. This section of the code specifically refers to the 2014 wetland rating system, which has been updated. Instead of referring to the 2014 wetland rating system, change wording to state “the current approved wetland rating system” or “as updated”
- AMC 19.70.235 (Required buffer areas) Part M (Functionally Separated and Isolated Buffers).
 - Consider adding a condition that if the proposed development area that is functionally separated has a hydrologic connection to the wetland in the form of a surface water connection (e.g., culvert under the road or sheet flows over the paved area) that the effect of the proposed development, that is located in the functionally separated area, on the hydrology and water quality of the wetland must be assessed by a qualified professional and the hydrology must be maintained and the water quality not further degraded. This is similar to AMC 19.70.330(B)(3)(C), that retains functionally separated stream buffer areas within the riparian management zone (RMZ) if they provide any of the five primary RMZ functions (bank stability, shade, pollution removal, contributions of detrital nutrients or recruitment of large woody debris). Buffers can provide higher rates of nutrient removal and removes pollutants from groundwater flows and infiltrate polluted surface waters and slow the flow so pollutants can be removed more effectively (Hruby 2013). According to the *Ecology Stormwater Management Manual for Western Washington* (Ecology 2024), increasing the amount

of water flow discharged to a wetland, decreasing the amount of water flow discharged to a wetland and/or increasing the amount of pollutants discharged to a wetland can decrease function and value provided by wetlands. In order to protect a wetland from stormwater, the landscape unit or an area of interrelated physical, chemical and biological processes (watershed to the wetland is a type of landscape unit), should be identified and interconnections among wetlands and other habitats maintained (Ecology 2024).

- *Ecology's Wetlands Guidance for CAO Updates* (Ecology 2022), suggest that for potential functionally disconnected buffer areas "The most effective provisions provide specific criteria to reduce uncertainty about how to determine whether a given area is functionally disconnected." The guidance goes on to suggest that critical area codes differentiate between minor developments and significant developments that completely block wetland buffer functions. Examples of minor developments that do not fully block buffer functions listed in the Ecology guidance include trails, minor accessory structures, paths and driveways serving a single residence (Ecology 2022). Adding clarifying definitions of the types of paved areas or structures that are more likely to fully separate a buffer from providing the protective measures to a wetland would provide some boundaries for applicants. Currently this section defines the separating developed area as: "areas that are functionally isolated and physically separated from a wetland due to existing, legally established roadways, railroads or other legally established structures or paved areas eight feet or more in width that occur between the area in question and the wetland...". A paved or developed area 8 feet or more in width does not necessarily fully functionally separate a buffer from providing habitat, water quality improvement and/or hydrologic functions to an associated wetland. For example: surface water may flow across or under the developed surface and towards/into the wetland; a forest canopy may "arch" over the developed surface providing a connected canopy; and/or an 8-foot-wide paved driveway with native vegetation on both sides will likely be crossed by wildlife and not isolate the side opposite the wetland.
- We recommend the following modification to AMC 19.70.235(M):
 - ~~"Consistent with the definition of "buffer" in this chapter, areas that are functionally isolated and physically separated from a wetland due to existing, legally established roadways, railroads or other legally established structures or paved areas eight feet or more in width that occur between the area in question and the wetland must that are demonstrated by the applicant in a critical areas report to be physically separated and isolated from providing functions such as habitat or water quality improvement or from contributing hydrology to the wetland, shall be considered physically isolated and functionally separated and shall not be included as part of the wetland buffer. Once determined by the Director, based on a submitted critical area report, to be a physically separated and functionally isolated from the wetland the portion of the wetland buffer separated from the wetland by a developed surface will be excluded from the wetland buffer, and not subject to the wetland buffer requirements of this chapter." buffer, development proposals are allowed in these areas."~~
- AMC 19.70.245 Part D lists preference of mitigation actions. In-Lieu fee programs are not listed in Part D, but it is discussed in Part G. Suggest adding In-Lieu Fee Mitigation to Part D to be consistent. AMC 19.70.245.D.5 lists "Wetland Bank or Advanced Wetland Mitigation. For future use since no current banks have a service area in Anacortes." This section is a logical place to list In-Lieu fee programs, because there are currently no In-Lieu fee programs in Anacortes.
- AMC 19.70.245.M.7.e; There appears to be a typo in the code; The item states that "the wetland should not contain more than 20 percent unvegetated/open water areas as measured at the seasonal high water mark, unless the mitigation is compensating for vegetated." Suggest changing the last word (vegetated) to "unvegetated" and add "or open water areas".

4.0 BAS Review for Fish and Wildlife Habitat Conservation Areas

FWHCAs are located within the City of Anacortes; they have been identified both through field investigations and by other means. GeoEngineers reviewed existing regulatory codes for the state and local jurisdictions for this BAS review. In addition, agency guidance and literature from state agencies was also reviewed to see what new research has been developed since the City of Anacortes last updated their CAO.

4.1 CURRENT CODE REVIEW AND COMPARISON

4.1.1 WAC and RCW

WAC 365-190-030 defines Fish and Wildlife Habitat Conservation Areas as follows:

“(6)(a) “Fish and wildlife habitat conservation areas” are areas that serve a critical role in sustaining needed habitats and species for the functional integrity of the ecosystem, and which, if altered, may reduce the likelihood that the species will persist over the long term. These areas may include, but are not limited to, rare or vulnerable ecological systems, communities, and habitat or habitat elements including seasonal ranges, breeding habitat, winter range, and movement corridors; and areas with high relative population density or species richness. Counties and cities may also designate locally important habitats and species.

(b) “Habitats of local importance” designated as fish and wildlife habitat conservation areas include those areas found to be locally important by counties and cities.

(c) “Fish and wildlife habitat conservation areas” does not include such artificial features or constructs as irrigation delivery systems, irrigation infrastructure, irrigation canals, or drainage ditches that lie within the boundaries of, and are maintained by, a port district or an irrigation district or company.”

WAC 365-190-130(2) mandates that “Fish and wildlife habitat conservation areas that must be considered for classification and designation include:”

- (a) Areas where endangered, threatened, and sensitive species have a primary association;
- (b) Habitats and species of local importance, as determined locally;
- (c) Commercial and recreational shellfish areas;
- (d) Kelp and eelgrass beds; herring, smelt, and other forage fish spawning areas;
- (e) Naturally occurring ponds under 20 acres and their submerged aquatic beds that provide fish or wildlife habitat;
- (f) Waters of the state;
- (g) Lakes, ponds, streams, and rivers planted with game fish by a governmental or tribal entity; and
- (h) State natural area preserves, natural resource conservation areas, and state wildlife areas.

WAC 365-190-130(4), Sources and methods states the following:

“(a) Endangered, threatened and sensitive species. Counties and cities should identify and classify seasonal ranges and habitat elements where federal and state listed endangered, threatened and sensitive species have a primary association and which, if altered, may reduce the likelihood that the species will persist over the long term. Counties and cities must consult current information on priority habitats and species identified by the Washington State Department of Fish and Wildlife. Recovery plans and management recommendations for many of these species are available from the United States Fish and Wildlife Service, the National Marine Fisheries Service and the Washington state department of fish and wildlife. Additional information that must be consulted is available from the Washington state department of natural resources, natural heritage program, and aquatic resources program.

(b) Habitats and species areas of local importance. Counties and cities should identify, classify and designate locally important habitats and species. Counties and cities must consult current information on priority habitats and species identified by the Washington State Department of fish and wildlife. Priority habitat and species information includes endangered, threatened and sensitive species, but also includes candidate species and other vulnerable and unique species and habitats. While these priorities are those of the Washington State Department of fish and wildlife, they should be considered by counties and cities as they include the best available science. The Washington state department of fish and wildlife can also provide assistance with identifying and mapping important habitat areas at various landscape scales. Similarly, the Washington state department of natural resources' natural heritage program includes a list of high-quality ecological communities and systems and rare plants that must be consulted.

(c) Shellfish areas. All public and private tidelands or bedlands suitable for shellfish harvest shall be classified as critical areas. Counties and cities should consider both commercial and recreational shellfish areas. Counties and cities should consider the Washington state department of health classification of commercial and recreational shellfish growing areas to determine the existing condition of these areas. Further consideration should be given to the vulnerability of these areas to contamination. Shellfish protection districts established pursuant to chapter 90.72 RCW shall be included in the classification of critical shellfish areas.

(d) Kelp and eelgrass beds; herring, smelt and other forage fish spawning areas. Counties and cities must classify kelp and eelgrass beds, identified by the Washington state department of natural resources and the department of ecology. Though not an inclusive inventory, locations of kelp and eelgrass beds are compiled in the Washington coastal atlas published by the department of ecology. Herring, smelt and other forage fish spawning times and locations are outlined in WAC 220-110-240 through 220-110-271.

(e) Naturally occurring ponds under 20 acres and their submerged aquatic beds that provide fish or wildlife habitat. Naturally occurring ponds do not include ponds deliberately designed and created from dry sites, such as canals, detention facilities, wastewater treatment facilities, farm ponds, temporary construction ponds (of less than three years duration) and landscape amenities. However, naturally occurring ponds may include those artificial ponds intentionally created from dry areas in order to mitigate conversion of ponds, if permitted by a regulatory authority.

(f) Waters of the state.

(i) Waters of the state are defined in RCW 90.48.020 and include lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses in Washington. Stream types are classified in Title 222 WAC, the forest practices regulations. Counties and cities may use the classification system established in WAC 222-16-030 to classify Waters of the State. Counties and cities using the water types defined in WAC 222-16-030 or 222-16-031 (interim) should not rely solely on Washington state department of natural resources maps of these stream types for purposes of regulating land uses or establishing stream buffers.

(ii) Counties and cities that use the stream typing system developed by the department of natural resources should develop a process to verify actual stream conditions, identify flow alterations, and locate fish passage barriers by conducting a field visit. Field verification of all intermittent or non-fish-bearing streams should occur during the wet season months of October to March or as determined locally.

(iii) Counties and cities may consider the following factors when classifying Waters of the State as fish and wildlife habitat conservation areas:

(A) Species present which are endangered, threatened or sensitive, and other species of concern;

(B) Species present which are sensitive to habitat manipulation (e.g., priority habitats and species program);

(C) Historic presence of species of local importance;

(D) Existing surrounding land uses that are incompatible with salmonid habitat;

(E) Presence and size of riparian ecosystems;

(F) Existing water rights; and

(G) The intermittent nature of some Waters of the State.

(g) Lakes, ponds, streams, and rivers planted with game fish. This includes game fish planted in these water bodies under the auspices of a federal, state, local, or tribal program or which supports priority fish species as identified by the Washington state department of fish and wildlife.

(h) State natural area preserves, natural resource conservation areas, and state wildlife areas. Natural area preserves and natural resource conservation areas are defined, established, and managed by the department of natural resources. State wildlife areas are defined, established, and managed by the Washington state department of fish and wildlife, which provides information about state wildlife areas for each county.

(i) Salmonid habitat. Counties and cities should consider recommendations found in salmon recovery plans (see the governor's salmon recovery office). Counties and cities may use information prepared by the United States Department of the Interior Fish and Wildlife Service, National Marine Fisheries Service, the Washington state department of fish and wildlife, the state recreation and conservation office, and the Puget Sound partnership to designate, protect and restore salmonid habitat."

4.1.2 *Washington State Department of Commerce*

The Washington State Department of Commerce and the GMA provide guidance for jurisdictions to consider the designation of appropriate fish and wildlife conservation areas, including Waters of the State (Washington State Department of Commerce, 2023). The Washington State Department of Commerce suggests considering the following principles in classification and designation of FWHCAs (Washington State Department of Commerce 2023):

- Creating a system of fish and wildlife habitat with connections between larger habitat blocks and open spaces, integrating with open space corridor planning where appropriate;
- The level of human activity in such areas, including presence of roads and level of recreation type (passive or active recreation may be appropriate for certain areas and habitats);
- Protecting riparian ecosystems, including salmonid habitat, which also include marine shoreline areas;
- Evaluating land uses surrounding ponds and fish and wildlife habitat areas that may negatively impact these areas, or conversely that may contribute positively to their function;
- Establishing buffer zones around these areas to separate incompatible uses from the habitat areas;
- Potential for restoring lost and impaired salmonid habitat;
- Potential for designating areas important for local and ecoregional biodiversity; and
- Establishing or enhancing non-regulatory approaches in addition to regulatory methods to protect FWHCAs.

4.1.3 *City of Anacortes Critical Areas Regulations: FWHCAs*

4.1.3.1 DESIGNATION OF FWHCAs

According to AMC 19.70.315 (Designation) FWHCAs are designated as follows:

- Critical saltwater habitats, which include all kelp beds, eelgrass beds, spawning and holding areas for forage fish, such as herring, smelt and sand lance; subsistence, commercial and recreational shellfish beds; mudflats, intertidal habitats with vascular plants and areas with which priority species have a primary association;
- Naturally occurring ponds under 20 acres with submerged aquatic beds that provide fish or wildlife habitat as further defined in WAC 365-190-130(4)(e);
- Riparian management zones as defined in AMC 19.70.330 and Waters of the State, including but not limited to Whistle Creek, Happy Valley Stream, Ace of Hearts Creek, Beaver Brook, Cranberry Creek, Clyde Creek, Anaco Bourn, Morrison Run, Cedar Springs, Weaverling Rill, Miller Creek, Aqua Creek, Howard Creek, Summit Creek and March's Run;
- Lakes, ponds, streams and rivers planted with game fish by a governmental or tribal entity;
- Areas with which anadromous fish species have a primary association;
- State natural area preserves, natural resource conservation areas and state wildlife areas as established by Washington State Department of Natural Resources (DNR);
- Areas of rare plant species and high-quality ecosystems as identified by the DNR through the Natural Heritage Program in Chapter 79.70 RCW;

- State priority habitats and areas associated with state priority species defined and listed by the WDFW in the Priority Habitats and Species (PHS) List, most recently updated edition.,
- The following habitats and species of local importance have been designated by the city:
 - The Anacortes Community Forest Lands (ACFL).
 - The March Point Heronry.
 - The 1½-acre “Park Reserve” at Cap Sante bounded by Third Street, East Park Drive and Curtis Drive.
 - Ship Harbor Wetland.
 - Cannery Pond Wetland.
 - Category II wetlands within the watersheds of Little Cranberry Lake, Whistle Lake and Hearth Lake, and with seasonal surface water connections.
 - Smiley’s Bottom Wetland.
- Additional habitats and species of local importance may be designated by the City of Anacortes using the following process:
 - Designation Process. The City of Anacortes may consider nominations for habitat areas and species to be designated as locally important on an annual basis as part of the annual comprehensive plan and development regulation update process, based on the following criteria:
 - Local populations of native species that are in danger of extirpation based on existing trends, likely to become endangered, or are vulnerable or declining;
 - The habitat represents either a high-quality native habitat, or the habitat has a high potential to recover to a suitable condition, and which is of limited availability, is highly vulnerable to alteration or provides landscape connectivity which contributes to the integrity of the surrounding landscape;
 - The species or habitat has recreation, commercial, game, tribal or other intrinsic value;
 - Long-term persistence of a species is dependent on protection, maintenance and/or restoration of the nominated habitat;
 - Protection by other county, state or federal policies, laws, regulations or nonregulatory tools is not adequate to prevent degradation of the species or habitat; and
 - Without protection, there is a likelihood that the species or habitat will be diminished.
 - The nomination must indicate whether specific habitat features are to be protected (for example, nest sites, breeding areas and nurseries) or whether the habitat or ecosystem is being nominated in its entirety.
 - The nomination may include management strategies for the species or habitats, which must be supported by BAS. Where restoration of habitat is proposed, a specific plan for restoration must be provided.
- All areas within the City of Anacortes meeting one or more of these criteria, regardless of any formal identification, are hereby designated critical areas and are subject to the provisions of this chapter.

4.1.3.2 GENERAL PROTECTIONS FOR FWHCAS

The City of Anacortes’ critical areas regulations provide the following general protections for FWHCAs according to AMC 19.70.325 (General development standards for all FWHCAs):

- Alteration of FWHCAs or their buffers is prohibited except as otherwise allowed by this chapter and may occur only if the proposed alteration of the habitat and any associated mitigation proposed does not degrade the functions and values of the habitat.”
- Exemptions are listed in the provisions established in AMC 19.70.040 (Exempt activities)
- Any approval of alterations or impacts to an FWHCA area must be *supported by the BAS* as described in the required critical area report.
- The decision-maker may condition approvals of activities allowed within or adjacent to a FWHCA to minimize or mitigate any potential adverse impacts. Conditions will be based on the BAS and include, but are not limited to:
 - Establishing buffers;
 - Preserving important vegetation and/or habitat features;
 - Limiting access to the habitat area (e.g., fencing, signage);
 - Imposing seasonal restrictions on construction;
 - Establishing and conducting periodic reviews of mitigation activities; and
 - Requiring performance bonds, when necessary, to ensure completion and success of proposed mitigation.
- Seasonal restrictions may apply when a species is more susceptible to adverse impacts during specific periods of the year. Larger buffers may be required, and activities may be further restricted during the specified season.
- The subdivision and short subdivision of land in FWHCAs and associated buffers is subject to the following:
 - Land that is located wholly within an FWHCA or its buffer may not be subdivided;
 - Land that is located partially within an FWHCA may be subdivided only if an accessible and contiguous portion of each new lot that meets the minimum lot size requirements for the zone is located outside the FWHCA and its buffer;
 - Access roads and utilities serving a proposed subdivision may be permitted within the FWHCA and associated buffers only if the applicants qualified professional(s) demonstrate, and the decision maker determines, that no other feasible alternative exists, all unavoidable impacts are fully mitigated, and the use is consistent with this chapter;
 - This subsection does not authorize new access roads and utilities in FWHCAs and associated buffers for existing subdivisions.
- No plant, wildlife or fish species not indigenous to Fidalgo Island may be introduced to an FWHCA unless authorized by a state or federal permit approval.

4.1.3.3 SPECIFIC STANDARDS FOR RIPARIAN MANAGEMENT ZONES

AMC 19.70.330 provides a definition of a RMZ and specific standards for protection of RMZs. Note that an RMZ includes the watercourse and the area adjacent to the watercourse as described in the definition below.

- “A riparian management zone (RMZ) is a critical area; specifically, it is a type of fish and wildlife habitat conservation area. A project site’s RMZ is associated with each aquatic species upstream and downstream from the project site.
- The RMZ consists of a watercourse and the area adjacent to the watercourse that has the potential to provide full riparian ecosystem functions for bank stability, shade, pollution removal, contributions of detrital nutrients, recruitment of large woody debris, and wildlife habitat. The width of the RMZ is the height of the tallest 200-year-old site-potential tree (SPTH200) or 100 feet, whichever is greater, measured horizontally. The RMZ is measured from whichever of the following features is furthest from the center of the watercourse: (a) the ordinary high-water mark, (b) the top of bank, or (c) the outer edge of the channel migration zone (if one exists). In watercourses with braided channels or alluvial fans, the ordinary high-water mark will include the entire stream feature. The RMZ may exceed the 200-year-old site-potential tree height based on subsection (A)(3) of this section.”

Per AMC 19.70.330.A.3, project applicants proposing an activity that may impact an RMZ must provide:

“... a critical areas report prepared by a qualified professional describing the functions and values of the RMZ. The report must include the 200-year-old site-potential tree height (SPTH200) as determined by WDFW at <https://gispublic.dfw.wa.gov/arcgis/rest/services/SPTH/SitePotentialTreeHeightPublic/MapServer>.

If SPTH200 was also calculated using site-scale data, that information must also be included. The report must describe the inner measurement point (e.g, ordinary high-water mark) and the extent of the RMZ with sufficient detail to allow field delineation. The report must demonstrate that the project will result in no net loss of the ecosystem functions for the RMZ and associated species.”

4.1.3.4 SPECIFIC STANDARDS FOR OTHER FWHCAS

AMC 19.70.335 provides definitions and specific standards for protection of other FWHCAs.

- Endangered, Threatened and Sensitive Species. “Fish and wildlife habitat conservation areas or buffers which state or federally endangered, threatened, or sensitive species or anadromous fish species have a primary association are subject to the following:
 - No development is allowed within a FWHCA or buffer with which state or federally endangered, threatened, or sensitive species have a primary association, except that which is provided for by a management plan established by WDFW or applicable state or federal agency.
 - Whenever activities are proposed adjacent to a FWHCA with which state or federally endangered, threatened or sensitive species have a primary association, such area must be protected through the application of protection measures in accordance with a critical area report. Approval for alteration of the FWHCA or its buffer may not occur prior to consultation with WDFW, Washington State Department of Natural Resources or other appropriate federal or state agencies.
- Other PHS. FWHCA or buffers with species that are not state or federally listed as endangered, threatened or sensitive species, and are not anadromous fish species are subject to the following:
 - Development activities and uses that result in unavoidable impacts are prohibited except as otherwise allowed by this chapter and may occur in priority species habitat areas and associated buffers only if the proposed alteration of the habitat does not degrade the functions and values for the habitat in accordance with an approved critical area report with habitat assessment/management plan, and only if the proposed activity is the only reasonable alternative

that will accomplish the applicant's objectives. Full compensation for the loss of acreage and functions of habitat and buffer areas must be provided in compliance with the mitigation performance standards and requirements of these regulations."

■ City of Anacortes-Designated Habitats and Species of Local Importance

□ ACFL.

- Construction of public recreation related facilities may be allowed in FWHCAs or buffers.
- Proposed alterations must be consistent with the adopted ACFL Comprehensive Plan, as amended.
- Non-native plants known to be invasive into the ACFL must be prohibited in landscaping plans of adjacent developments.
- The half of area of a street or alley vacation that is contiguous with an ACFL boundary, must be incorporated into the ACFL and subject to ACFL requirements.
- No new access will be established to the ACFL without prior request and approval by the City of Anacortes Council.
- Burn piles and outdoor fires will not be left unattended and if the flames or sparks come within 300 feet of the ACFL, the fire must be brought under control or extinguished.
- The City of Anacortes will work with property owners and developers to ensure that survey lines adjacent to the ACFL boundaries are clearly and correctly marked prior to timber or vegetation removal from adjacent property. The forest manager will be involved in the final inspection of boundary lines.
- The City of Anacortes will work with builders to secure a 30-foot ACFL buffer using all available incentives.

□ March Point Heronry.

- Proposed development activities within 1,000 feet or that are likely to impact the colony must provide a critical areas assessment report and habitat management plan (HMP) that follows the guidelines provided by WDFW's Management Recommendations for Washington's Priority Species (Azerrad 2012).
- Buffers will be implemented as described below.
- Colony protection is required for a minimum of 10 years after the colony is abandoned.

■ Required Buffers for Non-RMZ FWHCAs.

- Buffers for FWHCAs or species within marine shorelines are regulated by AMC Chapter 19.72 Shoreline regulations and the Shoreline Master Program (SMP) for the City of Anacortes.
- Buffer widths for other non-RMZ FWHCAs should be established to protect the functions and values of the critical area from impacts of adjacent activities. Specific buffer information is listed below:
 - Buffer widths for FWHCAs must be based on species specific recommendations from WDFW; recommendations contained in a HMP submitted by a qualified professional; and the nature and intensity of land uses and activities occurring on the land adjacent to the site. In addition, buffers must "consist of an undisturbed area of native vegetation or areas identified for restoration, sufficient to protect the integrity, functions and values of the affected habitat; Reflect the sensitivity of the habitat and the type and intensity of human activity proposed to be conducted nearby; and be consistent with applicable species-specific management recommendations issued by WDFW."
 - Bald eagles and associated habitats must be protected in a way that is consistent with the US Fish and Wildlife Service (USFWS) national bald eagle management guidelines or the state or

federal regulations in place at the time of application. A bald eagle HMP must be developed by a qualified professional. Activity approval will not be granted prior to consultation with the state or federal agency with authority on bald eagles and nests. Activities are considered to be adjacent to bald eagle sites when activities are within 660 feet of a nest or within a half mile of a shoreline foraging area.

- Great blue heron nesting and breeding areas have a year-round urban buffer of 197 feet. For activities that have a loud noise during breeding season (February through September) a seasonal buffer of 656 feet is required and there is a blasting buffer of 1,320 feet during breeding season. When properties do not have an existing and approved management plan, a management plan should be developed that follows at a minimum WDFW's management recommendations and the plan should identify the nesting and breeding site as well as the pre-nesting staging area, and breeding season foraging habitat. Specifically for the March Point Colony, there is a year-round buffer of 984 feet that has been established.

4.1.4 Code Comparisons

A review of critical area codes from other jurisdictions (cities and counties) was conducted to compare CAOs from other jurisdictions with the Anacortes CAO. For the FWHCA code comparison the City of Bellingham Critical Areas Code (Bellingham Municipal Code 16.55); MVMC 15.40; City of Burlington Critical Areas Code (Burlington Municipal Code 14.15); KCC 21A.24; and SMC 25.09 were reviewed and compared to the AMC CAO.

4.1.4.1 STREAMS

Anacortes regulations on RMZs were compared to other local jurisdiction regulations on stream buffers and RMZs. The City of Bellingham designates minimum and maximum buffers for specific fish-bearing streams (Type F) (e.g., Padden Creek, Connelly Creek and Baker Creek) ranging from 75 feet to 200 feet, with buffers varying by stream reach for Padden Creek (Bellingham Municipal Code Table 16.55.500(A)). For all other Type F streams the City of Bellingham designates buffers from 75 feet (minimum) to 150 feet (maximum) (Bellingham Municipal Code Table 16.55.500(A)). City of Mount Vernon designates a 150-foot buffer for fish-bearing streams (Type F), a 50-foot buffer for perennial non-fish-bearing streams (Type Np), and a 35-foot buffer for seasonal/ephemeral non-fish-bearing streams (Type Ns), and all stream types are subject to a minimum 15-foot minimum building setback beyond the buffer (MVMC Table 15.40.080(B)). City of Burlington identifies the use of WDFW guidelines to identify buffers; the guidance listed in the Burlington Municipal Code is the *Riparian Ecosystems, Volume 2 Management Recommendations* (Rentz et al. 2020.) which states SPTH should be used to identify RMZs (Burlington Municipal Code 14.15.380(B)). These buffer distances typically range from 100 to 240 feet (Rentz et al. 2020.). King County designates a 165-foot buffer for fish-bearing streams (Type F) located outside the urban growth areas (UGA) and for streams that are inside the UGA but located in a basin or shoreline designated as "high" on the Basin and Shoreline Conditions Map (KCC 21A.24.358(B)). Fish-bearing streams inside the UGA have 115-foot buffers (KCC 21A.24.358(B)). The City of Seattle *Regulations for Environmentally Critical Areas* (SMC 25.09) regulate and restrict development within a *riparian management area* defined as "...the area within 100 feet of the riparian watercourse measured horizontally landward from the ordinary high water mark [OHWM] of the watercourse as surveyed in the field, or from the top of the bank if the ordinary high water mark cannot be determined. In watercourses with braided channels or alluvial fans, the OHWM shall be determined so as to include the entire stream feature. SMC 25.09.012(D)(5)" Within the riparian management area, development is allowed within the limited *riparian development area*, defined as the area within the riparian management area and more than 75 feet from the OHWM for Type F waters with anadromous fish presence, or within the riparian management area and more than 50 feet from the OHWM for Type F waters

without anadromous fish presence and for Type Np and Ns waters (SMC 25.09.200(3)(B)). Table 5 below depicts buffer distances and methods for identifying buffer widths based on jurisdiction.

TABLE 5. STREAM BUFFER COMPARISON

JURISDICTION	BUFFER WIDTHS	METHOD/STREAM CHARACTERISTICS FOR IDENTIFYING BUFFER WIDTHS
City of Anacortes	Ranges from 100 to 231 feet. Based on WDFW's Site Potential Tree Height (SPTH) and Riparian Management Zone Values online map tool, SPTHs in Anacortes range from 91 to 231 feet. May be larger than 231 feet if the SPTH were to be calculated from site scale data.	SPTH, or 100 feet, whichever is larger
	Piped watercourses and non-watercourse ditches are subject to a 10-foot setback from the centerline of the piped watercourse or ditch.	Piped watercourses and ditches that do not meet the definition of a watercourse
City of Bellingham	Minimum and maximum ranges that extend from 75 to 200 for fish-bearing and 50 to 225 feet for non-fish-bearing streams	Stream Type, Specific stream and location of the stream
City of Mt. Vernon	Fish-bearing streams have a buffer width of 150 feet and non-fish-bearing streams have 50-foot (perennial flowing) and 35-foot (seasonal flowing) buffers.	Stream Type
City of Burlington	Typically ranges from 100 feet to 240 feet; however, if less than 100 feet the pollution removal function should be used.	<i>WDFW Guidelines - Riparian Ecosystems, Volume 2: Management Recommendations.</i> States that the SPTH should be used.
King County	Within the UGA: Shoreline of the State and fish-bearing streams have a 115-foot buffer; however, Shoreline of the State and fish-bearing streams that are in a basin or shoreline designated as "high" the buffer width is 165 feet Non-fish-bearing streams have a 65-foot buffer Type O¹ Streams have a 25-foot buffer Outside the UGA Shoreline of the State and fish-bearing streams have a 165-foot buffer Non-fish-bearing streams have a 65-foot buffer O type Streams have a 25-foot buffer Type N streams within the Bear Creek Drainage Basin have a 100-foot buffer Note - King County is currently reviewing and updating its Critical Areas Code. Aquatic area buffers are proposed to be renamed riparian areas, and riparian areas are proposed to increase from a range of 25 to 165 feet to a range of 50 to 200 feet, depending on the type of adjacent aquatic area. The application of riparian	Locations in or out of the UGAs and stream type

JURISDICTION	BUFFER WIDTHS	METHOD/STREAM CHARACTERISTICS FOR IDENTIFYING BUFFER WIDTHS
	areas widths in areas where with mapped channel migration hazard zones has been clarified.	
City of Seattle	Riparian management area is the area within 100 feet of the stream OHWM regardless of stream type. Development is allowed within the riparian management area: more than 75 feet from the top of the watercourse bank for Type F waters with anadromous fish; and more than 50 feet from the top of the watercourse bank for Type Np and Ns waters.	Distance from the top of the watercourse bank within the riparian management area where the riparian development area starts depends on fish use.

Notes:

1. According to KCC 21A.24.355(A)(4) - Type O waters include all segments of aquatic areas that are not type S, F or N waters and that are not physically connected to type S, F or N waters by an aboveground channel system, pipe or culvert, stream or wetland.

4.1.4.2 OTHER FWHCAS

Table 6 below compares critical areas code designation and protection of other FWHCAs between the City of Anacortes; City of Bellingham; City of Mt. Vernon; City of Burlington; King County; and City of Seattle. Each jurisdiction identifies FWHCAs in slightly different ways and has different requirements for protection (i.e. buffer widths or other measures). The table below lists critical areas code designations and protection standards for other FWHCAs. In general, all jurisdictions protected federally, and state-listed wildlife and PHS; all the jurisdictions also listed local protected habitats and species and had methods to adopt additional areas. The jurisdictions refer to existing management guidelines and plans from agencies such as WDFW and DNR. Protection standards vary where some jurisdictions require an HMP to be developed to identify buffers or other protection measures and some jurisdictions provided buffers identified by species and nesting seasons. In general, the jurisdictions required that actions and mitigation provided equal to greater biologic habitat functions.

TABLE 6. CODE COMPARISON FOR OTHER FWHCAS

CODE	CITY OF ANACORTES	CITY OF BELLINGHAM	CITY OF MT. VERNON	CITY OF BURLINGTON	KING COUNTY	CITY OF SEATTLE
Code Sections	Article III AMC 19.70.315 Designation AMC 19.70.325 General development standards for all FWHCAs. AMC 19.70.335 Specific standards for other FWHCAs.	BMC 16.55.470 Designation of fish and wildlife habitat conservation areas. BMC 16.55.490 Performance standards – General requirements. BMC 16.55.500 Performance standards – Specific habitats.	15.40.080. Fish and wildlife habitat conservation areas.	14.15.350. Fish and Wildlife Habitat Conservation Area Designations. 14.15.360. Fish and Wildlife Habitat Conservation Areas Initial Project Review 14.15.370. Fish and Wildlife Habitat Conservation Area Site Assessment Requirements	21A.24.382 Wildlife habitat conservation areas (WHCA) - development standards. 21A.24.383 Wildlife habitat conservation areas - modification. 21A.24.385 Wildlife habitat networks - applicability. 21A.24.386 Wildlife habitat networks - development standards and alterations (in effect for the shoreline jurisdiction until 14 days after state Ecology approval). 21A.24.386 Wildlife habitat networks - development standards and alterations (in effect for everywhere but the shoreline jurisdiction, for which this takes effect 14 days after state Ecology approval). 21A.24.388 Wildlife habitat conservation areas and wildlife networks - specific mitigation requirements.	25.09.012 - Designation and definitions of environmentally critical areas 25.09.200 - Development standards for fish and wildlife habitat conservation areas

CODE	CITY OF ANACORTES	CITY OF BELLINGHAM	CITY OF MT. VERNON	CITY OF BURLINGTON	KING COUNTY	CITY OF SEATTLE
Designation of FWHCAs	1. Critical saltwater habitats 2. Naturally occurring ponds under 20 acres with submerged aquatic beds 3. Lakes, ponds, streams and rivers planted with game fish 4. Areas with anadromous fish have a primary association 5. State natural area preserves, natural resource conservation areas and state wildlife areas 6. Areas of rare plant species and high-quality ecosystems 7. State priority habitats and areas associated with state priority species. 8. Local designated habitats and species. a. ACFL. b. March Point Heronry. c. Bald eagles and associated habitats	1. State or federal endangered, threatened or sensitive species with a primary association 2. Commercial and recreational shellfish areas 3. Naturally occurring ponds under 20 acres 4. Waters of the State. 5. State Natural Area Preserves and Natural Resource Conservation Areas 6. Areas of Rare Plant Species and High Quality Ecosystems.	Divides non-stream and waterbody (lakes and ponds are included with streams section) FWHCAs into two classes: 1. Class 1: Habitats and species federally or state designated as endangered, threatened or sensitive, areas targeted for preservation by federal state or local government that provide fish and wildlife habitat benefits and areas that contain habitat or species of local importance. All developments within 200 feet of a designated Class I wildlife habitat conservation area shall have buffer widths determined by an HMP. 2. Class II: Habitats for state-listed candidates and monitored species and habitats that have attributes that include comparatively high wildlife density, high wildlife species richness, significant wildlife breeding habitat, seasonal ranges or movement corridors of limited availability and/or high vulnerability. All development within a Class II wildlife habitat conservation area shall have the buffer width be determined by the State Environmental Policy Act (SEPA)/Critical area review on the project and may require an HMP. 3. Habitats and species of local importance	1. An area with which anadromous fish, endangered, threatened or sensitive species have a primary association and/or their habitat such as those designated and mapped by the WDFW PHS Program 2. A water of the state as defined under WAC 222-16-030; 3. A Critical Biological Area as designated and mapped by Ecology Coastal Zone Atlas dated June 1978 land/or the maps [Ecology 1977-80] 4. Designated species and habitats of local importance, including but not limited to the Gages Slough, Burlington Hill and Skagit River Corridor special management areas 5. Naturally occurring ponds under 20 acres and their submerged aquatic beds that provide fish or wildlife habitat 6. Lakes, ponds, streams and rivers planted with game fish by a government or tribal entity 7. Areas with which anadromous fish species have a primary association; and 8. The following species and habitats have been designated on a site-specific basis according to the official Species and Habitats of Local Significance Map: • Great blue heron nest sites; • Vaux’s swifts communal roosts; • Pileated woodpecker nest sites; • Osprey nest sites; • Townsend big-eared bat communal roosts; • Cavity nesting ducks breeding areas; • Trumpeter swan concentrations; • Harlequin duck breeding areas; • Waterfowl concentrations; • Special management areas.	1. Bald eagle 2. Great blue heron 3. Marbled murrelet 4. Northern goshawk 5. Osprey 6. Peregrine falcon 7. Spotted owl 8. Townsend's big-eared bat 9. Vaux's swift 10. Federal or state listed endangered, threatened, sensitive and candidate species or King County species of local importance	1. Areas defined and/or mapped by WDFW as biodiversity areas and corridors. 2. Areas designated by WDFW as priority habitats and species areas except wetlands, which are defined in subsection 25.09.012.C.3. 3. Corridors of land or water connecting priority habitats and species areas or habitat areas for species of local importance 4. Areas that provide habitat for species of local importance. 5. Areas that state or federally designated endangered, threatened and sensitive species have a primary association. 6. Great Blue Heron is a designated species of local importance.

1. State or federal endangered, threatened or sensitive species with a primary association

2. Commercial and recreational shellfish areas

3. Naturally occurring ponds under 20 acres

4. Waters of the State.

5. State Natural Area Preserves and Natural Resource Conservation Areas

6. Areas of Rare Plant Species and High Quality Ecosystems.

Divides non-stream and waterbody (lakes and ponds are included with streams section) FWHCAs into two classes:

1. **Class 1:** Habitats and species federally or state designated as endangered, threatened or sensitive, areas targeted for preservation by federal state or local government that provide fish and wildlife habitat benefits and areas that contain habitat or species of local importance. All developments within 200 feet of a designated Class I wildlife habitat conservation area shall have buffer widths determined by an HMP.

2. **Class II:** Habitats for state-listed candidates and monitored species and habitats that have attributes that include comparatively high wildlife density, high wildlife species richness, significant wildlife breeding habitat, seasonal ranges or movement corridors of limited availability and/or high vulnerability. All development within a Class II wildlife habitat conservation area shall have the buffer width be determined by the State Environmental Policy Act (SEPA)/Critical area review on the project and may require an HMP.

3. Habitats and species of local importance

1. An area with which anadromous fish, endangered, threatened or sensitive species have a primary association and/or their habitat such as those designated and mapped by the WDFW PHS Program

2. A water of the state as defined under WAC 222-16-030;

3. A Critical Biological Area as designated and mapped by Ecology Coastal Zone Atlas dated June 1978 land/or the maps [Ecology 1977-80]

4. Designated species and habitats of local importance, including but not limited to the Gages Slough, Burlington Hill and Skagit River Corridor special management areas

5. Naturally occurring ponds under 20 acres and their submerged aquatic beds that provide fish or wildlife habitat

6. Lakes, ponds, streams and rivers planted with game fish by a government or tribal entity

7. Areas with which anadromous fish species have a primary association; and

8. The following species and habitats have been designated on a site-specific basis according to the official Species and Habitats of Local Significance Map:

Great blue heron nest sites;

Vaux's swifts communal roosts;

Pileated woodpecker nest sites;

Osprey nest sites;

Townsend big-eared bat communal roosts;

Cavity nesting ducks breeding areas;

Trumpeter swan concentrations;

Harlequin duck breeding areas;

Waterfowl concentrations;

Special management areas.

1. Bald eagle

2. Great blue heron

3. Marbled murrelet

4. Northern goshawk

5. Osprey

6. Peregrine falcon

7. Spotted owl

8. Townsend's big-eared bat

9. Vaux's swift

10. Federal or state listed endangered, threatened, sensitive and candidate species or King County species of local importance

1. Areas defined and/or mapped by WDFW as biodiversity areas and corridors.

2. Areas designated by WDFW as priority habitats and species areas except wetlands, which are defined in subsection 25.09.012.C.3.

3. Corridors of land or water connecting priority habitats and species areas or habitat areas for species of local importance

4. Areas that provide habitat for species of local importance.

5. Areas that state or federally designated endangered, threatened and sensitive species have a primary association.

6. Great Blue Heron is a designated species of local importance.

Protection of FWHCA's	A. Endangered, Threatened and Sensitive Species. “Fish and wildlife habitat conservation areas or buffers which state or federally endangered, threatened, or sensitive species or anadromous fish species have a primary association are subject to the following: 1. No development is allowed within a FWHCA or buffer with which state or federally endangered, threatened, or sensitive species have a primary association, except that which is provided for by a management plan established by WDFW or applicable state or federal agency. 2. Whenever activities are proposed adjacent to a FWHCA with which state or federally endangered, ,threatened, or sensitive species have a primary association, such area must be protected through the application of protection measures in accordance with a critical area report. Approval for alteration of the FWHCA or its buffer may not occur prior to consultation with WDFW, Washington State Department of Natural Resources or other appropriate federal or state agencies.	BMC 16.55.490 Performance standards – General requirements. A. Nonindigenous Species. No plant, wildlife, or fish species not indigenous to the region shall be introduced into a habitat conservation area unless authorized by a state or federal permit or approval. B. Mitigation and Contiguous Corridors. Mitigation sites shall be located to preserve or achieve contiguous wildlife habitat corridors in accordance with a mitigation plan that is part of an approved critical area report to minimize the isolating effects of development on habitat areas, so long as mitigation of aquatic habitat is located within the same aquatic ecosystem as the area disturbed. C. Approval of Activities. The director shall condition approvals of activities allowed within or adjacent to a habitat conservation area and its buffer, as necessary to minimize or mitigate potential impacts. Conditions shall be based on BAS and may include but are not limited to: 1. Establishment of buffer zones. Buffer widths shall reflect the sensitivity of the habitat and type of intensity of human activity proposed to be conducted. 2. Preservation of critically important vegetation or habitat features 3. Limitation of access to the habitat area. 4. Seasonal restrictions of construction. 5. Establishment of a duration and timetable for periodic review. 6. Requirement of a performance bond. D. Mitigation and Equivalent or Greater Biological Functions. Mitigation for alterations FWHCA's shall have equal or greater biologic and hydrologic functions and shall include mitigation for impacts up and downstream of the project site.	HMPs are required if the City of Anacortes determines that impacts to habitats may occur. The HMP shall demonstrate that greater protection of the functions and values can be achieved through the HMP than through providing the prescribed habitat buffers and building setbacks. The HMP can be implemented as a means to protect habitat buffers. Endangered, Threatened and Sensitive Species: no development shall be allowed within a habitat conservation area or buffer which state or federally endangered, threatened or sensitive species have a primary association, except that which is provided for by an HMP. All activities, uses and alterations proposed to be located in water bodies used by anadromous fish or in areas that affect such water bodies shall give consideration to preservation and enhancement of anadromous fish habitat.	If the director determines that a FWHCA may be present within 300 feet of the project or activity area, then a site assessment or HMP shall be required as part of the complete application. FWHCAs shall be protected in accordance with local determination of appropriate conditions considering site specific recommendations from agencies with jurisdictions which may include but not be limited to WDFW, Ecology, federally recognized Indian Tribes and site-specific information supplied by the applicant. Bald eagle habitats shall be protected pursuant to the Washington State Bald Eagle Protection Rules; a cooperative HMP shall be developed in coordination with WDFW when activities are proposed near a verified nest or roost. Wetlands that are identified as FWHCA shall be protected. All other FWHCA's shall be protected on a case-by-case basis by means of an HMP based on the PHS program, initial project review and site assessment/HMP	For a bald eagle: WHCA is within a 400-foot radius from an active nest. Between March 15th and April 30th alterations are not allowed within 800 feet of the nest; between January 1 and August 31st, land clearing machinery may not be operated within 800 feet of the nest. For a great blue heron: the WHCA is an area with an 820-foot radius from the rookery. The department may increase the radius up to an additional 164 feet if the rookery population is declining; and between January 1st and July 31st, clearing or grading are not allowed within 924 feet of the rookery. For a marbled murrelet: the WHCA is an area within one half mile radius around an active nest. For a northern goshawk: the WHCA is an area with a 1,005-foot radius around an active nest located outside the UGA. For an Osprey: The WHCA is an area with a 230-foot radius around an active nest and between April 1st and September 30th alterations are not allowed within 660 feet of the nest. For a peregrine falcon: the WHCA is an area extending for a distance of 1,000 feet of an eyrie on a cliff face, the area immediately above the eyrie on the rim of the cliff and the area immediately below the cliff; between March 1st and June 30th land clearing activities that result in loud noises are not allowed within one half mile of the eyrie; and new power lines may not be constructed within 1,000 feet of the eyrie. For Spotted Owl: the WHCA is an area with a 3,700-foot radius from an active nest.	Development on parcels with FWHCA's shall comply with any species HMP set out in a director’s Rule. The director may establish by rule an HMP to protect any species listed as endangered or threatened under the federal Endangered Species Act (ESA), any priority habitat or species identified by WDFW or any species of local importance. Any person proposing development on a parcel containing FWHCA shall consult with WDFW and comply with the requirements of that agency and follow standards to protect FWHCA
-----------------------	---	--	---	---	--	--

Protection of FWHCAs	B. Other PHS. FWHCA or buffers with species that are not state or federally listed as endangered, threatened or sensitive species, and are not anadromous fish species are subject to the following: 1. Development activities and uses that result in unavoidable impacts are prohibited except as otherwise allowed by this chapter and may occur in priority species habitat areas and associated buffers only if the proposed alteration of the habitat does not degrade the functions and values for the habitat in accordance with an approved critical area report with habitat assessment/management plan, and only if the proposed activity is the only reasonable alternative that will accomplish the applicant's objectives. Full compensation for the loss of acreage and functions of habitat and buffer areas must be provided in compliance with the mitigation performance standards and requirements of these regulations.	AMC 16.55.500 Performance standards – Specific habitats. A. Endangered, Threatened, and Sensitive Species. 1. No development shall be allowed within a habitat conservation area or buffer with which state or federally endangered, threatened, or sensitive species have a primary association, unless a management plan consistent with applicable state or federal agency regulations or guidance is provided. Appropriate management measures shall be included in a critical areas report prepared by a qualified professional for review by the city. The city may require a consultation with the respective agency prior to approval. 2. Nesting bald eagles and bald eagle habitat shall be protected consistent with the U.S. Fish and Wildlife Service Bald Eagle Management Guidelines, or the state or federal regulations in place at the time of application. Whenever activities are proposed adjacent to a verified nest territory or communal roost, a bald eagle habitat management plan shall be developed by a qualified professional. Activities are adjacent to managed bald eagle sites when they are within 660 feet of a nest or within one-half mile (2,640 feet) of a shoreline foraging area. Approval of the activity shall not occur prior to consultation with the state or federal agency with authority on bald eagle pairs and their nest.			For a Townsend's big eared bat: between June 1st and October 1st the WHCA is an area with a 450-foot-radius from the entrance to a cave or mine, located outside of the urban area with an active nursery colony; between November 1st and March 31st the WHCA is an area with a 450-foot-radius around the entrance to a cave or mine located outside the UGA serving as a winter hibernacula; Between March 1st and November 30th a building, bridge, tunnel or other structure used solely for day or night roosting may not be altered or destroyed; Between May 1st and September 15th the entrance to a cave or mine that is protected because of bat presence is protected from human entry; a gate across the entrance to a cave or mine that is protected because of bat presence must be designed to allow bats to enter and exit the cave or mine. For a Vaux's Swift: the WHCA is an area with a 300-foot-radius around an active nest located outside of the UGA; between April 1st and October 31st clearing, grading or outdoor construction is not allowed within 400 feet of an active or potential nest tree. The applicant may use a species survey to demonstrate that the potential nest tree does not contain an active nest. The department shall require protection of an active breeding site of any federal or state listed endangered, threatened, sensitive and candidate species or King County species of local importance not listed above. If WDFW has adopted management recommendations for a species covered by the code, the department shall follow those management recommendations. If management recommendations have not been adopted, the department shall base protection decisions on BAS.	
----------------------	---	---	--	--	--	--

Protection of FWHCAs	C. City of Anacortes-Designated Habitats and Species of Local Importance 1. ACFL. - Construction of public recreation related facilities may be allowed in FWHCAs or buffers. - Proposed alterations must be consistent with the adopted ACFL Comprehensive Plan, as amended. - Nonnative plants known to be invasive into the ACFL must be prohibited in landscaping plans of adjacent developments. - The half of area of a street or alley vacation that is contiguous with an ACFL boundary, must be incorporated into the ACFL and subject to ACFL requirements. - No new access will be established to the ACFL without prior request and approval by the City of Anacortes Council. - Burn piles and outdoor fires will not be left unattended and if the flames or sparks come within 300 feet of the ACFL, the fire must be brought under control or extinguished. - The City of Anacortes will work with property owners and developers to ensure that survey lines adjacent to the ACFL boundaries are clearly and correctly marked prior to timber or vegetation removal from adjacent property. The forest manager will be involved in the final inspection of boundary lines. - The City of Anacortes will work with builders to secure a 30-foot ACFL buffer using all available incentives.	AMC 16.55.500 Performance standards – Specific habitats. B. Anadromous and Resident Fish. 1. All activities, uses, and alterations proposed to be located in water bodies used by anadromous fish or in areas that affect such water bodies shall give special consideration to the preservation and enhancement of anadromous fish habitat, including, but not limited to, adhering to the following standards: - Activities shall be timed to occur only during the allowable work window as designated by the Washington Department of Fish and Wildlife for the applicable species; - An alternative alignment or location for the activity is not feasible; - The activity is designed so that it will not degrade the functions or values of the fish habitat or other critical areas; - Shoreline erosion control measures shall be designed to use bioengineering methods or soft armoring techniques, according to an approved critical area report; and - Any impacts to the functions or values of the habitat conservation area are mitigated in accordance with an approved critical area report. 2. Structures that prevent the migration of fish shall not be allowed in the portion of water bodies currently, historically, or potentially used by fish. Fish bypass facilities shall be provided that allow the upstream migration of adult fish and shall prevent fry and juveniles migrating downstream from being trapped or harmed. 3. Fills, when authorized by the SMP, shall not adversely impact fish or their habitat or shall mitigate any unavoidable impacts and shall only be allowed for a water-dependent use. C. Wetland Habitats. All proposed activities within or adjacent to habitat conservation areas containing wetlands shall conform to the wetland development performance standards set forth in this chapter. If non-wetlands habitat and wetlands are present at the same location, the provisions of this chapter which provide the greater protection to the habitat apply.			Based upon site specific critical areas report, the department may approve a reduction of the WHCA for Bald eagle; Great blue heron; and Osprey. Mitigation to compensate for the adverse impacts to the WHCA must achieve equal or greater biologic functions. Mitigation requirements for impacts shall: - Expand or enhance the wildlife network as close to the location of impact as feasible. - Attend the following mitigation ratios: onsite – 1:1 for rectifying an illegal alteration; 1.5:1 for enhancement or restoration. Offsite – 2:1 for rectifying an illegal alteration; 3:1 for enhancement or restoration. - For temporary alterations the department may require rectification, restoration or enhancement of the altered wildlife habitat network. - The department may increase the width of the habitat network to mitigate for risks to habitat functions. - Mitigation projects involving habitat network restoration should provide replication of the site's pre-alteration natural environment. The department may modify the requirements in this section if the applicant demonstrates that greater wildlife habitat functions will be obtained in the same wildlife habitat conservation area or habitat network through alternative mitigation measures.	

Protection of FWHCAs	2. March Point Heronry. - Proposed development activities within 1,000 feet or that are likely to impact the colony must provide a critical areas assessment report and HMP that follows the guidelines provided by WDFW's Management Recommendations for Washington's Priority Species (Azerrad 2012). - Buffers will be implemented as described below. - Colony protection is required for a minimum of 10 years after the colony is abandoned. D. Required Buffers for Non-RMZ FWHCAs. Buffers for FWHCAs or species within marine shorelines are regulated by AMC Chapter 19.72 Shoreline regulations and the SMP for the City of Anacortes. Buffer widths for other non-RMZ FWHCAs should be established to protect the functions and values of the critical area from impacts of adjacent activities. Specific buffer information is listed below: Buffer widths for FWHCAs must be based on species specific recommendations from WDFW; recommendations contained in a HMP submitted by a qualified professional; and the nature and intensity of land uses and activities occurring on the land adjacent to the site. In addition, buffers must "consist of an undisturbed area of native vegetation or areas identified for restoration, sufficient to protect the integrity, functions and values of the affected habitat; Reflect the sensitivity of the habitat and the type and intensity of human activity proposed to be conducted nearby; and be consistent with applicable species-specific					
----------------------	--	--	--	--	--	--

CODE	CITY OF ANACORTES	CITY OF BELLINGHAM	CITY OF MT. VERNON	CITY OF BURLINGTON	KING COUNTY	CITY OF SEATTLE
	management recommendations issued by WDFW.” ▪ Bald eagles and associated habitats must be protected in a way that is consistent with the USFWS national bald eagle management guidelines or the state or federal regulations in place at the time of application. A bald eagle HMP must be developed by a qualified professional. Activity approval will not be granted prior to consultation with the state or federal agency with authority on bald eagles and nests. Activities are considered to be adjacent to bald eagle sites with activities are within 660 feet of a nest or within a half mile of a shoreline foraging area. ▪ Great blue heron nesting and breeding areas have a year-round urban buffer of 197 feet. For activities that have a loud noise during breeding season (February through September) a seasonal buffer of 656 feet is required and there is a blasting buffer of 1,320 feet during breeding season. When properties do not have an existing and approved management plan, a management plan should be developed that follows at a minimum WDFW’s management recommendations and the plan should identify the nesting and breeding site as well as the pre-nesting staging area, and breeding season foraging habitat. Specifically for the March Point Colony, there is a year-round buffer of 984 feet that has been established.					

4.2 SUMMARY OF EXISTING FISH AND WILDLIFE HABITAT CONSERVATION AREAS IN ANACORTES

4.2.1 Summary of Existing Conditions: Streams

As part of the Revised Stream Buffer Best Available Science Review and Buffer Recommendations report (GeoEngineers 2022). GeoEngineers developed a summary of headwaters, general alignment and channel condition, buffer condition and documented fish use for 27 mapped streams in Anacortes that can be viewed in Table 7 below. These streams are documented by the City of Anacortes, DNR Forest Practices Application Mapping Tool (FPAMT) (DNR 2022), the Northwest Indian Fisheries Commission (NWIFC) Statewide Washington Integrated Fish Distribution (SWIFD) map (NWIFC 2022), the WDFW Fish Passage and Diversion Screening Inventory Database (WDFW 2025a) and the WDFW PHS Interactive map viewer (WDFW 2025b).

With the exception of portions of the streams located within ACFL, and forested portions of Weaverling, Whistle, Turner's, Morrison Run, Miller, Howard and Aqua Creeks, the majority of riparian buffer zones for Anacortes streams consist of narrow (15 to 25 feet) buffers with varying stages of riparian vegetation development. Many areas are mowed lawns, fields, pastures or orchards, while others have narrow bands of young native trees and shrubs and some invasive plants (e.g., Himalayan blackberry [*Rubus armeniacus*], English ivy [*Hedera helix*] and reed canary grass [*Phalaris arundinacea*]). The headwaters of many of the streams are located within high quality forested ACFL lands, but downstream of ACFL lands the riparian zones are generally narrow and do not connect with other habitat areas such as natural preserves or parks of an acre or larger. This fact, combined with the adjacent high intensity residential land use, means that Anacortes riparian zones are unlikely to support diverse assemblages of wildlife that have large life-cycle ranges and require extensive wildlife corridors such as large mammals, reptiles and amphibians. Forested portions of the riparian corridors have the potential to offer some root strength, litter fall, coarse wood recruitment and shading functions and the potential to support species of songbirds and small mammals. Portions of the riparian corridors with grass and herbaceous cover also provide some water quality improvement and habitat value.

Stormwater from adjacent neighborhoods is generally collected into catch basins and piped directly into streams and, therefore, stream buffers are not given the opportunity to provide sediment and phosphorus removal from surface waters. Improvements to surface water management could allow for more infiltration techniques that would provide better treatment and allow for more infiltration/recharge of groundwater in the highly urbanized environment. Currently, surface waters are receiving basic levels of treatment and the City of Anacortes inspects all catch basins and inlets owned or operated by the City of Anacortes every 2 years and annually inspects all municipally owned or operated permanent stormwater treatment and flow control best management practices (BMPs)/facilities. Going forward, the City of Anacortes has adopted provisions in the development code regarding techniques for LID that make it the preferred and commonly-used approach to site development, in order to minimize impervious surfaces, native vegetation loss and stormwater runoff in all types of development situations.

Within residential neighborhoods, many sections of stream channels have been ditched and piped. In addition, the mouths of many of the creeks have been extensively piped including Cranberry Creek, Happy Valley Creek, Beaver Brook and Ace of Hearts, with lower piped sections ranging from 1,600 to 5,000 feet in length before discharging into Puget Sound. These streams currently do not have the ability to support anadromous fish although their hydrology and channel dimensions may meet characteristics determined

to support fish use. All other remaining Anacortes creeks have mouths with shorter piped or ditched sections, some of which are partial or full passage barriers. Some of these streams may have the ability to support anadromous fish and some may have hydrology and channel dimensions that meet characteristics determined to support fish use.

Most streams in the City of Anacortes do not have documented salmonid use; however, some streams have been modeled as gradient accessible for anadromous salmonids and some have documented salmonid use (NWIFC 2022). SWIFD maps Clyde Creek, Toot Creek and Turner's Creek as having modeled presence/being gradient accessible for anadromous salmonids. SWIFD shows documented presence of Coho and Resident Coastal Cutthroat Trout within the lower portion of Turner's Creek. SWIFD maps Cranberry Creek and Stream 8 as having documented presence of Coastal Cutthroat Trout (NWIFC 2022). It is the long-term goal of the City of Anacortes to restore the City of Anacortes' riparian corridors and to protect salmon passage where scientifically justified. Through buffer restoration, buffer mitigation and stream daylighting, the functions of Anacortes streams and their associated riparian areas will continue to improve.

Appendix A, 3 from Original Stream Buffer BAS Report, Figures A-1 through A-14 depict these 27 streams. The stream alignments shown in Figures A-1 through A-13 are based on the above-referenced sources as well as publicly available Light Detection and Ranging (lidar) and aerial photographs. A field-based ground truthing to confirm the stream alignments was not performed as part of the mapping exercise. The data shown in Figures A-1 through A-13 is from City of Anacortes GIS data and lidar from 2021/2022 when the *Revised Stream Buffer Best Available Science Review and Buffer Recommendations* report was being developed (GeoEngineers 2022).

TABLE 7. ANACORTES STREAM SUMMARY INFORMATION

#	STREAM NAME	FIGURE #	HEADWATERS	GENERAL DESCRIPTION	BUFFER CONDITION	AGENCY MAPPING AND MAPPED FISH USE ¹
1	Ace of Hearts Creek	6a, 6b and 6c	Heart Lake located within ACFL	A combination of wetland, ditched stream and natural channel that varies throughout its course. This stream is conveyed into the city stormwater system at 33 rd Street, a distance of 5,000 feet before draining into Fidalgo Bay. Cedar Springs confluence with Ace of Hearts Creek is located just upstream of Ace of Hearts Rotary Park (off leash area) near H Avenue and Cedar Springs Lane.	Shrub and forest sections generally have 25-foot buffers, with some limited areas of 50-foot buffers. Invasive species are common in buffer areas. Buffers consist of approximately 1,400 feet of open orchard fields and residential yards from 41 st Street north to Orchard Place. Portion of stream within the ACFL has a 250- to 1,000-foot forested buffer.	FPAMT and SWIFD map the stream as fish-bearing (F) No mapped fish use in PHS or SWIFD
2	Anaco Bourn	3	Forested wetland within ACFL	A stream that begins in a forested wetland in the ACFL. It is conveyed into a culvert through the Marine Heights development and enters Clyde Creek north of Anaco Beach Road. Wetlands periodically occur adjacent to this stream.	The first approximately 700 feet has a young forest buffer ranging from 25 to 100 feet. Upper portion through residential neighborhood (approximately 850 feet) has 10- to 25-foot buffers with landscaping and lawn. Headwaters are a forested wetland within ACFL.	Not mapped by SWIFD, PHS or FPAMT
3	Aqua Creek	8 and 12	Forested area to the northeast of Whistle Lake within ACFL	A channelized wetland that flows into Fidalgo Bay. Fidalgo Bay and tidal flushing extends to the west side of State Route (SR)-20 at the confluence of Aqua Creek.	Young forest ranging in width from greater than 250 feet to 50 feet or less. Buffers include residential yards in the lower watershed.	The first approximately 2,000 feet upstream from Hwy 20 is mapped as fish-bearing (F) by SWIFD/FPAMT and non-fish bearing (N) upstream of that. No mapped fish use in PHS or SWIFD.
4	Beaver Brook	5a and 5b	Headwaters are a large, inundated wetland within ACFL known as the “32 nd Street Swamp”	From the 32 nd Street Swamp, at the western terminus of 32 nd Street, Beaver Brook flows for approximately 1,500 feet along ditches to a natural channel (for approximately 2,000 feet) within a narrow and forested buffer (25 to 35 feet) and then flows through a series of ditches and pipes for approximately 1,500 before draining into the city’s stormwater system along approximately 4,700 feet of pipe before draining into Puget Sound at the end of 22 nd Street.	Buffer along ditched section between 33 rd Street and 29 th Street is generally forested on the west side (ACFL) and urban yards on the east side. Buffer upstream and downstream of D Avenue is a mostly narrow (25 feet) forested buffer with a mixture of cedar, Douglas fir, red alder and willow. Buffers along ditched sections are generally grass with some patches of native and non-native trees and shrubs.	Not Mapped by FPAMT, SWIFD or PHS
5	Cedar Springs	6b	Artesian well and City-mapped wetland near the headwaters, southwest of Cedar Springs Lane	An approximately 700-foot channel, consisting of a combination of wetlands and stream channel that flows into Ace of Hearts Creek. Much of the flow is from an artesian well.	50-foot forested buffer adjacent to residential neighborhoods. Headwaters are hay fields.	Not mapped by SWIFD, PHS or FPAMT No mapped fish use in PHS or SWIFD
6	Clyde Creek	3	Wetland north of Jaspar Way	Clyde Creek begins as a wetland north of Jaspar Way, is conveyed through ditches and swales as wetlands, and is then channeled through a housing development in open swales and culverts where it picks up lawn and roadside runoff. It then flows into a ditch along Anaco Beach Road and then is culverted into Burrows Bay. Clyde Creek has increased flow during storm events.	Forested sections are approximately 10- to 15-foot wide on either side of the creek (at the ground surface) with a wider canopy above. Vegetation in the forested buffer consists of Douglas fir and western red cedar forest with some red alder and big leaf maple, with sword fern and Oregon grape understory. Salmonberry dominates closer to the creek.	SWIFD maps Clyde Creek as having “modeled presence”/being gradient accessible for Fall Chinook salmon, Coho, winter Steelhead and pink salmon (odd year). FPAMT and SWIFD map the stream as fish-bearing (F) up to a point approximately 300 feet upstream of Clyde Way, above which the stream is mapped as non-fish-bearing (N).
7	Cranberry Creek	2	Cranberry Lake within ACFL	Stream is the regulated outlet of Cranberry Lake. The stream flows within a gorge, 10 to 20 feet deep, within a wooded riparian corridor that is part of ACFL. The channel is conveyed into a roadside ditch near West 4 th Street and the gravel access road to Cranberry Lake. It is then conveyed, via approximately 1,500 feet of stormwater pipe, into Guemes Channel (east along the gravel access road, north along Georgia Avenue, under Hwy 20 and out into Guemes Channel.)	150 to 250 feet+ of forested buffer along the approximately 1,300-foot section of open channel immediately downstream of Cranberry Lake Vegetation in the forested buffer consists of western hemlock and western red cedar forest with some red alder and big leaf maple, with sword fern and Oregon grape understory. Salmonberry dominates closer to the creek.	SWIFD maps the documented presence of resident Coastal Cutthroat Trout in Cranberry Creek. FPAMT and SWIFD map the stream as fish-bearing (F)

#	STREAM NAME	FIGURE #	HEADWATERS	GENERAL DESCRIPTION	BUFFER CONDITION	AGENCY MAPPING AND MAPPED FISH USE ¹
8	Happy Valley Stream	7 and 6c	In Skagit County north of Haddon Road within a shrub and forest wetland complex	A combination of wetland, ditched stream and natural stream channel. It is also conveyed into the city stormwater system after crossing under Hwy 20 at R Avenue, a distance of 4,000 feet before draining into Fidalgo Bay.	25- to 50-foot sections of forested and shrub buffer areas in the middle and upper watershed and mowed lawns and open fields. Piped section is urban and mostly impervious.	Not mapped by SWIFD, PHS or FPAMT WDFW fish passage online map viewer maps fish passage barrier culverts and dams along the alignment of Happy Valley Stream.
9	Heart Bourn	10	Forested lands with the ACFL located north of Lake Erie.	Heart Bourn flows south along Heart Lake Road and discharges into Lake Erie in Skagit County.	Second growth mixed forested lands within the ACFL. Deciduous forest near the mouth along Lake Erie.	Mapped by SWIFD/FPAMT as fish-bearing (F) No fish distribution mapped by SWIFD or PHS.
10	Howard Creek	12	Wetland complex south and west of South Fidalgo Bay Road	Howard Creek is a large wetland complex with an outlet.	Young forest and shrub.	Not Mapped by SWIFD, PHS or FPAMT No fish distribution mapped by SWIFD or PHS.
11	March's Run	14	Wetlands north of South March Point Road and the BNSF Railway Company (BNSF) railroad	March's Run is a ditched wetland and turns into a natural channel near the confluence of a shallow estuarine portion of Padilla Bay west of South March Point Road. March's Run, as ditches wetland, is mapped by the City of Anacortes as a stormwater system occurring on both the south and north side of the railroad tracks. The northern portion of March's Run is a channeled drainage that collects runoff from the ditches alongside of the road and the railroad.	Disturbed fields and Himalayan blackberry	Not Mapped by SWIFD, PHS or FPAMT No fish distribution mapped by SWIFD or PHS
12	Miller Creek	8 and 9	A rural residential area west of Hwy 20 accessed via San Juan Hill Road	Miller Creek is similar to Weaverling Rill that is culverted under SR-20 and is difficult to determine where it enters Fidalgo Bay. This stream also requires additional fieldwork to determine the source of hydrology.	Young forest with some open field areas in the upper watershed.	The first approximately 500 feet is mapped as fish-bearing (F) on FPAMT/SWIFD and non-fish bearing (N) above that. No fish distribution mapped by SWIFD or PHS.
13	Mitten Creek	4	Mitten Lake	Mitten Creek flows south out of Mitten Lake (within the ACFL) for approximately 500 feet before passing into Skagit County. In Skagit County, Mitten Creek flows through forested and wetland areas then passing under Marine Drive and South Del Mar Lane before discharging into Burrows Bay.	Approximately 500 linear feet of headwaters channel located within the Cranberry Lake ACFL lands has second growth forested buffers. Within Skagit County buffers consist of mixed young forest, open fields and wetlands. Near the mouth, Mitten Creek passes through a residential community.	FPAMT and SWIFD map Mitten Creek as fish-bearing. A tributary of Mitten Creek that originates from an Anacortes-mapped wetland near Fir Crest Boulevard (Stream 4) is mapped as non-fish-bearing by FPAMT and SWIFD. SWIFD does not show Mitten Creek as having any salmonid fish distribution.
14	Morrison Run	5a	Channelized wetland located north of Beaver Brook and east of Cranberry Lake between 28 th and 23 rd Streets	Morrison Run is a wetland that has been channelized in select locations that enter into the City of Anacortes stormwater system.	Forested area immediately east of the Cranberry Lake ACFL	Not Mapped by SWIFD, PHS or FPAMT Wetlands are not mapped by NWI ²
15	Summit Creek	13	A rural residential area west of Thompson Road	Summit Creek begins within rural residential area west of Thompson Road, is conveyed through a series of ditches over to Saterlee Road where it flows through a series of man-made and natural wetlands, then flows through an open ditch on the south side of SR-20 west of Christiansen Road, under Hwy 20 then ditched until it drains into Fidalgo Bay. A drainage channel through the golf course has a confluence with Summit Creek at Hwy 20.	Rural residential fields and lawns.	Both Summit Creek and its tributary that drains through the golf course are mapped as fish-bearing (F) by SWIFD/FPAMT. The headwaters of Summit Creek and the golf course tributary (in Skagit County) are mapped as non-fish-bearing (N) by SWIFD/FPAMT. WDFW fish passage online map viewer maps a fish passage barrier (culvert under Christianson Road). No fish distribution mapped by SWIFD or PHS

#	STREAM NAME	FIGURE #	HEADWATERS	GENERAL DESCRIPTION	BUFFER CONDITION	AGENCY MAPPING AND MAPPED FISH USE¹
16	Toot Creek	11	Whistle Lake	Toot Creek flows south from Whistle Lake through the ACFL and Skagit County, under Campbell Lake Road, and into Campbell Lake. Stream centerline and headwaters need to be field verified.	Forested area within ACFL.	SWIFD maps the lower portion of Toot Creek as having “modeled presence” (gradient accessible) for Fall Chinook salmon, Coho salmon, Winter Steelhead and pink salmon (odd year). The first approximately 3,220 feet is mapped as fish-bearing (F) on FPAMT and not classified above that.
17	Turner’s Creek	14	Wetland located between SR-20 and Padilla Heights Road	Turner’s Creek flows southwest through industrial use and undeveloped areas, under Reservation Road and into Turners Bay.	Young forest and cleared industrial use areas.	SWIFD/FPAMT mapped as fish-bearing (F) south/downstream of Padilla Heights Road and non-fish bearing (N) north/upstream of that. SWIFD maps the lower portion of Turner’s Creek as having “modeled presence” (gradient accessible) for Fall Chum salmon, Fall Chinook salmon, Winter Steelhead and pink salmon (odd year). SWIFD shows documented presence of Coho and Resident Coastal Cutthroat Trout within the lower portion of Turner’s Creek.
18	Weaverling Rill	9	Forested area west of Hwy 20. Fields near headwaters appear wet on aerial photographs	Flows through a forested area west of Hwy 20 and is conveyed under SR-20 into a ditch that is piped under Fidalgo Bay Road and out into Fidalgo Bay.	West of Hwy 20 and between Hwy 20 and Fidalgo Bay Road buffer consists of young forest ranging in width from greater than 250 feet to 50 feet or less. Piped sections consist of parking lots and open fields.	Mapped as fish-bearing (F) on FPAMT/SWIFD No fish distribution mapped by SWIFD or PHS.
19	Whistle Creek	8 and 9	Wetlands in the vicinity of Whistle Lake	Stream originates in wetlands north of Whistle Lake within the ACFL, parallels Whistle Lake Road in the upper watershed.	Young forest ranging in width from greater than 250 feet to 50 feet or less. Whistle Lake Road is within the buffer in the upper watershed.	Not Mapped by SWIFD, PHS or FPAMT. No fish distribution mapped by SWIFD or PHS.
20	Stream 1	4	Big Beaver Pond	Stream originates at Big Beaver Pond within the ACFL and flows approximately 630 feet into Little Cranberry Lake. Stream centerline and headwaters need to be field verified.	Forested area within ACFL.	Mapped as fish-bearing (F) by FPAMT/SWIFD No fish distribution mapped by SWIFD or PHS.
21	Stream 2	4	Big Beaver Pond	Stream originates at Big Beaver Pond within the ACFL and flows approximately 450 feet into the 32 nd Street Swamp. Stream centerline and headwaters need to be field verified.	Forested area within ACFL.	Mapped as fish-bearing (F) by FPAMT/SWIFD No fish distribution mapped by SWIFD or PHS.
22	Stream 3	4	Forested areas within ACFL and Skagit County	Stream appears to flow northeast from forested areas in Skagit County into Mitten Lake. Stream centerline and headwaters need to be field verified.	Forested area within ACFL.	Not Mapped by SWIFD, PHS or FPAMT.
23	Stream 4	4	Unnamed wetland within ACFL	Stream flows southwest from an unnamed wetland on the eastern border of the ACFL approximately 930 feet into Mitten Creek. Stream centerline and headwaters need to be field verified.	Forested area between the eastern boundary of the ACFL and residential areas.	Mapped as non-fish-bearing (N) on FPAMT No fish distribution mapped by SWIFD or PHS.
24	Stream 5	10	Forested areas within ACFL north of Lake Erie	Stream flows southwest from forested area in the ACFL, under Heart Lake Road and into Heart Bourn. Stream centerline and headwaters need to be field verified.	Second growth mixed forested area within ACFL	SWIFD/FPAMT mapped as non-fish-bearing (N) No fish distribution mapped by SWIFD or PHS.
25	Stream 6	10	Forested areas within ACFL north of Lake Erie	Stream flows west from forested area in the ACFL, under Heart Lake Road and into Heart Bourn. Stream centerline and headwaters need to be field verified.	Second growth mixed forested area within ACFL	SWIFD/FPAMT mapped as non-fish-bearing (N) No fish distribution mapped by SWIFD or PHS.
26	Stream 7	11	Forested areas within ACFL	Stream appears to flow southeast from forested area in the ACFL and into Whistle Lake/a wetland at the western edge of Whistle Lake. Stream centerline and headwaters need to be field verified.	Forested area within ACFL	SWIFD/FPAMT mapped as fish-bearing (F) No fish distribution mapped by SWIFD or PHS.

#	STREAM NAME	FIGURE #	HEADWATERS	GENERAL DESCRIPTION	BUFFER CONDITION	AGENCY MAPPING AND MAPPED FISH USE ¹
27	Stream 8	11	Forested areas within ACFL	Stream flows south from forested areas in the ACFL, into Skagit County, under Campbell Lake Road and into Campbell Lake. Stream centerline and headwaters need to be field verified.	Forested area within ACFL	Mapped as fish-bearing (F) on FPAMT Documented presence of Coastal Cutthroat Trout mapped by SWIFD.

Note:
¹ PHS (WDFW 2025b), SWIFD (NWIFC 2022) and FPAMT (DNR 2022). PHS reports are the up-to-date source for fish use.
² NWI is the National Wetlands Inventory (USFWS 2022)

4.2.2 Summary of Existing Conditions: Other FWHCAs

The following is a list of designated FWHCAs in Anacortes, per AMC 19.70.315(A), with a brief summary of existing conditions:

- Critical saltwater habitats, which include all kelp beds, eelgrass beds, spawning and holding areas for forage fish, such as herring, smelt and sand lance; subsistence, commercial and recreational shellfish beds; mudflats, intertidal habitats with vascular plants and areas with which priority species have a primary association;
 - According to the WDFW PHS mapper (WDFW 2025b) there is pinto abalone (*Haliotis kamtschatkana*) Potential Habitat - Aquatic habitat near: Cap Sante Park; Fidalgo Head to Shannon Point; Anacortes Harbor; Burrows Island.
 - According to the Washington State Department of Health (DOH 2025), there are two public shellfish beaches in Anacortes; one along the southwest shoreline of Washington Park and one at March's Point.
 - The Ecology Coastal Atlas and the DNR Puget Sound Seagrass Monitoring data viewer depict multiple eelgrass beds extending along the shoreline of Anacortes (Ecology 2025; DNR 2025a).
 - The WDFW Forage Fish Spawning Map for Washington State depicts many documented surf smelt (*Hypomesus pretiosus*) and Pacific sand lance (*Ammodytes hexapterus*) spawning areas along the shoreline and many Pacific herring (*Clupea pallasii*) spawning areas just offshore (WDFW 2025c).
- Naturally occurring ponds under 20 acres with submerged aquatic beds that provide fish or wildlife habitat as further defined in WAC 365-190-130(4)(e);
 - There are multiple ponds under 20 acres in Anacortes, including but limited to Little Beaver Pond, Big Beaver Pond and 32nd Street Swamp in the AFCL Cranberry Lake area and Smiley's Bottom Wetland at Volunteer Park.
- RMZs as defined in AMC 19.70.330 and Waters of the State, including but not limited to Whistle Creek, Happy Valley Stream, Ace of Hearts Creek, Beaver Brook, Cranberry Creek, Clyde Creek, Anaco Bourn, Morrison Run, Cedar Springs, Weaverling Rill, Miller Creek, Aqua Creek, Howard Creek, Summit Creek and March's Run;
 - Existing conditions of streams are described in Section 4.2.1 Summary of Existing Conditions Streams
- Lakes, ponds, streams and rivers planted with game fish by a governmental or tribal entity;
 - According to WDFW, Whistle Lake fishing opportunities include stocked Coastal Cutthroat Trout and resident Largemouth Bass and Yellow Perch (WDFW 2025d), and most anglers visit Heart Lake for the stocked Rainbow Trout, but resident Largemouth Bass can also be caught (WDFW 2025e).
- Areas with which anadromous fish species have a primary association;
 - Most streams in Anacortes do not have documented use by anadromous fish species. Lower portions of Toot Creek, Turner's Creek and Clyde Creek have modeled presence of anadromous salmonids (NWIFC 2022). Marine shorelines/nearshore areas support anadromous salmon rearing and migration.
- State natural area preserves, natural resource conservation areas and state wildlife areas as established by DNR;
 - The closest state natural area preserve to Anacortes is Cypress Highlands on Cypress Island and the closest natural resource conservation areas to Anacortes are Hat Island, located in Padilla Bay

between Anacortes and Bayview, and Cypress Island, located northwest of Anacortes (DNR 2023). The closest WDFW Wildlife Areas are the Telegraph Slough Unit and the South Padilla Bay Unit of the Skagit Wildlife Area, both located at the south end of Padilla Bay and the Samish Wildlife Area Unit, located between Samish Island Road and Padilla Bay (WDFW 2025g).

- Areas of rare plant species and high-quality ecosystems as identified by the DNR through the Natural Heritage Program in Chapter 79.70 RCW;
 - According to DNR's Washington Natural Heritage Program (WNHP) Data Explorer (DNR 2025b) the following rare plants and/or ecosystems are mapped in Anacortes:
 - two *Known Rare Wetland or Riparian Ecological Communities* associated with Shannon Lake,
 - one *Known Rare Plant* in the AFCL around Little Cranberry Lake,
 - two *Known Rare Nonvascular Fungi* species (lichens) in Washington Park,
 - one *Known Rare Plant* in Washington Park,
 - one *Known Rare Upland or High-Quality Common Ecological Community* in Washington Park,
 - one *Known Rare Upland or High-Quality Common Ecological Community* in the AFCL south of Mount Erie
 - one *Known Rare Upland or High-Quality Common Ecological Community* north of Lake Erie
 - *Known Rare Upland or High-Quality Common Ecological Communities* south and east of Whistle Lake
 - *Known Rare Upland or High-Quality Common Ecological Communities* around Heart Lake
 - One *Known Rare Plant* and two *Known Rare Upland or High-Quality Common Ecological Communities* between Heart Lake and Mount Erie
- Habitats and species of local importance designated by the City of Anacortes.
 - See a brief summary of their existing conditions below.
- State priority habitats and areas associated with state priority species defined and listed by the WDFW in the PHS List, most recently updated edition.
 - See a summary of mapped PHS in Anacortes below.

AMC 19.70.315(9) lists habitats and species of local importance that have been designated by the City of Anacortes. Below is a list of those habitats and species of local importance and a brief summary of their existing conditions:

- a. The Anacortes Community Forestlands.[AFCL]
 - According to AMC 19.70.335(C)(1)(a) "The Anacortes Community Forest Lands include three lakes and their watersheds, numerous wetlands, rock bluffs, old growth forests, grassy knolls, windswept hilltops, sheltered caves, and a variety of other habitats and microclimates that provide a unique and irreplaceable habitat for both imperiled and commonplace species."
 - The ACFLs contain the following shoreline lakes: Heart Lake; Whistle Lake; and Little Cranberry Lake; all of which serve as headwaters for the City of Anacortes streams.
- b. The March Point Heronry.
 - According to AMC 19.70.335(C)(2)(a) "Because Skagit County is home to the greatest concentration of nesting great blue heron in the Salish Sea, March Point being the largest, the city has identified the March Point Heronry as a habitat of local importance."

- c. The 1½ acre “Park Reserve” at Cap Sante bounded by Third Street, East Park Drive, and Curtis Drive.
- d. Ship Harbor Wetland.
- e. Cannery Pond Wetland.
- f. Category II wetlands within the watersheds of Little Cranberry Lake, Whistle Lake and Hearth Lake, and with seasonal surface water connections.
- g. Smiley’s Bottom Wetland.

According to the WDFW PHS mapper (WDFW 2025b) there are eight types of priority habitats within Anacortes. These habitats are:

- Biodiversity Areas and Corridor - Terrestrial Habitat
 - Fidalgo Island Open Space Areas, steep forested and rocky slopes.
 - Cap Sante Park in Anacortes. This site is used by bald eagles while hunting.
 - Washington Park in Anacortes. This site is used by bald eagles while foraging.
 - Mt. Erie City of Anacortes Park, steep forested and rocky slopes.
- Pinto abalone (*Haliotis kamtschatkana*) Potential Habitat - Aquatic habitat near: Cap Sante Park; Fidalgo Head to Shannon Point; Anacortes Harbor; Burrows Island.
- Wetlands
- Freshwater Forested/Shrub Wetland
- Estuarine and Marine Wetland
- Freshwater Pond
- Freshwater Emergent Wetland
- Cliffs/Bluffs - Habitat Feature. Cliff-Coastal Zone Atlas of Washington-steep slopes consisting of exposed. A limited rocky intertidal area is typically associated with these rugged shorelines.

According to the WDFW PHS mapper (WDFW 2025b) there are 19 priority species within Anacortes. These species are:

- Marine Species
 - Harbor seal (*Phoca vitulina*)
 - Surf smelt (*Hypomesus pretiosus*)
 - Pacific sand lance (*Ammodytes hexapterus*)
 - Pacific herring (*Clupea pallasii*)
 - Hardshell clam (*Mercenaria mercenaria*)
 - Pandalid shrimp (*Pandalus* spp.)
 - Dungeness crab (*Metacarcinus magister*)
 - Red sea urchin (*Mesocentrotus franciscanus*)

■ Anadromous/Freshwater Species

- Coho (*Oncorhynchus kisutch*)
- Rainbow trout (*Oncorhynchus mykiss*)

■ Bird Species

- Western High Arctic Brant (*Branta bernicla*)
- Great blue heron (*Ardea Herodias*)
- Purple Martin (*Progne subis arboricola*)
- Waterfowl concentrations – Regular Concentration:
 - Skagit County lakes. Waterfowl wintering areas; lakes which provide food resources for diving ducks and in some cases swans and important loafing habitat.
 - Padilla Bay Waterfowl Area. Coastal estuary and open water. This area provides winter food resources, loafing habitat and "graveling" sites for all kinds of waterfowl and shorebirds. Essential area for brant.
 - Fidalgo Bay Waterfowl Area. Coast estuary and open water. This area provides winter food resources, loafing habitat and "gravelly" sites for all kinds of waterfowl and shorebirds. Essential area for brant.
- Shorebird concentrations - Regular Concentration:
 - Padilla Bay. High counts for shorebirds were 11,000+ in winter 1995, 30,000+ in spring 1994 and 2,000+ in autumn 1992. Dunlins and western sandpipers were most numerous. Least sandpipers, killdeer and black-bellied plovers were also present.
 - Fidalgo Bay. High counts for shorebirds were 3,600+ in winter 1994 and 4,000+ in spring 1991. Dunlins were most numerous with the least sandpipers and black turnstones also present.

■ Bat Species

- Yuma bat (*Yuma myotis*)
- Big Brown Bat (*Eptesicus fuscus*)
- Little Brown Bat (*Myotis lucifugus*)
- Townsend's Big-eared bat (*Corynorhinus townsendii*)

■ Insects

- Beller's ground beetle (*Agonum beleric*)

Anacortes SMP will regulate and protect PHS-listed species and habitats, and other protected habitats within shoreline jurisdiction. Marine areas, areas within 200 feet of marine waters and/or shoreline lakes (i.e., Heart Lake, Whistle Lake and Little Cranberry Lake) and shoreline-associated wetlands fall under the jurisdiction of the SMP (AMC 19.72). The Anacortes Official Shoreline Environmental Designation Map shows marine and lake areas within the City of Anacortes that fall under shoreline jurisdiction (City of Anacortes 2010). The map is not meant to serve as an official shoreline jurisdiction area map, but instead to show shorelines and associated environmental designation.

4.3 BAS LITERATURE REVIEW: STREAMS

Below in Section 4.3.1 Stream Buffers is the BAS review from the *Revised Stream Buffer Best Available Science Review and Buffer Recommendations* report dated June 29, 2022 (GeoEngineers 2022), with some updates and modifications. Section 4.3.2 Stream Channel Protection and Restoration/Mitigation contains a summary of other protective measures for streams, including guidance on permitted alterations and restoration/mitigation.

4.3.1 Stream Buffers

The buffer size necessary to provide a particular level of function depends on the functions of the stream, the stream's relative sensitivity (as influenced by hydrology and other factors), the characteristics of the buffer, the intensity of adjacent land use and watershed characteristics. A multi-function buffer should be sized to meet all of the functions identified as being locally important.

In addition to their essential role as fish and wildlife habitats, riparian areas provide other significant benefits to humans in the form of a variety of ecosystem goods and services such as: provisioning food and water; decreasing flood flows; nutrient cycling, sediment and pollutant filtering; carbon sequestration; and recreational, spiritual, and other nonmaterial benefits (Naiman and Bilby 1998; Quinn, T., et. Al 2020; NRC 2002). The literature review below focuses on the water quality protection functions (nutrient cycling, sediment and pollutant filtering) and fish and wildlife habitat functions of riparian buffers.

4.3.1.1 WATER QUALITY PROTECTION

Buffers protect the water quality of streams by preventing the buffer area itself from serving as a source of pollution and by reducing harmful inputs through processing pollutants and absorbing heat. Urbanization can increase the amount of sediments and contaminants in surface runoff, cause changes in hydrology (rates and amounts of surface and groundwater contributions), increase the severity of water fluctuations in streams during storm events, and affect hydrology by changing the rate and nature of (more frequent rapid high flows and lower sustained low flows) (ELI 2008; May et al. 1997). Vegetated buffers with deep permeable soils absorb and slow down surface flows and impede the formation of channelized flows, allowing for infiltration before runoff reaches the stream channel and improving removal of sediments and nutrients (ELI 2008).

Water quality benefits to streams and other Waters of the State vary with the size of the buffer, and also vary with flow patterns, type of vegetation, slope, soils, adjacent and surrounding land use, pollutant type and dose, and patterns of precipitation (Adamus 2007; Wenger 1999; Sheldon et al., 2005). Buffers with both forested and grassy vegetation have been shown to be most effective at removing both sediments and nutrients. Buffer effectiveness can be reduced over time if sediments and/or nutrients are added too quickly or in chronically high concentrations, and by actions that remove vegetation or compact or erode soils, which can lead to the formation of rills and gullies (ELI 2008).

4.3.1.2 REMOVAL OF SEDIMENTS AND POLLUTANTS

Many researchers have found that the majority of sediment removal occurs within the first 15 to 30 feet, but that buffers of 30 to 100 feet will remove sediments more consistently (Dillaha et al. 1988 and 1989; Magette et al. 1989; Schoonover et al. 2006, Sheldon et al. 2005). The effectiveness of buffers to remove sediment decreases as slopes increase and as sediment loads increase (Wenger 1999; Sheldon et al. 2005). From their review of the literature, Sheldon et al. (2005) concluded that coarser

sediments are likely removed effectively in the first 16 to 66 feet of a buffer, while removal of finer particles may require buffers of 66 feet or larger. Locations with high sediment loads and steep slopes may also require wider buffers, as sediment removal efficiency decreases as slope increases (Wenger 1999; Sheldon et al. 2005). The ability of buffers to remove sediments and nutrients can degrade over time, if rates of sediment and contaminant inputs is too fast or in high enough concentrations that soil voids fill up with sediments and/or soil binding sites reach capacity (Cooke 1992). Channelized flow in the form of rills, gullies, ditches, subsurface pipes and other types of highly focused flows does not allow for contact with buffer vegetation and often is not sufficiently slowed to allow sediment removal, reducing or eliminating the pollution filtering capability of the buffer. Wenger (1999) found that the use of level spreaders, grass filter strips and other structural techniques also can encourage sheet flow through buffers. Welsch (1991) recommended planting a grass strip 20 feet (6.1 meters) wide at the outer edge of a forested riparian buffer to help disperse concentrated flow into sheet flow.

Phosphorus is carried to waterways in both dissolved and particulate form. Much of the phosphorus entering buffers is attached to sediments and thus buffer effectiveness at removing sediments can be a surrogate for much of the phosphorus removal function (Wenger 1999). Therefore, like sediment removal, much of the phosphorous removal may occur within the first 15 to 30 feet of a buffer, but more consistent phosphorus removal may occur within buffers of 30 to 100 feet (Dillaha et al. 1988 and 1989; Emmons & Olivier Resources 2001; Kuusemets and Mander 1999; Lowrance and Sheridan 2005; Syverson 2005). Buffers can become saturated with phosphorous and are not effective at long term phosphorous storage, but they can regulate rates of phosphorous release and prevent large pulses from reaching streams and wetlands (Wenger 1999). Removal of plant biomass (haymaking, mowing, grazing) from portions of the buffer, can permanently remove some phosphorus from the system (Wenger 1999).

Waschbusch et al. (1999) reported that lawns and streets were the largest sources of total phosphorus, dissolved phosphorus and total suspended solids (TSS) in a basin study, with a combined contribution of 80 percent of the phosphorus load. Lawns had the highest concentrations and load rates of both dissolved and total phosphorus, contributing from 56 to 70 percent of total phosphorus. Streets were the next largest contributor of phosphorus, while parking lots and roofs were the lowest contributors. Pitt et al. (2005) found that lawns and landscape areas were the largest sources of dissolved phosphorus with streets and driveways the next highest source. Barr (2005) identified the following major contributing sources of phosphorus loadings in a Minnesota watershed: streets 41 percent; lawns 17 percent; pet waste 5.1 percent; and fertilizers 1.4 percent. Matthews et al. (2007) identified lawn fertilizers as almost always being the single largest source of phosphorus in urban soils. There are conflicting study results as to the relative phosphorus loading contributions from fertilizers compared to lawn clippings; however, the literature is in general agreement that lawns are a major source of phosphorus (Waschbusch et al. 1999, Pitt et al. 2005, Barr 2005, Matthews et al. 2007).

Subsurface flows of nitrates dissolved in groundwater is the primary route of nitrogen transport through buffers, with secondary transport occurring via particulates. Primary removal processes are conversion of nitrate to nitrogen gas via denitrifying bacteria, and removal by uptake into plants. Wetlands and riparian areas remove nitrogen from surface water and shallow groundwater through three primary means: (1) denitrification which involves anaerobic bacteria converting nitrate (NO_3^-) or nitrite (NO_2^-) into nitrogen gas (N_2) or nitrous oxide gas (N_2O) (known as “degassing”); (2) settling out particulate matter and incorporating it into the soil/sediment; and (3) nitrate uptake by plants into their tissues (Howard-Williams 1985). Nitrogen removal in riparian areas is primarily through denitrification and plant

uptake with nitrates being removed from seasonally high groundwater near the surface (Groffman et al. 1992). Removal of nitrates from groundwater via uptake by plants occurs in riparian zones where groundwater comes into contact with the root zones of plants (Hill 1996). In a study of eight streams in southern Ontario, Canada, 90 percent of the nitrate in groundwater (varying in concentration from 0.15 to 44.7 milligrams per liter [mg/L]) was removed across 50-foot-wide stream buffers in areas where the confining layer was close to the surface (within 3 to 6 feet of the surface) (Philippe et al. 2004). In addition to nitrate removal within riparian buffers, removal of ambient nitrates was also documented within streams in the Catskill Mountains of New York (Burns 1998). Both denitrification and uptake of nitrates by photosynthetic organisms (photoautotrophs) was observed occurring in these streams (Burns 1998).

From a comprehensive review and synthesis of the literature pertaining to the nitrogen removal function of riparian buffers, Mayer et al. (2005) concluded that narrow buffers, of approximately 3 to 50 feet, can be effective at removing nitrogen, but wider buffers, of greater than approximately 160 feet, more consistently remove greater amounts of nitrogen. In buffers of approximately 10 feet, 90 feet and 370 feet wide, Mayer et al. (2005) suggested 50 percent, 75 percent and 90 percent nitrogen removal efficiencies respectively, via both surface and subsurface flow, depending on nitrate loading rates and buffer characteristics. Wenger (1999), after reviewing the same literature, concluded that a minimum of 50 feet is necessary for effective nitrogen removal, with wet organic soils performing the best, and that 100-foot buffers or greater would provide more areas for denitrification and more nitrogen removal.

In order for effective microbial denitrification and plant uptake of nitrogen, soils must have high levels of organic carbon, be saturated, and have anoxic or low oxygen conditions, and the root zone of riparian vegetation must have extended contact with groundwater (Groffman et al. 1992). When these soil conditions are maintained, removal of subsurface nitrate is highest (Correll 1997; Wenger 1999). These soil and root zone criteria may be more important than width in determining the effectiveness of the buffer (Mayer et al. 2005). For example, Vidon and Hill (2004) found that 50-foot buffers were effective at removing 90 percent of the nitrate at locations with loamy soils, but the buffer width required for 90 percent nitrate removal at locations with sand and cobble sediments (low organic matter) ranged from approximately 80 to 580 feet. To maintain nitrogen removal effectiveness of buffers over time, removal of leaf litter or ground cover, soil compaction, gullyng and increases in impervious surfaces should be minimized (Mayer et al. 2005).

A few studies have evaluated effective buffer widths for removing potentially toxic compounds, fecal coliform and other pathogenic microorganisms. Urban buffers were found to generally be good at removing hydrocarbons and metals from surface runoff (Herson-Jones et al. 1995, as cited in Wenger 1999). Potentially toxic compounds, such as pesticides and metals, may also be partially removed through filtration of sediments by the buffer (Sheldon et al. 2005), and temporarily, through vegetative uptake (Gallagher and Kibbey 1980). A 30-foot buffer treated with poultry manure removed 34 to 74 percent of the fecal coliform; however, the primary contact standard was still exceeded in the resulting runoff (Coyne et al. 1995).

4.3.1.3 SHADE, TEMPERATURE AND DISSOLVED OXYGEN

Factors that influence water temperature include overhead cover, shade, groundwater and surface inputs, relative humidity, ambient air temperature, wind, substrate and channel dimensions (Adams and Sullivan 1989; Mohseni and Stefan 1999). Shading and wind reduction provided by riparian vegetation influences water quality by maintaining cooler temperatures. Water temperature can affect species

distribution, metabolism and survival, and cooler temperatures help maintain sediment-pollutant bonds and increase the water's dissolved oxygen capacity (McMillan 2000). Stream temperatures have been observed to significantly increase after the loss of riparian forest cover (Brown and Krygier 1970; Beschta et al. 1987). Ecology modeled the effects of riparian buffer width on effective shade and stream temperature (Cristea and Janisch 2007). They found that for streams with a 10-foot channel width, that a 50-foot buffer produced 73 to 86 percent effective shade. Assumptions built into the model included: north-south orientation, vegetation cover right at the bankfull edge, no channel incision, no topographic shade, 80-foot-tall buffer vegetation and 85 percent canopy cover.

The temperature of stream water and the factors affecting it have been the focus of studies for many years because of the importance of temperature in governing in-stream processes such as decomposition of organic matter, metabolism and oxygen solubility as well as the effects of temperature on stream biota (Johnson 2004). There is conflicting information in the peer-reviewed literature about the relative ranking of factors affecting stream temperature (Johnson 2004). Johnson (2004) found that as hyporheic flow declines, stream temperature buffering declines, and daily minimum and maximum temperatures may increase.

4.3.1.4 HABITAT

Riparian zones provide many functions for fish and wildlife including, maintaining in-stream habitat, serving as a source of organic matter and woody debris, providing habitat for water-dependent species that rely on adjacent uplands as a critical part of their life history, screening for adjacent human disturbance and serving as wildlife corridors (ELI 2008). Riparian zones play a critical role of providing both transition zone wildlife habitat and in-stream habitat for aquatic life. Wildlife habitat value is determined by the ability of a buffer to provide structural complexity, connectivity with other habitats, food and water, and a moist and moderate microclimate (Knutson and Naef 1997). The ability of a buffer to provide in-stream habitat is determined by the ability of a buffer to produce and provide inputs of small and large organic debris into the stream. Although riparian ecosystems constitute a small portion of the surface landscape, approximately 85 percent of Washington's wildlife species are known to use riparian areas associated with rivers and streams (Knutson and Naef 1997).

4.3.1.5 WILDLIFE HABITAT

The appropriate buffer size for providing habitat functions depends on:

- resident species and their life-history characteristics;
- condition of the stream and the stream buffer;
- intensity of surrounding land use; and
- functions the buffer is providing/can provide

Many buffer studies in the literature make conclusions on appropriate buffer sizes for wildlife habitat based on how far individuals range from a stream or wetland for breeding or other life-cycle needs. A review of the science by the ELI (2008) found that effective buffer sizes for wildlife protection can range from 33 feet to more than 5,000 feet, depending on the species. Most studies report a range of 200 to 300 feet necessary to provide essential habitat for most wildlife species (Keller et al. 1993). However, it has been noted that even a narrow buffer will enhance the habitat of most species (Wenger 1999). Specific information on ranges for birds, mammals, reptiles and amphibians have been developed in the literature:

- Birds: from 49 to over 5,000 feet (ELI 2008; Fischer 2000)
- Mammals: between 98 and 600 feet (ELI 2008)
- Reptiles and Amphibians: between 164 and 951 feet (Semlitsch and Bodie 2003)

Buffers can protect aquatic life and wildlife from light, noise, domestic pets and human presence (Castelle et al. 1992). The intensity of adjacent land uses is directly related to the level of human disturbance in a buffer, and buffer effectiveness can decline over time from continued disturbance (Cooke 1992). Buffers of at least 50 feet are likely necessary to maintain buffer effectiveness over time (Cooke 1992). Amphibian species richness was observed to decline with increasing urban land use and road density (Rubbo and Kiesecker 2005; Houlahan and Findlay 2003). Buffers with greater structural complexity generally support more species (Shirley 2004); however, buffers with less complexity can be more favorable to a specific, locally rare species. Native vegetation is more likely to be effective at conserving native wildlife (Wenger 1999). Parkyn and Eades (2000, as cited in Parkyn 2004) suggest that a buffer of 33 to 66 feet is necessary for sustaining a community of native vegetation.

4.3.1.6 IN-STREAM HABITAT

The composition, structure and functions of riparian and aquatic ecosystems have a primary connection with wood (Quinn et al. 2020). In-stream large wood increases hydraulic complexity, (i.e., wider range of flow velocities), which causes streambed scour, pool formation, channel migration and sediment deposition, all resulting in a greater diversity of aquatic habitat types (Quinn et al. 2020).

Vegetation (especially woody vegetation) has mechanical and hydrologic effects on bank stability, and these effects can be stabilizing or destabilizing. In general, the net effect of vegetation is stabilizing. Bank stability (dynamic stability) is one of five key ecological functions of riparian areas (Quinn et al. 2020). Simple models suggest that in an old-growth riparian forest, the full contribution of root strength to streambank stability is provided by trees within approximately 33 feet of the streambank.

Large woody debris (LWD) influences the development of geomorphic structures, especially in headwater streams, compared to downstream channels (Gregory et al. 1991). Small streams and headwater streams rarely transport LWD (and other debris) so that as the debris builds up, the consequent obstructions formed alter hydrology and geomorphology (Knutson and Naef 1997). Larger streams have increased capacity to transport large wood downstream. The influence of in-stream large wood on streams and rivers is a function of wood size relative to channel size. For example, up to 80 percent of pools in small streams can be associated with wood (Montgomery et al. 1995) with the frequency of wood-associated pools decreasing with increasing stream size (Bilby and Ward 1989 and 1991; Montgomery et al. 1995). LWD lengthens water residence time in streams (Naiman and Décamps 1997) and captures and retains small organic debris and provides a substrate for microbial life and algae, thus supplying a food base for macroinvertebrates (Bolton and Shellberg 2001). Woody debris and the entrapped smaller branches, limbs, leaves and other material significantly reduce flow conveyance (Dudley et al. 1998).

Studies on LWD recruitment conducted for timber managed forest lands generally recommend buffer widths of one to two SPTHs (Spence et al. 1996; Kondolf et al. 1996; FEMAT 1993). SPTH is defined as the average maximum height that a tree can attain, given site conditions. For smaller streams, ephemeral streams and streams on private land, buffers of one SPTH were generally recommended (Spence et al. 1996; Kondolf et al. 1996; FEMAT 1993). In an unmanaged natural riparian area, 100 percent of a site's

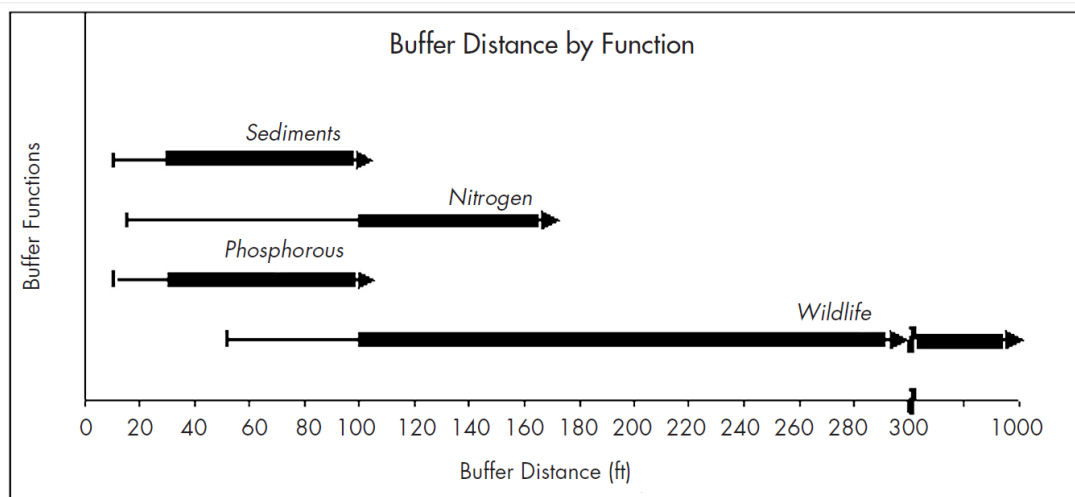
large wood recruitment potential comes from a distance of approximately 85 to 230 feet from the stream channel, depending on site productivity class. This does not account for additional wood recruitment through landslides, debris flows or extreme channel migration.

Based on WDFW's Site-potential Tree Height and Riparian Management Zone Values online map tool, SPTHs in Anacortes range from 91 to 231 feet (WDFW 2025f). SPTHs in Anacortes are based on 200-year-old projected heights for Douglas fir (*Pseudotsuga menziesii*) and red alder (*Alnus rubra*) combined with Natural Resources Conservation Service (NRCS) soil productivity data. Douglas fir SPTHs in Anacortes range from 91 to 231 feet, with the most common SPTHs being from 165 to 189 feet. Red alder SPTHs in Anacortes range from 100 to 105 feet (WDFW 2025f).

4.3.1.7 STREAM BUFFER BAS SUMMARY

The literature on buffers generally suggests that a 50-foot buffer is the minimum required to provide a basic level of functions. As discussed above, 50-foot buffers can provide a high level of function for sediment and phosphorus removal but generally provide moderate to low levels of function for wildlife habitat and nitrogen removal. Chart 1 below (from ELI 2008) provides a visual summary of buffer function provided by width of buffer.

CHART 1. BUFFER DISTANCE BY FUNCTION (ELI 2008)



*Effective buffer distance for water quality and wildlife protection functions. The thin arrow represents the range of potentially effective buffer distances for each function as suggested in the science literature. The thick bar represents the buffer distances that may **most** effectively accomplish each function (30 - > 100 feet for sediment and phosphorous removal; 100 - > 160 feet for nitrogen removal; and 100 - > 300 feet for wildlife protection. Depending on the species and the habitat characteristics, effective buffer distances for wildlife protection may be either small or large.*

Although simplified generalizations can be made from the literature about level of function by buffer width, the actual function provided by a buffer depends on many site-specific factors including the following:

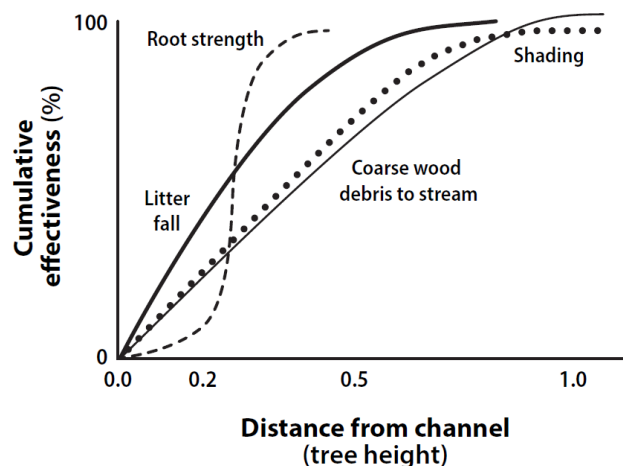
- Structural complexity (e.g., tree, shrubs and herbaceous canopy layers; snags; downed wood; canopy openings, conifers and hardwoods)
- Connectivity with other habitats

- Availability of food and water for wildlife (e.g., rotten wood for insect prey, berries, nuts)
- Moist and moderate microclimate (e.g., shade, canopy closure, wind protection)
- Buffer trees tall enough to provide inputs of small and large organic debris into the stream
- Organic content of soil
- Slope
- Riparian vegetation root zone has extended contact with groundwater (nitrogen removal)
- Grass filter strips combined with forest buffer (disperses channelized flow into sheet flow and encourages sedimentation)

A smaller buffer can provide more sediment, phosphorus and nitrogen removal, and more in-stream and wildlife habitat if it has more of the elements listed above.

FEMAT's (1993) curves are conceptual models describing how the cumulative effectiveness of four fundamental riparian ecosystem functions changes with distance from the stream channel (see Graph 1 below). The four functions in the FEMAT model are litter fall (i.e., input of detrital nutrients), stream shading, root strength (i.e., streambank stability) and coarse woody debris to stream (i.e., large wood recruitment). FEMAT (1993) also included the pollution removal function (i.e., water quality) but did not create a curve for it. The curves convey two central points: first that the four riparian ecosystem functions occur within one SPTH, and secondly that the marginal return for each function decreases as distance from the stream channel increases. In other words, the FEMAT curves show that areas closer to the stream provide more of each function per unit width than areas farther from the stream.

GRAPH 1. FEMAT CURVES: CUMULATIVE EFFECTIVENESS OF RIPARIAN ECOSYSTEM FUNCTIONS AND PROCESSES VS DISTANCE FROM CHANNEL



Graph Note:

The “FEMAT Curves” (FEMAT 1993) are generalized conceptual models describing some riparian ecosystem functions and processes as the distance from a stream channel increases. “Tree height” in the figure above is based on the average maximum height of the tallest dominant trees (200 years old or greater) and is referred to as SPTH.

Graph from Quinn et al. 2020

Although some riparian functions, such as pollution removal, are not strongly associated with tree height. Several key riparian functions are, including large wood recruitment, stream shading and litter fall. The FEMAT curves can thus be used to help estimate the amount of function provided by riparian areas of different widths for those functions that are strongly associated with tree height. Based on the FEMAT curves, a buffer with a width equivalent to half the SPTH will be providing the vast majority of the root strength and litter fall functions and from 70 to 75 percent of the coarse wood recruitment and shading functions. With SPTHs in Anacortes ranging from 91 to 231 feet with the most common SPTHs being from 165 to 189 feet (WDFW 2025f), a riparian buffer in Anacortes that ranges from 85 to 95 feet (50 percent of the SPTH) will provide most of the root strength and litter fall functions and from 70 to 75 percent of the coarse wood recruitment and shading functions.

4.3.2 Stream Channel Protection and Restoration/Mitigation

WDFW has four guidance manuals focusing on specific types of habitat or restoration activities, including *Water Crossing Design Guidelines* (Barnard et al. 2013), *Marine Shorelines Design Guidelines* (Johannessen et al. 2014), *Stream Habitat Restoration Guidelines* (Cramer 2012), and *Integrated Streambank Protection Guidelines* (Cramer et al. 2003). WDFW is in the process of revising portions of the *Water Crossing Design Guidelines* and *Marine Shoreline Design Guidelines*. A public review period is anticipated in fall 2025.

The *Water Crossing Design Guidelines* (Barnard et al. 2013) present a process for selecting a water-crossing type, size and location and a design process intended to minimize the effect of the crossing structure on the natural processes that create and maintain the stream morphology and structures where fish live and migrate. The *Water Crossing Design Guidelines* cover five types of water-crossing design methods, including no-slope culverts, stream simulation culverts, bridges, temporary culverts or bridges, and hydraulic design fishways, with a guide/key provided for selecting the appropriate design method for various situations.

The *Marine Shoreline Design Guidelines* (Johannessen et al. 2014) provide a framework for site assessment and alternatives analysis to assess and confirm the need for shore protection and identify the technique best-suited to conditions at a given site. These guidelines would be implemented within Shoreline Jurisdiction under the SMP. A draft update of the SMP includes adopting by reference the CAO, with some exclusions. Because of this adopting by reference the CAO into the updated SMP, the CAO regulations must be consistent with the updated SMP and must provide protections for marine FWHCAs and wetlands that are not provided in the updated SMP.

The multi-agency *Stream Habitat Restoration Guidelines* (Cramer 2012) include methods for site, reach and watershed assessment, how to recognize and define the problem, approaches to restore riparian and stream habitat, approaches to solve common restoration objectives and the factors to consider when selecting an approach, and restoration techniques for stream and riparian habitat.

The goal of the *Integrated Streambank Protection Guidelines* (Cramer et al. 2003) is to assist state and local governments, organizations and individuals in addressing streambank erosion through a science-based decision-making process to protect the public and public/private property while avoiding and/or minimizing damage to fish and wildlife habitat. The guidelines include project objectives and associated design criteria, reach and site assessment, habitat considerations and mitigation, risk assessment, selection process and a suite of streambank protection techniques.

National Oceanic and Atmospheric Administration (NOAA) Fisheries provides river restoration effectiveness research products on their science and data website (NOAA Fisheries 2025). One study looked at urban stream restoration trying to link human actions with changing stream health (Booth et al. 2004). The study found that stream biological condition, measured by the benthic index of biological integrity (B-IBI), declined as impervious area increased, but that impervious area alone was not a nuanced enough picture. Backyard land use immediately adjacent to streams and basin-wide stormwater detention and treatment (or lack thereof) had disproportionate impacts on stream health (Booth et al. 2004).

AMC 19.70.230 discusses alterations to wetlands and buffers that, according to AMC 19.70.045, require a permit. For clarity, it is recommended that a reference to AMC 19.70.045 is added to this section.

According to AMC Table 19.70.045 (Permitted Activities), public services, including public roads and trails are permitted within a critical area (i.e., a wetland, stream or other FWHCA) as long as several criteria are met including “Designs for crossings, boardwalks, bridges, and culverts are consistent with Washington Department of Fish and Wildlife and National Marine Fisheries Service best available science for the protection of fish and wildlife habitat.” Additionally, AMC Table 19.70.045 (Permitted Activities) shows that single-family residences and normal appurtenances as well as structures and facilities in the ACFLs are permitted within a critical area (i.e., a wetland, stream, or other FWHCA) as long as several criteria are met including avoidance and minimization necessary to achieve reasonable use of the lot as determined by the decision-maker (for single-family residences). Per AMC Table 19.70.045 “Any and all new uses and development of new facilities within the ACFL must meet the requirements of the conservation easements/deed restrictions of the land, Anacortes comprehensive plan, the ACFL comprehensive plan, this chapter, and AMC Chapter 8.10, Parks and the Anacortes Community Forest Lands.”

4.4 BAS LITERATURE REVIEW: OTHER FWHCA'S

In addition to RMZs, the City of Anacortes has designated other FWHCAs, according to WAC 365-190-030. These other FWHCAs are listed in Section 4.1.3.1 Designation of FWHCAs above. Literature and guidance from Washington State agencies and federal agencies were reviewed for guidance regarding protection and management of FWHCAs. A summary of the literature and guidance review is below.

4.4.1 Critical Saltwater Habitats

According to AMC 19.70.315 critical saltwater habitats include the following: kelp beds, eelgrass beds, spawning and holding areas for forage fish, such as herring, smelt and sand lance; subsistence, commercial and recreational shellfish beds; mudflats, intertidal habitats with vascular plants and areas with which priority species have a primary association. Critical saltwater habitats provide numerous functions and values that can be protected by a vegetated buffer zone adjacent to the OHWM of the saltwater habitat (Desbonnet, A. et al 1994, Brennan et al. 2009, Brennan and Culverwell 2004). Desbonnet et al. (1994) explored the argument that the functional mechanisms that apply to freshwater riparian areas should be analogously applied to marine systems. Vegetated riparian zones provide similar protections to marine areas as they do to streams (BAS review for stream buffers is discussed in Section 4.3.1 above) including nutrient and contaminant removal/sediment control, shading, bank protection/erosion control/soil stability, small and large organic inputs (e.g., leaf litter to large woody debris), adding to the geomorphic complexity of shorelines, a source of insects for salmonids and other fish in the nearshore, and wildlife habitat (Desbonnet et al 1994, Brennan et al. 2009, Brennan and Culverwell 2004). The Anacortes SMP regulates critical saltwater habitats. See Section 4.3.1 of this report for a BAS review of buffer functions

provided by vegetated areas adjacent to aquatic habitats. Depending on function provided the minimum buffer width recommended, based on the FEMAT curve to achieve greater than 80 percent effectiveness, ranged varied from approximately 80 feet to 280 feet (Brennan et al. 2009, Appendix G). Average buffer widths recommended by all the literature reviewed by Brennan et al. (2009) to achieve greater than 80 percent effectiveness, ranged varied from approximately 80 feet to 570 feet (Brennan et al. 2009, Appendix G).

4.4.2 Wildlife Habitat

Section 4.3.1.5 Wildlife Habitat above, discussed the appropriate buffer size for providing habitat functions. The appropriate buffer size for providing habitat functions depends on resident species and their life-history characteristics, condition of the FWHCA and buffer, intensity of surrounding land use, and functions the habitat and/or buffer is providing/can provide.

Many buffer studies in the literature make conclusions on appropriate buffer sizes for wildlife habitat based on how far individuals range from a stream or wetland for breeding or other life-cycle needs. A review of the science by the ELI (2008) found that effective buffer sizes for wildlife protection can range from 33 feet to more than 5,000 feet, depending on the species and Goates (2006) as cited in Brennan et al. (2009) states buffers for wildlife should range from 240 feet to 902 feet. Most studies report a range of 200 to 300 feet necessary to provide essential habitat for most wildlife species (Keller et al. 1993). These buffer sizes can inform the effective width of vegetated wildlife corridors as well as vegetated buffers to protect other FWHCAs that support protected species.

WDFW provides management recommendations for Washington's priority species including documents with management recommendations for multiple species including: invertebrates (Larsen et al. 1995); riparian pollinators (Martin and Azerrad 2023); amphibians and reptiles (Larsen 1997); birds (Larsen et al, 2004); and mammals (WDFW 2010) and documents with management recommendations for single species including: Dungeness Crab (Fisher and Velasquez 2008); Western Bumble Bee (*Bombus occidentalis*) (Martin and Azerrad 2023); Ferruginous Hawk (*Buteo regalis*) (Watson and Azerrad 2024); Great Blue Heron (Azerrad 2012); and Mazama Pocket Gopher (*Thomomys mazama*) (WDFW 2011).

Each wildlife species or wildlife habitat type that is designated as a FWHCA will have specific life history requirements and sensitivities to human activities that must be researched and analyzed and then documented in a critical areas report, including but not limited to recommended buffers, timing restrictions and prohibited actions.

4.4.2.1 BIRDS

The City of Anacortes has several species of birds and associated nesting and concentration habitats that would fall into the recommended buffer widths for birds ranging from 49 to 5,000 feet (ELI 2008 and Fischer 2000).

For protection of **great blue herons**:

- AMC 19.70.335(C)(2), March Point Heronry, requires that:

“Proposed development activities within 1,000 feet, or that are likely to impact the colony, must provide a critical areas assessment report and habitat management plan that follows

at a minimum the guidelines provided by WDFW's Management Recommendations for Washington's Priority Species (March 2012)". and

■ AMC 19.70.335(D)(2)(c) stipulates that for:

"Great Blue Heron Nesting and Breeding Areas. Development near a verified heron breeding habitat including nesting colony areas, former nesting colonies:

i. A year-round urban buffer of 197 feet;

ii. For unusually loud activities that occur during breeding season (February through September) a seasonal buffer of 656 feet, and a blasting buffer of 1,320 feet;

iii. For properties without an existing and approved management plan, a management plan developed by a qualified professional to follow, at a minimum, WDFW's Management Recommendations for Washington's Priority Species (March 2012) and that identifies the nesting and breeding site as well as pre-nesting staging area, and breeding season foraging habitat;

iv. For the March Point colony, given the observed and documented sensitivity of this mega-colony to human intrusion and the fact that the colony is in a rare, isolated, but tight location, a year-round buffer of 984 feet."

■ According to WDFW's PHS List (WDFW 2008):

"Species are often considered a priority only within known limiting habitats (e.g., breeding areas) or within areas that support a relatively high number of individuals (e.g., regular concentrations). These important areas are identified in the PHS List under the heading Priority Area. For example, great blue herons are often found feeding along shorelines, but they are considered a priority only in areas used for breeding."

For protecting all **other Non-RMZ FWHCAs** AMC 19.70.335(D)(2) stipulates that:

"Buffers from fish and wildlife habitat conservation areas must be established to protect the functions and values of the critical area from the impacts of proposed adjacent activities. a. Buffer widths for fish and wildlife habitat areas must be based on consideration of the following factors: species-specific recommendations of the Washington Department of Fish and Wildlife; recommendations contained in a habitat management plan submitted by a qualified professional; and the nature and intensity of land uses and activities occurring on the land adjacent to the site."

In August 2007, bald eagles were removed from the federal endangered species list. In 2011, when the WDFW Commission changed the status of bald eagle from "threatened" to "sensitive," many of the state's special protective measures for bald eagles (bald eagle protection rules, WAC 220-610-100), were eliminated including removing the requirement that landowners develop bald eagle management plans. In 2017, bald eagles were removed from the Washington State endangered species list. Now that the State of Washington no longer requires a bald eagle management plan, the primary responsibility for managing

bald eagles has shifted from the WDFW to the USFWS under the provisions of the federal Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

4.4.2.2 BATS

There are four documented priority bat species in Anacortes including Yuma bat, Big Brown Bat, Little Brown Bat and Townsend's Big-eared bat (WDFW 2025b). WDFW provides management recommendations for Townsend's big-eared bat in their *Management Recommendations for Washington's Priority Species, Volume V: Mammals* (Interim) (WDFW 2010). Hayes and Wiles (2013) recommends conservation measures such as managing old forests; creating large snags; having buffers; and controlling public access. Hayes and Wiles (2013) recommends that areas within 400 meters of roosts should be managed to prevent or eliminate harmful activities that can alter the suitability of the environment for bats; activities such as logging, burning, changes in drainage patterns and air flow can affect roosts. Riparian zones and limiting insecticide use are desirable for retaining insect populations that are important to bats (Hayes and Wiles 2013).

4.4.2.3 INSECTS

Beller's ground beetle (*Agonum belleri*) is a candidate species to be listed and has been identified in Cranberry Lake (WDFW 2025b). WDFW's management recommendations for Beller's ground beetle (Larsen et al. 1995) include preventing activities that might alter the condition of sphagnum bogs where these insects are known to occur. In addition, activities that might have indirect effects such as changing water levels, increasing sediment inflow or using insecticides should be avoided (Larsen et al. 1995).

The western bumble bee (*Bombus occidentalis*) became a Washington State Candidate Species in 2021 in response to recent declines. The species is also under consideration for a federal listing by the USFWS under the ESA. WDFW's management recommendations for Western Bumble Bee (Martin and Azerrad 2023) provide guidance on managing foraging, nesting and overwintering habitat as well as on compensatory mitigation for unavoidable impacts.

4.5 CONCLUSIONS AND RECOMMENDATIONS: FWHCAS

The designation and protection of FWHCAs in the Anacortes CAO (AMC 19.70) is generally in accordance with the Washington Administrative Code, Revised Code of Washington and with BAS. Below are code recommendations to improve consistently with BAS and to improve clarity and understanding of the code for applicants.

4.5.1 Riparian Management Zones - Watercourses and Riparian Areas

4.5.1.1 CONSISTENCY WITH BAS

Required stream buffers in Anacortes are in line with the most recent science and management recommendations for riparian ecosystems (Quinn et al. 2020; Rentz et al. 2020), that provide information and policy recommendations for maintaining riparian functions thought to be important to fish and wildlife and their habitats including stream morphology, large wood and water quality (stream temperature, pollutant removal and nutrient dynamics). As discussed in Section 4.3.1.7 Stream Buffer BAS Summary FEMAT curves convey that four riparian ecosystem functions (root strength, litter fall, coarse wood recruitment and shading) occur within one SPTH and that riparian areas closer to the stream provide more of each function per unit width than areas farther from the stream. Section 4.3.1.7 discusses that a 50-foot riparian buffer is the minimum required to provide a basic level of functions and that a riparian buffer that

is at least 50 percent of the SPTH will provide most of the root strength and litter fall functions and more than 70 percent of the course wood recruitment and shading functions. AMC 19.70.330(A0(1) stipulates that “...The width of the RMZ is the height of the tallest 200-year-old site-potential tree (SPTH200) or 100 feet, whichever is greater, measured horizontally.” Other local jurisdictions have specific mechanisms in their CAOs for riparian areas that allow for buffer reductions or specific development areas within buffers or the RMZ. Anacortes allows for a reduced RMZ for daylighted watercourses (per AMC 19.70.330 (D)(2)(c)) and allows for development in the RMZ if a project meets specific criteria (per AMC 19.70.330 (B)(3)). These criteria point to Table 19.70.040(A), Exempt Activities, or Table 19.70.045, Permitted Alterations.

Part one of Table 19.70.040(A) lists exempt activities (No review required, must strictly meet standards), and whether each specific activity is exempt from review in the Critical Area or in the Critical Area Buffer. Exempt activities include: (1) Emergencies; (2) Yard and garden activities; (3) Site Investigation; and (4) Outdoor Recreation Activities. Part two of Table 19.70.040(A) lists exemptions requiring that a letter of exemption be obtained from the Director prior to construction or initiation of activities. Subject to conditions by the Director to ensure compliance with this chapter. The table lists whether each specific activity is exempt from review in the Critical Area or in the Critical Area Buffer. Exemptions that require a letter of exemption include: (1) Utility Operation, Maintenance, Repair or Replacement; (2) Transportation Infrastructure Operation, Maintenance, Repair or Replacement; (3) Recreation Areas Operation, Maintenance, Repair or Replacement; (4) Vegetation Management; and (5) Clearing, grading and the construction of fences and arbors. The criteria listed in Table 19.70.040(A) require that the activity does not adversely affect the functions and values of the critical area and/or its buffer but requiring that disturbed areas be restored (or mitigated if necessary for emergencies for example) and impacted vegetation be replaced. Yard and garden activities are not an exempt activity inside a critical area (only in the buffer) and if the yard/garden maintenance activity has ceased for 1 year or more, any future yard/garden maintenance activity must be reviewed and conducted in accordance with the full critical areas code. Vegetation Management is permitted inside critical areas and their buffers, including (1) noxious weed management; (2) vegetation management consistent with a previously approved critical area mitigation, restoration, remediation or enhancement plan; and (3) hazard tree removal/trimming with a requirement to replace the tree or vegetation in-kind, with similar or appropriate native species, within 1 year. These provisions are all in line with BAS by protecting the habitat and water quality protection functions and values of critical areas (as discussed in Section 4.3.1).

Similarly, AMC 19.70.045 Permitted alterations, require that an applicant looking to be issued a permit for alteration of a critical area and/or buffer width requirements, must meet specific criteria including those listed under AMC 19.70.045(D): (1) there being special circumstances applicable to the subject property; (2) the issuance of a variance to zoning requirements (setback, height, coverage, etc.) by itself will not provide sufficient relief; (3) mitigation sequencing must be applied per AMC 19.70.125(A); (4) the proposed alteration is supported by BAS; and (5) the proposed alteration allows for development with the least impact. Number 5 above is similar to mitigation sequencing but implies that the applicant must demonstrate that the proposed alteration is the least impactful while allowing for development.

The following are recommended changes to code text to make the code align with the BAS. Underlined text (e.g., text) is recommended to be added, and strikethrough text (e.g., ~~text~~) is recommended to be removed.

- Add a provision to AMC 19.70.330; potentially after AMC 19.70.330(B)(3)(c) requiring that, where not in conflict with stormwater code or geohazards standards, proposed developments shall not divert

surface water flows away from the RMZ and/or away from the watercourse. The reason for this provision is to maintain the quantity of surface water draining from the proposed project area into the RMZ and watercourse.

- We suggest adding the following to AMC 19.70.045(D) and or to AMC 19.70.330(B)(3)(b):
 - Add an additional criterion that the proposed development must be situated as far away from the watercourse as possible. This would make the requirements in closer compliance with BAS discussed in Section 4.3.1.7, which states that the FEMAT curves show that areas closer to the stream provide more of each function per unit width than areas farther from the stream (FEMAT 1993).
- Ecology's Wetlands Guidance for CAO Updates (Ecology 2022) is useful in thinking about isolated stream buffer areas. Similar to the recommendation in Section 3.4 Conclusions and Recommendations: Wetlands for potentially isolated wetland buffer areas, we recommend the following modifications to AMC 19.70.330(C):
 - "Consistent with the definition of "riparian management zone" in this chapter, RMZs are places that potentially provide riparian ecosystem functions. Portions of the RMZ that are ~~functionally isolated and~~ physically separated from a watercourse due to existing, legally established roadways, railroads or other legally established structures or paved areas ~~eight feet or more in width that occur between the area in question and the watercourse may be excluded from the RMZ. that are demonstrated by the applicant in a critical areas report to be physically separated and isolated from providing functions such as habitat, water quality improvement, surface water contributions, bank stability, shade, pollution removal, contributions of detrital nutrients, or recruitment of large woody debris to the stream, may be excluded from the RMZ. If such an area provides any of the five primary RMZ functions (bank stability, shade, pollution removal, contributions of detrital nutrients, or recruitment of large woody debris) it will be retained within the RMZ; if it provides none of these functions it may be excluded. After an RMZ is determined by the decision-maker, based on a submitted critical area report, to be physically separated and functionally isolated, the area is no longer considered an RMZ critical area. Once determined by the Director, based on a submitted critical area report, to be a physically separated and functionally isolated, the portion of the RMZ separated from the watercourse by a developed surface will be excluded from the RMZ and no longer subject to the requirements of the RMZ regulations in this chapter.~~"
 - Of note: AMC 19.70.330(C) goes on to state "If such an area provides any of the five primary RMZ functions (i.e., bank stability, shade, pollution removal, contributions of detrital nutrients or recruitment of large woody debris) it will be retained within the RMZ."
- AMC 19.70.330(D)(1): Recommended text changes: "Development along piped watercourses, and ditches that do not meet the definition of a watercourse ~~are~~ is subject to a 10-foot setback from the centerline of the piped watercourse or ditch and are subject to the recording of a utility easement granted to the city for access and maintenance of the watercourse infrastructure."
- Related to the above comment about piped watercourses: in Table 19.70.040(A) Exempt Activities (under the EXEMPTIONS that require a letter of exemption be obtained from the Director prior to construction or initiation of activities):
 - We suggest the following modifications to the exemption for: "Clearing, grading, and the construction of fences and arbors are allowed within the required 10-foot ~~stream~~ setback for a piped watercourse ~~stream~~ segment if no other critical area or buffer is present."
- Suggested additions to provisions of AMC 19.70.330(E), Riparian Management Zone Enhancement Measures:
 - Riparian functions can be improved by adding/incorporating the following into the buffer:

- Reducing impervious surface and encouraging infiltration of surface water to recharge local groundwater to keep streams flowing during the summer months.
 - Grass filter strips along the edges of buffers, or other low impact development (LID) structures that encourage sheet flow and infiltration.
 - Removing invasive plant species.
 - De-compacting soils and amending top soils with organic matter and retaining leaf litter.
- Suggest adding to enhancement measure 7 of AMC 19.70.330(E), Riparian Management Zone Enhancement Measures, "... including restoring historical sources of hydrology to a watercourse that were removed/diverted in the past."

4.5.1.2 IMPROVE CLARITY AND UNDERSTANDING OF THE CODE FOR APPLICANTS

- **Comment on RMZs as designated FWHCAs:** AMC 19.70.315(A) and AMC 19.70.330(A) lists RMZs as designated FWHCAs and critical areas, not just buffer areas. Per AMC 19.70.330(A)(1) "The RMZ consist of a watercourse and the area adjacent to the watercourse that has the potential to provide full riparian ecosystem functions for bank stability, shade, pollution removal, contributions of detrital nutrients, recruitment of large woody debris, and wildlife habitat." This has repercussions for allowed/permitted activities in critical areas vs buffers in Table 19.70.040(A) and Table 19.70.045, with the following examples:
- Table 19.70.040(A) Exempt Activities, the following are **not** an exempt activity in a Critical Area (i.e., **not** an exempt activity in an RMZ):
- **Yard and garden activities:**
 - Recommendation: Next to the "No" in the Critical Area column add " Except exempt in the RMZ landward of the ordinary high water mark and landward of the top of a stream bank"
 - **Clearing, grading and the construction of fences and arbors:**
 - Recommended wording changes: "are allowed within the required 10-foot ~~stream~~ setback for a piped ~~stream~~ watercourse segment if no other critical area or buffer is present."
- Table 19.70.040(A) Exempt Activities, recommend the following revision under:
- **Vegetation Management, including:** Replace "stream buffer" with "RMZ". Even though the RMZ includes the watercourse/stream channel in this case using RMZ is fine because there is a qualifying criterion that the states "All work performed must occur above the OHWM and above the top of stream bank"
- Table 19.70.045 Permitted Activities, the following are **not** a permitted activity in a Critical Area and therefore are **not** a permitted activity in an RMZ:
- **Buffer Modifications, including:** increased buffer width, buffer averaging and buffer alterations as described specifically in this chapter.
 - Recommendation: Next to the "No" in the Critical Area column add " Except permitted in the RMZ landward of the ordinary high water mark and landward of the top of a stream bank"
 - **Recreational Areas/Facilities.** Low impact activities which are consistent with the purpose and function of the critical area buffer (not to include the ACFL) and do not detract from its integrity may be permitted within the buffer depending on the sensitivity of the critical area.

- Recommendation: Next to the “No” in the Critical Area column add " Except permitted in the RMZ landward of the ordinary high water mark and landward of the top of a stream bank"
- Recommended wording changes to Part 2 of Recreational Areas/Facilities: “b. The trail is located in the outer 50 percent of the RMZ or the outer 25 percent of the wetland or other FWHCA buffer areas and is designed to avoid removal of trees and native vegetation;”
- Recommendation to update the definition of “Riparian management zone” in Chapter 19.70, Definitions, to include the stream channel/watercourse and the adjacent protective riparian area around the stream channel to be consistent with the definition in AMC 19.70.330(A)(1), which includes the stream channel/watercourse and the adjacent protective riparian area. Having the RMZ defined as containing both the watercourse and the adjacent protective riparian area is consistent with the BAS. Additionally, the above recommended changes to the code address the issue of separating the watercourse and protective area around it when necessary.

Because RMZs are based on SPTHs and because SPTHs in Anacortes range from 91 to 231 feet (WDFW 2025f) with a minimum of 100 feet for an RMZ per AMC 19.70.330(A)(1), applicants with lots abutting or adjacent to streams often find that large portions of their parcel or their entire parcel is within the RMZ. These applicants therefore need to apply for permission to conduct a proposed activity within the RMZ following the provisions listed in AMC 19.70.330 and in Table 19.70.040(A), Exempt Activities, or Table 19.70.045, Permitted Activities.

Based on our experience reviewing critical areas reports submitted to the Anacortes Planning Department as part of third-party reviews, the criteria and provisions that must be met are spread throughout the critical areas code and can be difficult to follow. This has been demonstrated by applicants attempting to use buffer reduction and/or averaging methods when the code for RMZs does not list these methods. We recommend that the City of Anacortes consider the following for updates to AMC 19.70.330 (Specific standards for riparian management zones), AMC 19.70.040 (Exempt activities) and AMC 19.70.045 (Permitted alterations) to make it more clear when development is allowed in the RMZ, where is must be located, how the design process must follow mitigation sequencing and what parts of the RMZ must be restored and/or mitigated for.

- The Anacortes CAO defines some areas that are or may be excluded from the RMZ (listed in bullets below). We recommend combining these into one section focusing on areas excluded from the RMZ **or** moving AMC 19.70.330(B)(3) to the definition of the RMZ in AMC 19.70.330(A).
 - AMC 19.70.330(B)(3) states that “Existing improved areas of public or private streets/driveways are excluded from the regulations for the RMZ.”
 - According to AMC 19.70.330(C) (Functionally Separated and Isolated Riparian Management Zones) “Portions of the RMZ that are functionally isolated and physically separated from a watercourse due to existing, legally established public roadways, railroads or other legally established structures or paved areas eight feet or more in width that occur between the area in question and the watercourse may be excluded from the RMZ.”
- We suggest the following modification to AMC 19.70.330(B)(3): Riparian Management Zone. The RMZ is defined in subsection (A)(1) of this section. Existing legally established improved areas of public or private streets/driveways are excluded from the regulations for the RMZ.

- We noted an inconsistency in AMC 19.70.330(B)(3)(b):
 - It states that “On existing developed lots and platted lots existing prior to adoption of Ordinance 4025 that **satisfies one or more of the provisions** within Table 19.70.040(A), Exempt Activities, or Table 19.70.045, Permitted Alterations, if the applicant demonstrates that:” however,
 - Table 19.70.040(A) and Table 19.70.045 list criteria and say that all the criteria must be met to be exempt or allowed, respectively.
 - AMC 19.70.040(F) states “Table 19.70.040(A) describes activities that must **meet the precise description** to be allowed without following a critical area process.”, and
 - AMC 19.70.045(F) states “Table 19.70.045 describes activities that must **meet the precise description** to be allowed following the prescribed critical area process.” And under specific listed activities it states that a given activity is allowed “...provided, that **all of the following are satisfied:**”
- AMC 19.70.330(B)(3)(d) lists mitigation requirements that can be satisfied on site when the RMZ is degraded and the proposed activity will impact the RMZ. There are no other provisions in this section that describe what to do if the RMZ is not degraded and the proposed activity impacts the RMZ. Presumably the requirement would be to do the mitigation off-site.
 - Recommendation for revised text of AMC 19.70.330(B)(3)(d): If the RMZ is degraded due to the lack of trees and vegetation, the presence of invasive or nonnative species, and/or the presence of impervious surface or other development, the applicant shall prepare and carry out a restoration plan on site. The restoration plan shall that restores the ecological function of the RMZ to the extent commensurate with the impact of the development on the RMZ and according to mitigation standards pursuant to AMC 19.70.125, Mitigation requirements, and AMC 19.70.130, Mitigation plan requirements.
 - Recommendation: Add a provision following AMC 19.70.330(B)(3)(d) that states that “Off-site mitigation is allowed within the same drainage basin, to the extent necessary, as determined by the critical areas report. Off-site mitigation may be necessary when the quality of the RMZ on the development site is so high that functions cannot be lifted/enhanced to fully compensate for the impact of the proposed development on the RMZ.”
- AMC 19.70.330(B)(3)(e) states that “If the development is authorized pursuant to AMC 19.49.040, Nonconforming uses and structures, or Table 19.70.040(A), Exemptions, or Table 19.70.045, Permitted Alterations, the Director must require that the degraded portion of the RMZ be restored ...” It is not clear what is meant by “the degraded portion of the RMZ” in this provision. Does it refer to the portion of the RMZ that is temporarily impacted from the proposed activity OR does it refer to the portion of the RMZ that in its existing condition provides a low level of functions. If the latter, then in a situation where the RMZ covers the entire parcel (or a large portion of parcel) and the RMZ is in a degraded condition, the project proponent will need to restore areas around the house as well as the area close to the stream. This interpretation would indicate that restoration would be required that may provide more compensation than just replaced lost RMZ functions, unless there are other sections of code that allow for lawns as part of residential “reasonable use”.
 - Recommendation for revised text of AMC 19.70.330(B)(3)(e): “If the development is authorized pursuant to AMC 19.49.040, Nonconforming uses and structures, or Table 19.70.040(A), Exemptions, or Table 19.70.045, Permitted Alterations, the Director must require that ~~the a~~ degraded portion of the RMZ be restored, to the extent commensurate with the impact of the development on the RMZ, by removing existing nonnative and invasive plant species, and replanting with native trees and vegetation, and providing a five-year monitoring and maintenance

plan consistent with the requirements of AMC 19.70.130, Mitigation plan requirements, based on a critical area restoration plan.”

4.5.2 Other FWHCAs

Based on our review and research, we recommend the following revisions to the FWHCA code:

- For AMC 19.70.315(A) add:
 - Species and Critical Habitats listed as threatened or endangered under the federal Endangered Species Act (ESA) according to the National Marine Fisheries Service and United State Fish and Wildlife Service (USFWS)
- For AMC 19.70.315(A)(8) add the following priority habitats (WDFW 2025b):
 - Forage fish spawning areas
 - Cliffs and bluffs
- For AMC 19.70.630(B)(1): replace “primary constituent elements” with “essential physical or biological features of critical habitat”, this is the new term used by the NMFS and USFWS.
- Bald Eagles: AMC 19.70.335(D)(2)(b): the language in this section is from the Washington State Bald Eagle Protection Rules (WAC 232-12-292), which was updated to WAC 220-610-100. These rules are only applicable and enforceable when the bald eagle is listed under state law as threatened or endangered. In 2016, WDFW recommended that bald eagles no longer needed to be designated as a Sensitive species in Washington due to population recovery, and the species was removed from Washington's list of threatened and endangered species. Bald eagles are now protected by the U.S. Fish and Wildlife Service (USFWS) under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.
 - Recommendation for AMC 19.70.335(D)(2)(b): remove the text from this section and replace with the following text: “Project proponents need to consider how their project may affect nearby nesting bald eagles, and how to avoid and minimize impacts. The U.S. Fish and Wildlife Service has developed the National Bald Eagle Management Guidelines to help understand how bald eagles may react to various human activities and to reduce and minimize project impacts. The USFWS issues permits for eagle incidental take and eagle nest take under the Bald and Golden Eagle Protection Act including a system of general permits in addition to the specific-permit situations (USFWS 2025). Activities within 660 feet of a bald eagle nest, or within half a mile for loud activities such as explosions, have the potential to bother bald eagles to the degree that causes nest abandonment and a permit from the USFWS may be required. For proposed projects meeting the above distance from bald eagle nest and noise thresholds, approval of the activity from the Director must not occur until the project proponent provides documentation of consultation with the USFWS and provides a copy of the eagle permit, if one was required. In addition, if bald eagles are listed as threatened or endangered by the State of Washington before this ordinance is updated, the proponent must provide evidence of compliance with the Washington State Bald Eagle Protection Rules (WAC 220-610-100, or as otherwise updated).
- **Definitions:**
 - “Significant tree” replace “at five feet above grade” with “at four and a half feet above grade”. This is consistent with the definition of diameter at breast height (DBH) and where surveyors will measure tree diameters.

5.0 Limitations

We have prepared this report for use by the City of Anacortes in revising the existing City of Anacortes Critical Areas Regulations. Our interpretations and recommendations are based on our review of select scientific maps and literature, information provided by the Department of Commerce, and our technical and regulatory experience. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

6.0 References

73 FR 19594. 33 CFR Parts 325 and 332. Compensatory Mitigation for Losses of Aquatic Resources. Federal Register, Vol. 73, No. 70. April 10, 2008.

Adams, N.T., and Sullivan, K. 1989. The physics of forest stream heating: a simple model. Timber Fish and Wildlife, TFW-WQ3-90-007, pp. 2-39.

Adamus, P.R. 2007. Best Available Science for Wetlands of Island County, Washington: Review of Published Literature. A Report Prepared in Response to Critical Areas Ordinance Updating Requirements for

Anacortes Municipal Code (AMC). 2025. Available at: <https://anacortes.municipal.codes/>

Azerrad, J. M. 2012. Management recommendations for Washington's priority species: Great Blue Heron. Washington Department of Fish and Wildlife, Olympia, Washington. <https://wdfw.wa.gov/publications/01371>

Barnard, R. J., J. Johnson, P. Brooks, K. M. Bates, B. Heiner, J. P. Klavas, D.C. Ponder, P.D. Smith, and P. D. Powers .2013. Water Crossings Design Guidelines, Washington Department of Fish and Wildlife, Olympia, Washington. Available online at: <https://wdfw.wa.gov/publications/01501>

Barr Engineering Company (Barr). 2005. Detailed Assessment of Phosphorus Sources to the Ramsey-Washington Metro Watershed District. Prepared for the Ramsey-Washington Metro Watershed District.

Bellingham Municipal Code. 2025. Available at: <https://bellingham.municipal.codes/BMC>

Beschta, R.L., R.E. Bilby, G.W. Brown, L.B Holtby, T.D. Hofstra. 1987. Stream temperature and aquatic habitat. In: Salo, E.O., and T.W. Cundy, editors. Streamside Management: Forestry and Fishery Interactions. University of Washington, Institute of Forest Resources. Contribution No. 57, pp. 191-232.

Bilby, R.E., and J.W. Ward. 1989. Changes in characteristics and function of woody debris with increasing size of streams in western Washington. Transactions of the American Fisheries Society 118:368-378.

- Bilby, R.E., and J.W. Ward. 1991. Characteristics and function of large woody debris in streams draining old-growth, clear-cut, and second-growth forests in southwestern Washington. *Canadian Journal of Fisheries and Aquatic Sciences* 48:2499-2508.
- Bolton, S. and J. Shellberg. 2001. White Paper: Ecological Issues in Floodplains and Riparian Corridors. Washington Department of Fish and Wildlife, pp. 88.
- Booth, D.B., J.R. Karr, S. Schauman, C.P. Konrad, S.A. Morley, M.G. Larson, and S.J. Burges. 2004. Reviving urban streams: land use, hydrology, biology, and human behavior. *Journal of the American Water Resources Association* 40:1351-1364. Available online at: <https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1752-1688.2004.tb01591.x>
- Brennan, J.S., and H. Culverwell. 2004. Marine Riparian: An Assessment of Riparian Functions in Marine Ecosystems. Published by Washington Sea Grant Program Copyright 2005, UW Board of Regents Seattle, WA. 34 p. Available at: <https://wsg.washington.edu/wordpress/wp-content/uploads/Marine-Riparian-Function-Assessment.pdf>
- Brennan, Jim, Hilary Culverwell, Rachel Gregg, Pete Granger, P.I. 2009. Protection of Marine Riparian Functions in Puget Sound, Washington. Prepared for Washington Department of Fish and Wildlife (WDFW Agreement 08-1185). Prepared by Washington Sea Grant. June 15, 2009. <https://wdfw.wa.gov/sites/default/files/publications/00693/wdfw00693.pdf>
- Brown, G.W. and J.T. Krygier. 1970. Effects of clear-cutting on stream temperature. *Water Res. Research*. 6(4): 1133-1139.
- Burlington Municipal Code. 2025. Available at: <https://burlingtonwa.gov/153/Municipal-Code>
- Burns, D.A. 1998. "Retention of NO-3 in an upland stream environment: A mass balance approach," in *Biogeochemistry*, 40(1), pp. 73-96, January 1998.
- Castelle, A. C. Conolly, M. Emers, E.D. Metz, S. Meyer, M. Witter, S. Mauermann, T. Erickson, and S.S. Cooke. 1992. Wetland buffers: use and effectiveness. Adolfson Associates, Inc., Shorelands and Coastal Zone Management Program, Washington State Department of Ecology, Olympia, WA. Publication #92-10.
- City of Anacortes. 2010. Shoreline designation map. Available at: <https://www.anacorteswa.gov/DocumentCenter/View/865/Shoreline-Designation-Map-PDF>
- City of Anacortes Critical Areas Ordinance (CAO). 2022. Critical Areas Planning, Adopted Critical Areas Regulations. Dated July 26, 2021, amended March 28, 2022 and October 17, 2022. Available at: <https://www.anacorteswa.gov/201/Critical-Areas-Planning>
- City of Anacortes GIS. 2025. Available at: <https://www.arcgis.com/apps/webappviewer/index.html?id=f36b7220998446848771d534f73a7126&extent=-13660969.8854%2C6185886.88%2C-13643074.0662%2C6194380.9448%2C102100>
- Cooke, S.S. 1992. Wetland Buffers: Use and Effectiveness. Appendix A: Wetland buffers - A Field Evaluation of Buffer Effectiveness in Puget Sound. Washington Department of Ecology. Publication No. 92-10.

- Correll, D.L. 1997. Buffer Zones and Water Quality Protection: General Principles. In: Buffer Zones: Their Processes and Potential in Water Protection. The Proceedings of the International Conference on Buffer Zones September 1996. Haycock, N.E., T.P. Burt, K.W.T. Goulding, and G. Pinay (Eds). Quest Environmental. UK.
- Coyne, M. S., R. A. Gilfillen, R. W. Rhodes and R. L., Blevins. 1995. Soil and Fecal Coliform Trapping by Grass Filter Strips During Simulated Rain. *Journal of Soil and Water Conservation* 50(4): 405-408.
- Cramer, Michelle L. (managing editor). 2012. Stream Habitat Restoration Guidelines. Co-published by the Washington Departments of Fish and Wildlife, Natural Resources, Transportation and Ecology, Washington State Recreation and Conservation Office, Puget Sound Partnership, and the U.S. Fish and Wildlife Service. Olympia, Washington. Available online at: <https://wdfw.wa.gov/publications/01374>
- Cramer, M., Bates, K., Miller, D., Boyd, K., Fotherby, L., Skidmore, P., and Hoitsma, T. 2003. Integrated Streambank Protection Guidelines, Washington Department of Fish and Wildlife, Olympia, Washington. Available online at: <https://wdfw.wa.gov/sites/default/files/publications/00046/wdfw00046.pdf>
- Cristea, N. and J. Janisch. 2007. Modeling the Effects of Riparian Buffer Width on Effective Shade and Stream Temperature. Washington State Department of Ecology Publication No. 07-03-028. Olympia, Washington. June 2007.
- Desbonnet, A., P. Pogue. V., Lee and N. Wolff. 1994. Vegetated Buffers in the Coastal Zone - A Summary Review and Bibliography. Coastal Resources Center Technical Report No. 2064. University of Rhode Island Graduate School of Oceanography. Narragansett. RI 02882. 72 pp. <https://repository.library.noaa.gov/view/noaa/40622>
- Dillaha, T. A., J. H. Sherrard, D. Lee, S. Mostaghimi, and V.O. Shanholtz. 1988. Evaluation of Vegetative Filter Strips as a Best Management Practice for Feed Lots. *Journal of the Water Pollution Control Federation* 60(7):1231-1238.
- Dillaha, T.A., R.B. Reneau, S. Mostaghimi, and D. Lee. 1989. Vegetative Filter Strips for Agricultural Nonpoint Source Pollution Control. *Transactions of the ASAE* 32:513-519.
- Dongqing Zhang, Richard M. Gersberg, Wun Jern Ng, Soon Keat Tan. 2014. Removal of pharmaceuticals and personal care products in aquatic plant-based systems: A review, *Environmental Pollution*, Volume 184, 2014, Pages 620-639, ISSN 0269-7491, Available at: <https://doi.org/10.1016/j.envpol.2013.09.009>.
- Dudley, S., J.C. Fischenich, and S. R. Abt. 1998. Effect of woody debris entrapment on flow resistance. *J. Amer. Water Res. Assoc.* 34(5): 1189-1197.
- Emmons & Olivier Resources. 2001. Benefits of Wetland Buffers: A Study of Functions, Values and Size. Prepared for: Minnehaha Creek Watershed District, Deephaven, MN.

- Environmental Law Institute (ELI). 2008. Planner's Guide to Wetland Buffers for Local Governments. 2008. Environmental Law Institute®, March 2008. Washington, D.C.
- Fischer, R. A. 2000. Width of riparian zones for birds. Ecosystem Management and Restoration Research Program Technical Notes Collection, U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi. www.wes.army.mil/el/emrrp.
- Fisher, Wendy and Velasquez, Donald. 2008. Washington Department of Fish and Wildlife, Olympia. December 2008. <https://wdfw.wa.gov/publications/00028>
- Forest Ecosystem Management Assessment Team (FEMAT). 1993. Forest Ecosystem Management: an ecological, economic and social assessment. Report of the Forest Ecosystem Management Assessment Team. 1993-793-071. U.S. Govt. Printing Office.
- Gallagher, J.L. and H.V. Kibbey. 1980. Marsh Plants as Vectors in Trace Metal Transport in Oregon Tidal Marshes. American Journal of Botany 67:1069-1074.
- GeoEngineers Inc. (GeoEngineers). 2022. Revised Stream Buffer Best Available Science Review and Buffer Recommendations. Prepared for the City of Anacortes, Planning, Community & Economic Development Department. June 29, 2022. GEI File No 0382-030-04.
- Goates, M.C. 2006. The Dogma of the 30 Meter Riparian Buffer: The Case of the Boreal Toad (*Bufo boreas boreas*). M.S. Thesis, Brigham Young University, Provo, Utah. <https://wdfw.wa.gov/sites/default/files/publications/00693/wdfw00693.pdf>
- Granger, T., Hruby, T., McMillan, A., Peters, D., Rubey, J., Sheldon, D., Stanley, S., & Stockdale, E. 2005. Wetlands in Washington State - Volume 2: Guidance for Protecting and Managing Wetlands (Final). Ecology Publication No. 05-06-008. Washington State Department of Ecology. Available at: [Wetlands in Washington State - Volume 2: Guidance for Protecting and Managing Wetlands](#)
- Gregory, S.V., F.J. Swanson, W.A. McKee, and K.W. Cummins. 1991. An ecosystem perspective of riparian zones: focus on links between land and water. BioScience 41(8): 540-551.
- Groffman, P.M., Gold, A.J., and Simmons, R.C. 1992. Nitrate Dynamics in Riparian Forests: Microbial Studies, in Journal of Environmental Quality, 21(4), October 1992, pp. 666-671.
- Hamilton, B., Coops, N. C., Lokman, K. 2021. Time series monitoring of impervious surfaces and runoff impacts in Metro Vancouver. Science of The Total Environment, 760, 143873. <https://doi.org/10.1016/j.scitotenv.2020.143873>
- Hattermann, F., Krysanova, V., & Hesse, C. 2008. Modelling wetland processes in regional applications. Hydrological Sciences Journal, 53(5), 1001-1012. Available at: <https://doi.org/10.1623/hysj.53.5.1001>
- Hayes, G. and G.J Wiles. 2013. Washington Bat Conservation Plan. Washington Department of Fish and Wildlife, Olympia, Washington. 138+viii pp. <https://wdfw.wa.gov/sites/default/files/publications/01504/wdfw01504.pdf>

- Herson-Jones, L. M., M. Heraty and B. Jordan. 1995. Riparian Buffer Strategies for Urban Watersheds. Washington, DC: Metropolitan Washington Council of Governments.
- Hill, A.R. 1996. Nitrate Removal in Stream Riparian Zones, in *Journal of Environmental Quality*, 25(4) pp. July 1996, 743-755.
- Houlahan, J.E. and C.S. Findlay. 2003. The Effects of Adjacent Land Use on Wetland Amphibian Species Richness and Community Composition. *Canadian Journal of Fisheries and Aquatic Sciences* 60:1078-1094.
- Howard-Williams, C. 1985. Cycling and retention of nitrogen and phosphorus in wetlands: a theoretical and applied perspective, in *Freshwater Biology*. 15 (4), August 1985, pp. 391–431.
- Hruby, T. 2012. Calculating Credits and Debits for Compensatory Mitigation in Wetlands of Western Washington. Final Report, March 2012. Washington state Department of Ecology Publication #10-06-11.
- Hruby, T. 2013. Update on Wetland Buffers: The State of Science, Final Report, October 2013. Washington State Department of Ecology Publication #13-06-11.
- Hruby, T. and Yahnke, A. 2023. Washington State Wetland Rating System for Western Washington: 2014 Update (Version 2). (Publication #23-06-009). Olympia, WA: Washington Department of Ecology.
- Jiang, K., Li, Z., Luo, C., Wu, M., Chao L., Zhou Q., and Zhao H. 2019. The reduction effects of riparian reforestation on runoff and nutrient export based on AnnAGNPS model in a small typical watershed, China. *Environ Sci Pollut Res* 26, 5934–5943 (2019). Available at: <https://doi.org/10.1007/s11356-018-4030-7>
- Johannessen, J., A. MacLennan, A. Blue, J. Waggoner, S. Williams, W. Gerstel, R. Barnard, R. Carman, and H. Shipman. 2014. Marine Shoreline Design Guidelines. Washington Department of Fish and Wildlife, Olympia, Washington. Available online at: <https://wdfw.wa.gov/publications/01583>
- Johnson, S.L. 2004. Factors influencing stream temperatures in small streams: substrate effects and a shading experiment. *Can. J. Fish. Aquat. Sci./J. Can. Sci. Halieut. Aquat.* 61(6): 913-923.
- Keller, C.M.E., C.S. Robbins, and J.S. Hatfield. 1993. Avian communities in riparian forests of different widths in Maryland and Delaware. *Wetlands* 13(2): 137-144.
- King County Code (KCC). 2025. Available at: <https://kingcounty.gov/en/dept/council/governance-leadership/county-legislation-codes/king-county-code>
- Kondolf, G.M.; R. Kattelmann, M. Embury, D.C. Erman. 1996. Status of riparian. In: Sierra Nevada Ecosystem Project: Final report to Congress, vol. II, Assessments and scientific basis for management options. Wildland Resources Center Report no. 37. Davis, CA: University of California, Centers for Water and Wildland Resources; 1009-1030.
- Knutson, K. L. and V. L. Naef. 1997. Management Recommendations for Washington's Priority Habitats – Riparian. Washington Department of Fish and Wildlife, Olympia, WA. 181p.

- Kuusemets, V. and U. Mander. 1999. Ecotechnological Measures to Control Nutrient Losses from Catchments. *Water Science and Technology* 40(10): 195-202.
- Larsen, E. M., editor. 1997. Management recommendations for Washington's priority species, Volume III: Amphibians and Reptiles. Wash. Dept. Fish and Wildlife, Olympia. 122pp. <https://wdfw.wa.gov/publications/00025>
- Larsen, E., Azerrad, J.M., Nordstrom, N. editors. 2004. Management recommendations for Washington's priority species, Volume IV: Birds. Washington Department of Fish and Wildlife, Olympia, Washington, USA. <https://wdfw.wa.gov/publications/00026>
- Larsen, E.M., E. Rodrick, and R. Milner, eds. 1995. Management recommendations for Washington's priority species, Volume I: invertebrates. Washington Department of Fish and Wildlife, Olympia. 82pp. <https://wdfw.wa.gov/publications/00024>
- Leibowitz, S. G., Hill, R. A., Creed, I. F., Compton, J. E., Golden, H. E., Weber, M. H., Rains, M. C., Jones, Jr., C. E., Lee, E. H., Christensen, J. R., Bellmore, R. A., & Lane, C. R. 2023. National hydrologic connectivity classification links wetlands with stream water quality. *Nature Water*, 1, 370-380. <https://doi.org/10.1038/s44221-023-00057-w>
- Lowrance, R. and J.M. Sheridan. 2005. Surface Runoff Water Quality in a Managed Three Zone Riparian Buffer. *Journal of Environmental Quality* 34:1851-1859.
- Magette, W. L., R. B. Brinsfield, R. E. Palmer and J. D. Wood. 1989. Nutrient and Sediment Removal by Vegetated Filter Strips. *Transactions of the ASAE* 32(2): 663-667.
- Martin, M. F., and J. M. Azerrad. 2023a. Management Recommendations for Washington's Priority Habitats and Species: Riparian Pollinators. Washington Department of Fish and Wildlife, Olympia, Washington. <https://wdfw.wa.gov/publications/02451>
- Martin, M. F., and J. M. Azerrad. 2023b. Management recommendations for Washington's priority species: Western Bumble Bee. Washington Department of Fish and Wildlife, Olympia, Washington. <https://wdfw.wa.gov/publications/02441>
- Matthews, R.A., M. Hilles, J. Vandersypen, R.J. Mitchell, and G.B. Matthews. 2007. Lake Whatcom Monitoring Project 2005/2006 Draft Final Report. Western Washington University, Bellingham, Washington.
- May, C.W., R.R. Horner, J.R. Karr, B.W. Marr, and E.B. Welch. 1997. Effects of urbanization on small streams in the Puget Sound Lowland Ecoregion. *Watershed Protection Techniques* 2(4): 483-494.
- Mayer, P.M., S.K. Reynolds Jr., and T.J. Canfield. 2005. Riparian Buffer Width, Vegetative Cover, and Nitrogen Removal Effectiveness: A Review of Current Science and Regulations. EPA/600/R-05/118. Cincinnati, OH, U.S. Environmental Protection Agency.
- McMillan, A. 2000. The science of wetland buffers and its implications for the management of wetlands. M.S. Thesis, Evergreen State College, p. 102.

- Mitchell, M. E., Newcomer-Johnson, T., Christensen, J., Crumpton, W., Richmond, S., Dyson, B., Canfield, T. J., Helmers, M., Lemke, D., Lechtenberg, M., Green, D., & Forshay, K. J. 2022. Potential of water quality wetlands to mitigate habitat losses from agricultural drainage modernization. *Science of The Total Environment*, 838(Part 4), 156358. <https://doi.org/10.1016/j.scitotenv.2022.156358>
- Mohseni, O. and H.G. Stefan. 1999. Stream temperature/air temperature relationship: a physical interpretation. *Journal of Hydrology* 218: 128-141.
- Montgomery, D.R., J.M. Buffington, R.D. Smith, K.M. Schmidt, and G. Pess. 1995. Pool spacing in forest channels. *Water Resources Research* 31:1097-1105.
- Mount Vernon Municipal Code (MVMC). 2025. Available at <https://www.codepublishing.com/WA/MountVernon/>
- Naiman, R.J., and H. Décamps. 1997. The ecology of interfaces: riparian zones. *Annual Review of Ecology and Systematics* 28: 621-658.
- Naiman, R.J., and R.E. Bilby, editors. 1998. *River ecology and management: lessons from the Pacific Coastal Ecoregion*. Springer-Verlag, New York.
- National Oceanic and Atmospheric Administration (NOAA) Fisheries. 2025. Restoration Effectiveness Research Products. Available at: <https://www.fisheries.noaa.gov/west-coast/science-data/restoration-effectiveness-research-products#river-restoration-effectiveness>
- National Research Council (NRC). 2002. *Riparian areas: functions and strategies for management*. National Academy Press. Washington, D.C.
- Northwest Indian Fisheries Commission (NWIFC). 2022. Statewide Washington Integrated Fish Distribution Mapper. Available at: <https://geo.nwifc.org/swifd/>
- Office of the Governor of Washington. 1989. Executive Order No. 89-10. Available at: https://governor.wa.gov/sites/default/files/exe_order/eo_89-10.pdf
- Office of the Governor of Washington. 1990. Executive Order No. 90-04. [Rescinded by Executive Order No. 15-04, Jay Inslee]. Available at: https://governor.wa.gov/sites/default/files/exe_order/eo_90-04.pdf
- Parkyn, S. 2004. Review of Riparian Buffer Zone Effectiveness. MAF Technical Paper No. 2004/05. New Zealand Ministry of Agriculture and Forestry. Wellington, New Zealand. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.74.742&rep=rep1&type=pdf>
- Parkyn, S., W. Shaw, and P. Eades. 2000. Review of Information on Riparian Buffer Widths Necessary to Support Sustainable Vegetation

- Pei Wang, Meng Zhang, Yonglong Lu, Jing Meng, Qifeng Li, Xiaotian Lu. 2019. Removal of perfluoroalkyl acids (PFAAs) through fluorochemical industrial and domestic wastewater treatment plants and bioaccumulation in aquatic plants in river and artificial wetland, *Environment International*, Volume 129, 2019, Pages 76-85, ISSN 0160-4120, Available at: <https://doi.org/10.1016/j.envint.2019.04.072>.
- Philippe, G., Vidon, F., Hill, A.R. 2004. Landscape controls on nitrate removal in stream riparian zones, in *Water Resources Research*, 40 (3), March 2004.
- Pitt, R., R. Bannerman, S. Clark, and D. Williamson. 2005. Sources of pollutants in urban area (Part 2) – Recent sheetflow monitoring. Chapter 24 IN: *Effective Modeling of Urban Water Systems*, Monograph 13. William James, Kim Irvine, Edward McBean, and Robert Pitt, eds. Published by CHI, Guelph, Ontario.
- Quinn, T., G.F. Wilhere, and K.L. Krueger, technical editors. 2020. *Riparian Ecosystems, Volume 1: Science Synthesis and Management Implications*. Habitat Program, Washington Department of Fish and Wildlife, Olympia.
- Rentz, R., A. Windrope, K. Folkerts, and J. Azerrad. 2020. *Riparian Ecosystems, Volume 2: Management Recommendations*. Habitat Program, Washington Department of Fish and Wildlife, Olympia.
- Revised Code of Washington (RCW). 2025. Available at: <https://app.leg.wa.gov/rcw/>
- Rubbo, M.J. and J.M. Kiesecker. 2005. Amphibian Breeding Distribution in an Urbanized Landscape. *Conservation Biology* 19:504-511.
- Schoonover J.E., K.W. J. Williard, J.J. Zaczek, J.C. Mangun and A.D. Carver. 2006. Agricultural Sediment Reduction by Giant Cane and Forest Riparian Buffers. *Water, Air, and Soil Pollution* 169: 303–315.
- Seattle Municipal Code (SMC). Available at: https://library.municode.com/wa/seattle/codes/municipal_code
- Semlitsch R.D. and J.R. Bodie. 2003. Biological Criteria for Buffer Zones around Wetlands and Riparian Habitats for Amphibians and Reptiles. *Conservation Biology* 17(5): 1219-1228.
- Sheldon, D., T. Hruby, P. Johnson, K. Harper, A. McMillan, S. Stanley, and E. Stockdale. 2005. *Freshwater Wetlands in Washington State - Vol. 1: A Synthesis of the Science*. Washington Department of Ecology, Olympia.
- Shirley, S.M. 2004. The Influence of Habitat Diversity and Structure on Bird Use of Riparian Buffer Strips in Coastal Forests of British Columbia, Canada. *Canadian Journal of Forest Research* 34:1499-1510.
- Spence, B.C., G.A. Lomnický, R.M. Hughes and R. P. Novitzki. 1996. *An Ecosystem Approach to Salmonid Conservation*. Funded jointly by the U.S. EPA, U.S. Fish and Wildlife Service and National Marine Fisheries Service. TR-4501-96-6057. Man Tech Environmental Research Services Corp., Corvallis, Oregon. <http://www.nwr.noaa.gov/1habcon/habweb/ManTech/front.htm#TOC>

- Syversen, N. 2005. Effect and Design of Buffer Zones in the Nordic Climate: The Influence of Width, Amount of Surface Runoff, Seasonal Variation and Vegetation Type on Retention Efficiency for Nutrient and Particle Runoff. *Ecological Engineering* 24:483-490.
- United States Fish and Wildlife Service (USFWS). 2022. Wetlands Mapper. Available at: <http://www.fws.gov/wetlands/Data/mapper.html>.
- United States Fish and Wildlife Service (USFWS). 2025. U.S Fish and Wildlife Service, Do I need an eagle take permit? Available at: <https://www.fws.gov/story/do-i-need-eagle-take-permit>
- Vidon, P.G.F., and A.R. Hill. 2004. Landscape Controls on Nitrate Removal in Stream Riparian Zones. *Water Resources Research* 40: W03201.
- Waschbusch, R.J., W.R. Selbig, and R.T. Bannerman. 1999. Sources of Phosphorus in Stormwater and Street Dirt from Two Urban Residential Basins in Madison, Wisconsin. U.S. Geological Survey. Middleton, Wisconsin.
- Washington Administrative Code (WAC). 1984. WAC 197-11-768. Mitigation. Available at: <https://app.leg.wa.gov/wac/default.aspx?cite=197-11-768>.
- Washington Administrative Code (WAC). 2025. Available at: <https://app.leg.wa.gov/wac/default.aspx>
- Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 291pp. Available at: <https://wdfw.wa.gov/publications/00165>
- Washington Department of Fish and Wildlife (WDFW). 2010. Management Recommendations for Washington's Priority Species – Volume V: Mammals (Interim) Washington Department of Fish and Wildlife, Olympia, Washington, USA. <https://wdfw.wa.gov/sites/default/files/publications/00027/wdfw00027.pdf>
- Washington Department of Fish and Wildlife (WDFW). 2011. Priority Habitats and Species Management Recommendations: Mazama Pocket Gopher. Revised 2016. Washington Department of Fish and Wildlife, Olympia, Washington. <https://wdfw.wa.gov/publications/01175>
- Washington Department of Fish and Wildlife (WDFW). 2025a. Washington State Fish Passage Map. Available at: <https://geodataservices.wdfw.wa.gov/hp/fishpassage/index.html>.
- Washington Department of Fish and Wildlife (WDFW), 2025b. Priority Habitats and Species (PHS) on the Web. Available at: <https://geodataservices.wdfw.wa.gov/hp/phs/>
- Washington Department of Fish and Wildlife (WDFW). 2025c. Forage Fish Spawning Map. Available at <https://www.arcgis.com/home/webmap/templates/OnePane/basicviewer/embed.html?webmap=19b8f74e2d41470cbd80b1af8dedd6b3&gcsextent=-126.1368,45.6684,-119.6494,49.0781&displayslider=true&displayscalebar=true&displaylegend=true&displaydetails=true&displaysearch=true&searchextent=true>.

Washington Department of Fish and Wildlife (WDFW). 2025d. Fishing & Shellfishing, Places to go Fishing, Lowland Lakes, Whistle Lake. Available at <https://wdfw.wa.gov/fishing/locations/lowland-lakes/whistle-lake#prospects>

Washington Department of Fish and Wildlife (WDFW). 2025e. Fishing & Shellfishing, Places to go Fishing, Lowland Lakes, Heart Lake. Available at <https://wdfw.wa.gov/places-to-go/wildlife-areas>

Washington Department of Fish and Wildlife (WDFW). 2025f. Site-potential Tree Height (SPTH) and Riparian Management Zone (RMZ) Values Online Map Tool. Available at: <https://wdfw.maps.arcgis.com/apps/MapJournal/index.html?appid=35b39e40a2af447b9556ef1314a5622d>

Washington Department of Fish and Wildlife (WDFW). 2025g. Places to go, Wildlife areas. Available at: <https://wdfw.wa.gov/places-to-go/wildlife-areas>

Washington State Department of Commerce. 2023. Critical Areas Handbook: A Handbook for Reviewing Critical Areas Regulations available online at <https://deptofcommerce.box.com/s/rlysirfvrpxwnm9jvbc3lc7ji19ntp>

Washington State Department of Ecology (Ecology). 1977-80. Coastal zone atlas of Washington. 12 volumes. Washington Department of Ecology, Olympia.

Washington State Department of Ecology (Ecology). 2006. U.S. Army Corps of Engineers Seattle District, and US Environmental Protection Agency Region 10. March 2006. Wetland Mitigation in Washington State – Part 2: Developing Mitigation Plans (Version 1). Washington State Department of Ecology Publication #06-06-011b. Olympia, Washington.

Washington State Department of Ecology (Ecology). 2021. U.S. Army Corps of Engineers Seattle District, and U.S. Environmental Protection Agency Region 10. Wetland Mitigation in Washington State – Part 1: Agency Policies and Guidance (Version 2). Washington State Department of Ecology Publication #21-06-003. Olympia, Washington.

Washington State Department of Ecology (Ecology). 2022. Wetland Guidance for Critical Areas Ordinance (CAO) Updates, Western and Eastern Washington. October 2022, Publication #22-06-014.

Washington State Department of Ecology (Ecology). 2024. Stormwater Management Manual for Western Washington. July 2024; Publication # 24-10-013.

Washington State Department of Ecology (Ecology). 2025. Coastal Atlas – Map. Available at <https://apps.ecology.wa.gov/coastalatlasmap>.

Washington State Department of Health (DOH). 2025. Shellfish Safety Information. Available at: <https://fortress.wa.gov/doh/biotoxin/biotoxin.html>

Washington State Department of Natural Resources (DNR). 2022. Forest Practices Application Mapping Tool (FPAMT). Available at: <https://fpamt.dnr.wa.gov/default.aspx>

Washington State Department of Natural Resources (DNR). 2023. Washington's Natural Areas. May 2023. Available at: https://dnr.wa.gov/sites/default/files/2025-03/amp_na_natural_areas_map.pdf

Washington State Department of Natural Resources (DNR). 2025a. Puget Sound Seagrass Monitoring mapper. Available at <https://wadnr.maps.arcgis.com/apps/webappviewer/index.html?id=83b8389234454abc8725827b49272a31>.

Washington State Department of Natural Resources (DNR). 2025b. Washington Natural Heritage Program. Available at: https://experience.arcgis.com/experience/174566100f2a47bebe56db3f0f78b5d9/page/Rare-Plant-and-Ecosystem-Locations?views=P%26E-View--Legend#data_s=id%3AdataSource_1-1860f1593ba-layer-47%3A4599

Washington State Legislature. 1990. Growth Management Act of 1990, Revised Code of Washington (RCW) 36.70A. Available at: <https://app.leg.wa.gov/rcw/default.aspx?cite=36.70A&full=true>

Watson, J. W., and J. M. Azerrad. 2024. Management Recommendations for Washington's Priority Species: Ferruginous Hawk. Washington Department of Fish and Wildlife, Olympia, Washington. <https://wdfw.wa.gov/publications/02511>

Welsch, D. J. 1991. Riparian Forest Buffers: Function and Design for Protection and Enhancement of Water Resources. Radnor, PA: USDA Forest Service.

Wenger, S. 1999. A Review of the Scientific Literature on Riparian Buffer Width, Extent, and Vegetation. Available at http://www.rivercenter.uga.edu/service/tools/buffers/buffer_lit_review.pdf

Appendices

Appendix A

Figures from Original Stream Buffer BAS Report

Best Available Science Review

Critical Areas Regulations Update:
Critical Aquifer Recharge Areas
Anacortes, Washington

for
**City of Anacortes, Planning, Community &
Economic Development Department**

February 6, 2026

554 West Bakerview Road
Bellingham, Washington 98226
360.647.1510



Best Available Science Review

Critical Areas Regulations Update: Critical Aquifer Recharge Areas Anacortes, Washington

File No. 0382-030-05
February 6, 2026

City of Anacortes
Planning, Community & Economic Development Department
P.O. Box 547
Anacortes, Washington 98221

Attention: John Coleman, Director of Planning, Community & Economic Development

Prepared by:

GeoEngineers, Inc.
554 West Bakerview Road
Bellingham, Washington 98226
360.647.1510

Bridget A. August, LG, LHG
Senior Hydrogeologist

Sean W. Cool, PE
Principal

BAA:SWC:tlm

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.

Table of Contents

1.0 Introduction	1
2.0 Purpose and Background	1
3.0 BAS Review for Critical Aquifer Recharge Areas	2
3.1 Source Aquifers and Drinking Water Supply	2
3.2 Wellhead Protection Areas	3
3.3 Hydrogeologic Vulnerability	3
3.4 Surface Water Vulnerability	4
3.5 Literature Review	4
4.0 BAS Evaluation of Existing Ordinance	4
4.1 AMC 19.70.515 Applicability	4
4.2 AMC 19.70.520 Designation	5
4.3 AMC 19.70.525 Mapping	6
4.4 AMC 19.70.530 General Development Standards and AMC 19.70.535 Specific Development Standards for Regulated Facilities	7
4.5 AMC 19.70.540 Critical Area Report Additional Requirements	7
5.0 Conclusions and Recommendations	7
5.1 Code References	7
6.0 Limitations	7
7.0 Cara References	8

1.0 Introduction

The City of Anacortes (City) adopted an updated Comprehensive Plan on December 31, 2025, and is in the process of updating its Critical Areas Ordinance (CAO) as required by the Growth Management Act (GMA) (Washington State Legislature 1990) pursuant to Revised Code of Washington (RCW) 36.70A.130. We understand that the CAO update will be part of a greater code update that is currently underway by the City planning staff.

The City first adopted a CAO in 1992. The City's most recent periodic review and update was completed on July 26, 2021, with City Council adoption of Ordinance 3064 (CAO 2022). The CAO was subsequently amended via Ordinance 4015 (adopted 3/28/22) and Ordinance 4025 (adopted 10/17/22). The GMA (Washington Administrative Code [WAC] 365-195) requires the use of “best available science (BAS) in developing policies and development regulations to protect the functions and values of critical areas.” This report summarizes the results of our BAS review and presents discussion and conclusions related to potential updates to Critical Aquifer Recharge Areas (CARAs) regulations for Anacortes Municipal Code (AMC).

Our services for this review are described in our scope and fee estimate dated April 3, 2025, and City Signed Agreement No. 25-139-PLN-001. Our services were authorized by the City on May 12, 2025. The scope of services was developed in collaboration with the City planning staff.

2.0 Purpose and Background

The purpose of this report is to provide technical evaluation, discussion and recommendations to City staff for the purpose of updating the related portions of the CAO with regard to current BAS for CARAs. Based on discussions with City planning staff, the current CAO as related to CARAs serves the general public and City administration/code responsibilities reasonably well and therefore the functional changes do not need to be extensive.

According to the Washington State Department of Commerce (formerly the Office of Community Development), BAS is defined as scientific information applicable to the critical area prepared by local, state or federal natural resource agencies, or qualified scientific professionals, that is consistent with criteria established in Chapters 365-195-900 through 365-195-925 WAC (Washington State Legislature 1990). The applicability of BAS and even particular critical area regulations are unique to each city and county depending on many factors including: location; geography; hydrologic, geologic and hydrogeologic conditions; presence/absences and type of water bodies. GeoEngineers completed our review in accordance with the criteria specified in the referenced WAC sections while considering our understanding of the applicable attributes for the City.

BAS must be involved in developing the policies and regulations related to the critical area; however, local jurisdictions also have the opportunity and responsibility to include context where proposed development regulations consider relevant mitigation strategies for impacts to, and possible impacts from, critical areas. These considerations are generally incorporated into critical area regulations by:

- Using BAS in developing policies and development regulations to protect functions and values of critical areas, while recognizing the agency also has a responsibility to protect lives and property within the regulatory framework;
- Requiring a valid scientific process to evaluate the effects of the policies and regulations; and consider how a valid scientific process can be incorporated in submittals related to the critical areas when assessing possible impacts to critical areas from proposed development activities; and
- Incorporating non-science-based decisions with discussion of supporting information, rationale and potential risks to functions and values of critical areas.

BAS reviewed for this update of the City CAO for CARAs are described in subsequent sections of this report.

3.0 BAS Review for Critical Aquifer Recharge Areas

A CARA is defined by the GMA as “areas with a critical recharging effect on aquifers used for potable water.” Chapter 365-190-030 WAC uses the following definition:

“Areas with critical recharging effect on aquifers used for potable water, including areas where an aquifer that is a source of drinking water is vulnerable to contamination that would affect the potability of the water, or is susceptible to reduced recharge.”

CARAs need to be protected to ensure adequate recharge and protect water quality of sources used for drinking water. According to the Washington State Department of Ecology (Ecology) *Critical Aquifer Recharge Areas Guidance* (Ecology 2021), the specific methodology to classify CARAs is left to the local jurisdiction but are typically developed using available data sets of hydrogeologic, geologic and hydrologic information. These data sets have a hierarchy of applicability to CARAs based on the level of knowledge of the aquifers and what information is available. Typically, CARAs are based on (1) the mapped extent of the source aquifers used for drinking water supply; (2) Wellhead Protection Areas (WHPAs) for Group A and Group B wells designated per Chapter 246-290 WAC; and (3) hydrogeologic vulnerability and susceptibility to contamination. Special consideration may be taken for anadromous fisheries and surface water sources relying on groundwater recharge (Ecology 2021).

3.1 SOURCE AQUIFERS AND DRINKING WATER SUPPLY

We conducted a BAS review of source aquifers used for drinking water supply in the City limits and immediately adjacent area. There are no known published studies related specifically to the aquifers or hydrogeology of Fidalgo Island or the City, but we reviewed geologic information accessed through the Washington State Department of Natural Resources (DNR) Washington Geologic Information Portal (DNR 2025) and the United States Geological Survey (USGS) National Geologic Map Database (NGMDB) (USGS 2025). The primary geologic formations underlying the City consist of sedimentary and igneous bedrock overlain by surficial glacial drift (Dragovich et al. 2000; Pessl et al. 1989). Groundwater in this area generally occurs in permeable glacial drift deposits and in fractured or porous bedrock, typically in low quantities. There are no mapped sole-source aquifers in this area.

The potable drinking water supply for the City is the City owned and operated municipal water system which provides the entire domestic service for all residential and commercial customers within the City. The water

supply is not sourced from groundwater but instead is sourced from the Skagit River. Skagit River water is diverted and treated at a water treatment plant on the east side of the river near Mount Vernon, approximately 12 miles east of the City and outside of City limits. The water is transmitted to City reservoirs and distributed within the water system service area (City of Anacortes 2024).

Based on conversations with the City planning department, all new residential, commercial and industrial developments within the City are required to connect to City water and sewer. New permit exempt wells relying on groundwater are not allowed within City limits for potable water supply. However, City geographic information system (GIS) resources identify 33 “wells” within City limits (City of Anacortes GIS 2025). Logs for all wells could not be identified but most of the wells in the area appear to be completed in bedrock. It is unclear whether the wells included in the City’s GIS database still exist or are in use since they are within the City’s water service area and municipal water is readily available. However, the City has included these wells and their buffers as designated CARAs.

3.2 WELLHEAD PROTECTION AREAS

Public drinking water supply systems are regulated by the Washington State Department of Health (DOH) under the Safe Drinking Water Act. Generally, the state regulates systems with 15 or more residential connections (Group A; Chapter 246-290 WAC), and the local health jurisdiction regulates systems with 3 to 14 connections (Group B; Chapter 246-291 WAC). WHPAs are delineated as the areas where contamination in the aquifer could reach a well within a specified time period. State DOH guidelines require that WHPAs be based primarily on travel-time-related capture zones. Travel-time-related capture zones are estimates of the region surrounding a well that contributes flow to a well within a specified time, typically the 6-month, 1-, 5- or 10-year time of travel (Chapter 246-290-135 WAC).

In December 2025, we accessed the Ecology Well Report Viewer database (Ecology 2025) and the DOH Source Water Assessment Program (SWAP) maps (DOH 2025) to review water supply wells located within City limits. We also accessed the Skagit County Public Health Department (SCPHD) Group A and Group B Well GIS Database (SCPHD 2025). Based on our review and research, there are no known Group A or B water systems within City limits that are served by groundwater. The DOH SWAP and SCPHD mapping tools indicate there are several water systems located outside of City boundaries. However, none of the WHPAs appear to overlap with City boundaries.

3.3 HYDROGEOLOGIC VULNERABILITY

According to Chapter 365-190-100 WAC, counties and cities must classify CARAs according to known or suspected vulnerability of aquifers within a designated area. Vulnerability is the combined effect of hydrogeological susceptibility to contamination and land uses that may contribute to contamination that may degrade groundwater. Vulnerability represents the risk that an aquifer could become contaminated by potential sources of pollution. Areas underlain by highly-permeable soils such as sand and gravel have higher susceptibility to contamination than areas underlain by low-permeability soils such as glacial till or bedrock. Soils with high permeability are mapped under Critical Areas within the City’s GIS Database but are not specifically listed as CARAs. This layer is to be used as a reference but is not a final critical area designation.

3.4 SURFACE WATER VULNERABILITY

In designating critical areas, counties and cities shall give special consideration to conservation or protection measures necessary to preserve or enhance anadromous fisheries and surface water sources relying on groundwater to provide base flows (Chapter 365-195-925 WAC). Surface water sources and areas with anadromous fish species within the City are designated Fish and Wildlife Habitat Conservation Areas (FWHCAs) and are regulated under AMC 19.70 Article III. However, “areas within a “closed” or “low-flow” stream watershed designated by the Department of Ecology pursuant to RCW Chapter 90.22” are also included as designated CARAs. The only mapped closed or low-flow stream in the area is Lake Erie, shown on the Skagit County Aquifer Recharge Area Map (Skagit County 2010). Lake Erie is adjacent to but outside City boundaries.

3.5 LITERATURE REVIEW

We reviewed selected documents cited in Section 7.0 CARA References of this document. This included a review of documents contained on the Washington State Department of Commerce website and technical reports/documents discovered during independent research by GeoEngineers. We reviewed selected CARA code regulations for consistency, including Skagit County (2025), City of Port Townsend (2025) and City of Blaine (2025). These references and our review of BAS references provide a basis for our recommended revisions to the City CARA portion of the CAO.

4.0 BAS Evaluation of Existing Ordinance

The current CARA ordinance is contained in AMC 19.70. Based on our literature review and professional experience, it is our opinion that existing ordinance generally meets the current BAS for CARAs. Our BAS evaluation of the existing ordinance is contained in the following sections.

4.1 AMC 19.70.515 APPLICABILITY

The City’s CARA regulations apply only to regulated facilities that are within or adjacent to those portions of the City designated as CARAs on the City’s critical areas map. Regulated facilities are defined as commercial, industrial and home occupation uses that:

1. Process or handle hazardous materials in regulated quantities; and
2. Treat or store regulated quantities of hazardous materials.

Many cities and counties have limited applicability or allow exemption from review requirements for certain development activities and associated uses. For example, within the City of Blaine, all single-family, duplex or attached single-family construction and any activity exempt from State Environmental Policy Act (SEPA) review are exempt from CARA review procedures and regulatory requirements (City of Blaine 2025). Similarly, within the City of Port Townsend, only high-risk uses are regulated under the CARA chapter (City of Port Townsend 2025).

Based on the type and location of CARAs within the City and existing land use regulations (e.g., zoning, stormwater management regulations, and other critical area regulations), it is our opinion that the CARA applicability is consistent with current BAS.

4.2 AMC 19.70.520 DESIGNATION

The City's CARA designations are currently listed as follows:

1. *Areas served by groundwater which have been designated as a "sole source aquifer area" under the Federal Safe Drinking Water Act;*
 - a. *Areas with a "closed" or "low flow" stream watershed as designated by the Department of Ecology in accordance with RCW Chapter 90.22;*
 - b. *Areas designated as "wellhead protection areas" pursuant to Chapter [246-290](#) WAC and the [groundwater](#) contribution area pursuant to WAC [246-291-125\(3\)\(d\)\(iii\)](#) or otherwise recognized by the [Director](#) as needing wellhead protection. Wellhead protection areas include, for the purpose of this regulation, the identified recharge areas associated with*
 - i. *The 10-year groundwater time-of-travel for all Group A public water supply wells; or*
 - ii. *The five-year groundwater time-of-travel for Group B public water supply wells with a wellhead protection plan filed with the Skagit County Health Department; or*
 - iii. *Plats serviced by five or more individual wells where the average lot size is equal or less than two acres for which a wellhead protection plan has been completed and filed with the Skagit County Health Department; or*
 - iv. *The 1,000-foot radius for individual private drinking water supply wells, as identified by map criterion in AMC 19.70.525.*

It is our opinion that the CARA designation is consistent with the current BAS for CARAs; however, we believe there may have been a formatting error when the designations were last updated on the AMC website. It is our opinion that the CARA designations are correct, but the bullets should be reformatted as follows to be more inclusive of all CARAs within City limits and to be consistent with BAS:

1. *Areas served by groundwater which have been designated as a "sole source aquifer area" under the Federal Safe Drinking Water Act;*
2. *Areas with a "closed" or "low flow" stream watershed as designated by the Department of Ecology in accordance with RCW Chapter 90.22; and*
3. *Areas designated as "wellhead protection areas" pursuant to Chapter [246-290](#) WAC and the [groundwater](#) contribution area pursuant to WAC [246-291-125\(3\)\(d\)\(iii\)](#) or otherwise recognized by the [Director](#) as needing wellhead protection. Wellhead protection areas include, for the purpose of this regulation, the identified recharge areas associated with:*
 - a. *The 10-year groundwater time-of-travel for all Group A public water supply wells; or*
 - b. *The five-year groundwater time-of-travel for Group B public water supply wells with a wellhead protection plan filed with the Skagit County Health Department; or*
 - c. *Plats serviced by five or more individual wells where the average lot size is equal or less than two acres for which a wellhead protection plan has been completed and filed with the Skagit County Health Department; or*

- d. *The 1,000-foot radius for individual private drinking water supply wells, as identified by map criterion in AMC 19.70.525.*

Additional CARA designations may be considered based on specific hydrogeologic susceptibility and vulnerability. For example, Skagit County includes a CARA designation for areas identified as potential or existing seawater intrusion areas (Skagit County 2025). The Skagit County Aquifer Recharge Area Map (Skagit County 2010) identifies a ½-mile buffer from the shoreline as a potential seawater intrusion area (including within the City).

Seawater intrusion is induced by overextraction of groundwater. According to City GIS resources, there is one well within ½-mile of the shoreline, but it is unclear whether it is still in use. The City also requires new development to connect to the municipal system for potable water supply, which limits future groundwater extraction and thus limits the risk of seawater intrusion. In addition, critical areas occurring within the jurisdiction of shorelines are regulated and protected through the Anacortes Shoreline Master Program (AMC Chapter 19.72) and separate critical areas permits are not required (AMC 19.70.015).

It is our opinion that the City's exclusion of seawater intrusion areas from CARA designations is appropriate and consistent with BAS.

4.3 AMC 19.70.525 MAPPING

According to AMC 19.70.525, the approximate location and extent of CARAs are shown in the City's CARA data layers maintained in the City's GIS. The GIS layers associated with CARAs include:

- Wells – previously identified wells. To our knowledge, the well locations have not been field verified and it is unknown if they are still in use.
- Wells 1,000-foot radius – the 1,000-foot-radius surrounding the previously identified wells.
- Soils w/High Permeability – soils with moderate to rapid permeability as indicated by the Soil Survey of Skagit County (NRCS 1989).

AMC 19.70.525 also cites the following maps and resources providing information on the location and extent of CARAs:

- Areas with soils that have moderate to rapid permeability (greater than 2 inches per hour) as listed in Table 14 of the Soil Survey of Skagit County (NRCS 1989).
- Source for identifying drinking water supply wells identified by agencies such as Ecology and Skagit County Health Department.

The City indicates that the GIS layers and resources cited above are guides for the City and applicants but do not provide final critical area designation as indicated by AMC 19.70.520.

City CARA mapping is generally consistent with BAS for CARAs. For ease of use, the City may consider adding additional layers to their GIS database so all mapped CARAs are in one place. This could include adding the location of and WHPAs for Group A and Group B wells (sources include SCPHD GIS Database and DOH SWAP maps), Lake Erie and associated buffer as a closed stream (Skagit County 2010) and the location of plats serviced by five or more wells where the average lot size is equal to or less than 2 acres for which a wellhead protection plan has been completed and filed with SCPHD.

4.4 AMC 19.70.530 GENERAL DEVELOPMENT STANDARDS AND AMC 19.70.535 SPECIFIC DEVELOPMENT STANDARDS FOR REGULATED FACILITIES

Based on our review and professional experience, it is our opinion that the General Development Standards in AMC 19.70.530 and the Specific Development Standards for Regulated Facilities in AMC 19.70.535 meet the current BAS for CARAs and are consistent with the standards and regulations for Skagit County and other municipalities.

4.5 AMC 19.70.540 CRITICAL AREA REPORT ADDITIONAL REQUIREMENTS

Based on our review and professional experience, it is our opinion that the reporting requirements for a hydrogeological assessment in AMC 19.70.540 meets the current BAS for CARAs and are generally consistent with the standards and regulations for Skagit County and other municipalities.

5.0 Conclusions and Recommendations

In our opinion, the City code for CARAs is in general accordance with our technical and regulatory experience, information contained within codes from other sources and the limited available BAS information. Based on our review and research, we recommend the following revisions to AMC Chapter 19.70 Critical Areas, to be accomplished within the framework of other overall City code revisions:

- It is our opinion that the CARA designations in AMC 19.70.520 are consistent with BAS, but the bullets should be reformatted, as described above, to be more inclusive of all CARAs and to be consistent with local jurisdictions.
- City CARA mapping is generally consistent with BAS for CARAs but for ease of use, the City may consider adding additional layers to their GIS database so all mapped CARAs are in one place. This could include adding the location of and WHPAs for Group A and Group B wells (sources include SCPHD GIS Database and DOH SWAP maps), Lake Erie and associated buffer as a closed stream (Skagit County 2010) and the location of plats serviced by five or more wells where the average lot size is equal to or less than 2 acres for which a wellhead protection plan has been completed and filed with SCPHD.

5.1 CODE REFERENCES

We did not find references to codes within the current AMC Chapter 19.70 Article V. Critical Aquifer Recharge Areas that are out of date with the referenced code.

6.0 Limitations

We have prepared this report for use by the City in revising the existing AMC Critical Areas Regulations. Our interpretations and recommendations are based on our review of select scientific maps and literature, information provided by the City, and our technical and regulatory experience.

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

7.0 Cara References

Anacortes Municipal Code (AMC). 2025. Available at: <https://anacortes.municipal.codes/>

City of Anacortes. 2024. 2024 Annual Water Report.

City of Anacortes Critical Areas Ordinance (CAO). 2022. Critical Areas Planning, Adopted Critical Areas Regulations. Dated July 26, 2021, amended March 28, 2022 and October 17, 2022. Available at: <https://www.anacorteswa.gov/201/Critical-Areas-Planning>

City of Anacortes GIS. 2025. Available at: <https://www.arcgis.com/apps/webappviewer/index.html?id=f36b7220998446848771d534f73a7126&extent=-13660969.8854%2C6185886.88%2C-13643074.0662%2C6194380.9448%2C102100>

City of Blaine. 2025. City of Blaine Municipal Code, Chapter 17.82.495.

City of Port Townsend. 2025. City of Port Townsend Municipal Code, Chapter 19.05.

Dragovich, J.D, M.L. Troost, D.K. Norman, G. Anderson, J. Cass, L.A. Gilbertson, and D.T. McKay Jr. 2000. Geologic Map of the Anacortes South and La Conner 7.5-minute Quadrangles, Skagit and Island Counties, Washington, Washington State Department of Natural Resources.

Natural Resource Conservation Service (NRCS). 1989. Soil Survey of Skagit County Area, Washington.

Pessl, Jr., Dethier, D.P., Booth, D.B., and Minard, J.P. 1989. Surficial Geologic Map of the Port Townsend 30- by 60- Minute Quadrangle, Puget Sound Region, Washington. United States Geological Survey.

Skagit County. 2010. Aquifer Recharge Area Map, Category 1 Areas, SCC 14.24.310. Dated January 11, 2010.

Skagit County. 2025. Skagit County Code (SCC), Chapter 14.24.

Skagit County Public Health Department (SCPHD). 2025. Groupd A and B Wells GIS Map. [Health/GroupAandBWells \(MapServer\)](#)

United States Geological Survey (USGS). 2025. National Geologic Map Database (NGMDB). Accessed December 2025.

Washington State Department of Commerce. 2023. Critical Areas Handbook: A Handbook for Reviewing Critical Areas Regulations available online at <https://deptofcommerce.box.com/s/rlysjrfvrpxwnm9jvbc3lc7ji19ntp>

Washington State Department of Ecology. 2021. Critical Aquifer Recharge Areas Guidance Document. Publication #05-10-028, 138 pages.

Washington State Department of Ecology. 2025. Well Report Viewer database. Accessed December 2025.

Washington State Department of Health (DOH). 2025. Online Source Water Assessment Program (SWAP) maps. Accessed December 2025.

Washington State Department of Natural Resources (DNR). 2025. Washington Geologic Information Portal. Accessed December 2025.

Washington State Legislature. 1990. Growth Management Act of 1990, Revised Code of Washington (RCW) 36.70A. Available at: <https://app.leg.wa.gov/rcw/default.aspx?cite=36.70A&full=true>

Washington State Legislature. 2025. Washington Administrative Code (WAC).

Washington State Legislature. 2025. Revised Code of Washington (RCW).

Best Available Science Review

Critical Areas Regulations Update:
Geologically Hazardous Areas
Anacortes, Washington

for
City of Anacortes

February 6, 2026

554 West Bakerview Road
Bellingham, Washington 98226
360.647.1510

GEOENGINEERS 

Best Available Science Review

Critical Areas Regulations Update: Geologically Hazardous Areas Anacortes, Washington

File No. 0382-030-05
February 6, 2026

City of Anacortes
Planning, Community & Economic Development
P.O. Box 547
Anacortes, Washington 98221

Attention: John Coleman, Director of Planning, Community & Economic Development

Prepared by:

GeoEngineers, Inc.
554 West Bakerview Road
Bellingham, Washington 98226
360.647.1510

Cody R. Gibson, LG
Geologist

Sean W. Cool, PE
Principal

CRG:SWC:tlm

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.

Table of Contents

1.0 Introduction	1
2.0 Purpose and Background	1
3.0 BAS Review for Geologically Hazardous Areas	2
3.1 Literature Review	2
3.2 BAS Evaluation of Existing Ordinance.....	3
3.2.1 Erosion Hazard Areas	3
3.2.2 Landslide Hazard Areas	3
3.2.3 Seismic Hazard Areas	5
3.2.4 Mine Hazard Areas	5
3.2.5 Volcanic Hazard Areas	5
3.2.6 Tsunami Hazard Areas	6
3.2.7 Climate Change/Sea Level Rise	6
3.3 Conclusions and Recommendations	6
3.3.1 Erosion Hazards.....	6
3.3.2 Landslide Hazard Areas	6
3.3.3 Seismic Hazard Areas	8
3.3.4 Mine Hazards.....	8
3.3.5 Volcanic Hazards	8
3.3.6 Tsunami Hazards.....	8
3.3.7 Vegetation Management.....	8
3.3.8 Maps.....	9
4.0 Limitations.....	9
5.0 GHA References	9

1.0 Introduction

The City of Anacortes (City) adopted an updated Comprehensive Plan in 2025 and is in the process of updating its Critical Areas Ordinance (CAO) as required by the Growth Management Act (GMA, Chapter 36.70A Revised Code of Washington [RCW] [Washington State Legislature 1990]). We understand that the CAO update will be part of a greater code update that is currently underway by the City planning staff.

The City first adopted a CAO in 1992. The City's most recent periodic review and update was completed on July 26, 2021, with City Council adoption of Ordinance 3064 (CAO 2022). The CAO was subsequently amended via Ordinance 4015 (adopted 3/28/22) and Ordinance 4025 (adopted 10/17/22). The GMA (Washington Administrative Code [WAC] 365-195) requires the use of “best available science (BAS) in developing policies and development regulations to protect the functions and values of critical areas.” This report summarizes the results of our BAS review, presents discussion and conclusions related to potential updates to Geologically Hazardous Areas (GHAs) critical areas regulations for Anacortes Municipal Code (AMC).

Our services for this review are described in our scope and fee estimate dated April 3, 2025, and City Contract 25-139-PLN-001. Our services were authorized by the City on May 12, 2025. The scope of services was developed in collaboration with the City planning staff.

2.0 Purpose and Background

The purpose of this report is to provide technical evaluation, discussion and recommendations to City staff for purpose of updating the related portions of the CAO with regard to current BAS for GHAs. Based on discussions with City planning staff, the current CAO as related to GHAs, serves the general public and City administration/code responsibilities reasonably well and therefore the functional changes do not need to be extensive. A consideration for updating the GHA critical areas since 2017 is how to weight potential impacts of climate change and sea level rise into new policies and development regulations.

According to the Washington State Department of Commerce (formerly the Office of Community Development), BAS is defined as scientific information applicable to the critical area prepared by local, state or federal natural resource agencies, or qualified scientific professionals, that is consistent with criteria established in WAC 365-195-900 through WAC 365-195-925 (WAC 360). The applicability of BAS and even particular critical area regulations are unique to each city and county depending on many factors including: location; geography; geologic; hydrologic and hydrogeologic conditions; and presence/absences and type of water bodies. GeoEngineers completed our review in accordance with the criteria specified in the referenced WAC sections while considering our understanding of the applicable attributes for the City.

BAS must be involved in developing the policies and regulations related to the critical area; however, local jurisdictions also have the opportunity and responsibility to include context where proposed development regulations consider relevant mitigation strategies for impacts to, and possible impacts from, critical areas. These considerations are generally incorporated into critical area regulations by:

- Using BAS in developing policies and development regulations to protect functions and values of critical areas, while recognizing the agency also has a responsibility to protect lives and property within the regulatory framework;

- requiring a valid scientific process to evaluate the effects of the policies and regulations; and consider how a valid scientific process can be incorporated in submittals related to the critical areas when assessing possible impacts to critical areas from proposed development activities; and
- incorporating non-science-based decisions with discussion of supporting information, rationale and potential risks to functions and values of critical areas.

3.0 BAS Review for Geologically Hazardous Areas

GHAs are defined by WAC 365-190-030:

“Geologically hazardous areas are areas that because of their susceptibility to erosion, sliding, earthquake, or other geological events, are not suited to siting commercial, residential, or industrial development consistent with public health or safety concerns.”

GHAs as further defined by WAC 365-190-030 include erosion hazard areas, landslide hazard areas, seismic hazard areas (which include tsunamis hazards), mine hazards and volcanic hazards.

The WAC recommends that cities or counties should classify these hazards as “known or suspected risks,” “no risk,” or “risk unknown.” Based on our experience, review and research:

- Erosion, landslide and seismic hazards exist within the City and immediately surrounding area and evaluating potential updates is appropriate;
- we did not identify any coal mine hazards in published references for the City and immediate surrounding area. The City code has a more general reference to “mine hazard areas” and we did find published information related to two historical mineral mines in the City limits;
- we did not identify any significant risk of volcanic hazards in published references for the City and immediate surrounding area, other than airborne particulate impacts from an eruption which is the case for most, if not all, Washington jurisdictions; and
- the “other” categories of geohazards relevant to the City include tsunamis, and potential impacts associated with climate change and sea level rise.

3.1 LITERATURE REVIEW

We reviewed selected documents cited in the “GHA References” section of this document. This included a review of documents contained on the Department of Commerce website and technical reports/documents discovered during independent research by GeoEngineers. We also reviewed selected GHA code regulations in other jurisdictions that were updated recently including the City of Bellingham (2025), City of Edmonds (2025), City of Everett (2025) and the City of Shoreline (2025). We also reviewed the GHA code regulations for City of Seattle, King, Island and Whatcom Counties for relevant opportunities for code changes. These references and our review of BAS references provide a basis for our recommended revisions to the City GHA portion of the CAO.

3.2 BAS EVALUATION OF EXISTING ORDINANCE

3.2.1 *Erosion Hazard Areas*

It appears that the existing ordinance for erosion hazard areas generally meets the current BAS, based on our literature review and professional experience, as discussed below.

The City code references WAC 365-190-120(5) which states, “Erosion hazard areas include areas likely to become unstable, such as bluffs, steep slopes, and areas with unconsolidated soils.” The WAC also refers to Washington State Department of Ecology (Ecology) Coastal Zone Atlas (CZA) for this information (Ecology 1978). WAC 365-190-030 (Definitions) states “Erosion hazard areas are those areas containing soils which, according to United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), may experience significant erosion. Erosion hazard areas should also include coastal erosion-prone areas and channel migration zones.”

Activities in and near designated erosion hazard areas are generally allowed if specific development or performance standards, as described within an approved critical areas report, are followed. The standards generally include the time of year disturbance is allowed, limits of allowable disturbed area and required plans (such as a Temporary Erosion Control Plan [TESC]) to minimize possible impacts from the disturbance and possible monitoring or mitigation for the disturbance. These elements appear to be present in the current ordinance.

3.2.2 *Landslide Hazard Areas*

It appears that the existing ordinance for landslide hazard areas generally meets the current BAS, based on our literature review and professional experience, as discussed and with the exceptions noted below.

The current AMC for landslide hazard areas is described in detail in the current code. However, the COA interactive map does not have a layer depicting landslides. Washington State Department of Natural Resources (WADNR) has mapped landslides to the south and east of current City limits. The mapped landslides are shown on the WADNR Geologic Information Portal website. We recommend that the WADNR identified landslides be added to the COA interactive map.

Landslide activity within glacial and post-glacial deposits in the Puget Sound Region is a component of a continuous local and regional landscape evolution. Typically, landslides occur in marginally stable areas; oversteepened slopes and along steep bluffs; areas where landslides have previously occurred; and in areas that have been recently modified by human activities or natural processes. The City and surrounding area also have some steep/vertical bedrock slopes that could be considered within landslide regulations. Based on our experience, landslides in the Puget Sound Area generally advance upslope dimensionally less than the vertical height of the pre-existing landslide or slope feature. However, landslides developing on weak, very wet soils can propagate upslope and downslope more than the vertical height of the feature. Also, the rate of landslide growth or movement varies widely depending on a variety of factors that require site specific evaluation.

3.2.2.1 LIDAR MAPPING AND RUNOUT CONSIDERATIONS

Light Detection and Ranging (lidar) mapping represents the current BAS with respect to identifying and mapping recent and historic landslides and should be incorporated into the current hazard maps. We recommend that the existing City inventory be updated using the stated BAS.

3.2.2.2 BUFFERS AND SETBACKS

Development standards for landslide areas, including buffer and/or building setback requirements, depend largely on the type of proposed development, the size of the landslide hazard area, the potential landslide type, frequency of potential landslide activity, underlying soil and groundwater conditions, and in particular, the likely consequences of landslide activity. It is our opinion that it is not realistic to incorporate all of these criteria within a CAO, but it is appropriate to require that all relevant factors specific to a site be addressed in critical area reports to be completed by a licensed engineer with geotechnical training and experience, or a licensed geologist or engineering geologist with relevant training and background.

CAO regulations typically include minimum buffers and/or setbacks and allow disturbance to landslide hazard areas only if a site-specific investigation is completed, analysis indicates that the proposed development will not affect or be affected by the landslide hazard, and specific development or performance standards/recommendations are followed. There is a myriad of ways for landslide/steep slope codes to address this consideration:

- The City CAO (19.70.430) states that a standard buffer of 50 feet shall be established from the closest edge of landslide hazard areas. The size of the buffer can be reduced by a maximum of 25 percent and will be determined by the planning director based on review of a critical areas report completed by a qualified professional. The buffer may also be increased by the planning director as necessary.
- The International Building Code (IBC; ICC 2024) requires building setbacks from the top of descending slopes equal to one-third of the slope height or 40 feet, whichever is smaller, and from the bottom of the slope equal to one-half of the slope height or 15 feet, whichever is smaller. The IBC setback considerations are provided for slopes only and do not provide provisions for landslide areas. Potential runout distances for landslide material at the bottom of slopes are not specifically discussed in the IBC or in the current Washington State Department of Commerce documents.
- Island County CAO requires: a 50-foot setback or greater from a slope that is more than 10 feet but no more than 30 feet in height; 75-foot setback or greater from a slope that is more than 30 feet but no more than 50 feet in height; 100-foot setback or greater from a slope that is more than 50 feet in height.
- Skagit County CAO requires a minimum buffer of 30 feet from top, toe and edges of all landslide and erosion hazards; for areas with a vertical relief greater than 50 feet, the minimum buffer is increased to 50 feet.
- City of Seattle CAO requires a minimum 15-foot buffer from top/toe of landslide hazard areas unless director determines otherwise.
- City of Everett requires a landslide buffer be specified in a geohazard report; if not stated, then will be based on standards in the IBC.
- City of Shoreline CAO recently updated-very high-risk landslide areas 50 feet from edges, can be reduced based on assessment, but minimum is 15 feet.
- City of Bellingham CAO requires a minimum 50-foot buffer from all edges of the landslide hazard area. The 50-foot buffer can be reduced based on assessment, but minimum is 10 feet.
- Whatcom County CAO requires setbacks to be established by a qualified professional with no specific minimum requirements. However, the buffer shall include woody vegetation to stabilize the soil, or the

technical administrator has the authority to require vegetation or other measures to improve slope stability and prevent erosion.

- The Whatcom County code also identifies potential landslide areas in rock areas as those “slopes that are parallel or subparallel to planes of weakness (such a bedding planes, joint systems, and fault planes) in subsurface materials” and “slopes having gradients steeper than 80 percent subject to rock fall during seismic shaking.”

3.2.3 Seismic Hazard Areas

It appears that the existing ordinance for seismic hazard areas generally meets the current BAS, based on our literature review and professional experience, as discussed and with the exceptions noted below.

Designation/definition of seismic hazard areas in the City appears to be in general accordance with our technical and regulatory experience, information contained within codes from other sources and the limited available BAS information. The WAC lists tsunami hazard within the seismic hazard areas, while the City includes it as a separate section.

The City currently allows certain types of development within seismic hazard areas if specific performance standards are followed. The specific standards generally include an evaluation of the type and magnitude of potential seismic hazard and mitigation to reduce the seismic risk through engineering design. The engineering design must be done in accordance with the most recent version of IBC, which is typical of all Puget Sound jurisdictions. This represents the BAS in our opinion. Some codes also reference that public roads, bridges, utilities and trails be designed in accordance with most recent version of the *American Association of State Highway and Transportation Officials (AASHTO) Manual*.

Classification and mapping of seismic hazard areas in the City are in general accordance with our technical and regulatory experience, information contained within codes from other sources and the BAS information reviewed.

3.2.4 Mine Hazard Areas

The designation/definition for mine hazard areas meets the current BAS for mine hazard Areas, based on our literature review and professional experience. According to the WAC 365-190-120(8)(b), “mine hazard areas are defined as those areas underlain by, adjacent to, or affected by mine workings such as adits, gangways, tunnels, drifts, or air shafts. Factors which should be considered include: proximity to development, depth from ground surface to the mine working, and geologic material.”

Our research did not identify coal mine or other mine tunnel hazards in the Anacortes area. Our research identified two silver-copper-gold mines within City limits, Anacopper Mine located near 1517 36th Street and the Stephens (Fidalgo) Mine located in the Anacortes Community Forest Lands North and to the west of Little Cranberry Lake, but no additional information was found related to previous mining activities.

3.2.5 Volcanic Hazard Areas

The designation/definition for volcanic hazard areas meets the current BAS for volcanic hazard areas, based on our literature review and professional experience. The City is not at risk of various hazard flows, avalanche, lahars or related flooding from volcanic activity of the nearest peaks, which include Mount Baker

or Glacier Peak (the two closest volcanoes) according to United States Geological Survey (USGS) maps for volcanic hazards associated with Mount Baker and Glacier Peak.

3.2.6 *Tsunami Hazard Areas*

It appears that the existing ordinance meets the current BAS for tsunami hazard areas, based on our literature review and professional experience. The WAC includes tsunami hazards within the seismic hazards section (WAC 365-190-120(7)). The 2024 IBC requires, by reference to American Society of Civil Engineers (ASCE) 7, evaluation of tsunami loading in structural design. Other codes reviewed include it in the flood hazard section or address it separately. Based on review of updated tsunami hazard maps, including Tsunami hazard maps of the Puget Sound and adjacent waters (Dolcimascolo et al. 2022; Walsh et al. 2003), and WADNR Geologic Information Portal, the most significant tsunami hazard areas in the City are the Flounder Bay and Bayside Marina area, Anacortes Ferry Terminal area and the areas to the southwest and east of the Port of Anacortes. Other smaller areas exist along the shoreline of Guemes Channel and Fidalgo Bay. The City of Anacortes Interactive Map appears to reference the data from the updated tsunami hazard map. Tsunami inundation depth/runup elevation areas are also defined and available in the online ASCE Tsunami Hazard Tool (ASCE 2021).

3.2.7 *Climate Change/Sea Level Rise*

Climate change and sea level rise must be considered in CAO updates by the WAC. However, the science is rapidly changing at this time and there is no consensus on how to incorporate into relevant codes in Puget Sound. BAS review indicates that the potential impacts associated with climate change include more extensive coastal flooding during storms, periodic tidal flooding and increasing coastal erosion. The current BAS related to climate change and sea level rise is discussed in more detail in the Frequently Flooded Areas (FFAs) portion of the CAO, where the impacts are more obvious. While most codes are not including climate change and sea level rise in the GHA section of their code, increasing bluff marine erosion and/or impacts to developments in particularly vulnerable areas such as Skyline Marina may warrant some articulation of risk and potential mitigation.

3.3 **CONCLUSIONS AND RECOMMENDATIONS**

The current GHA code, Section 19.70.220, was updated July 26, 2021. The code update was required by the Growth Management Act.

3.3.1 *Erosion Hazards*

In our opinion, the City code for erosion hazard areas is in general accordance with our technical and regulatory experience, information contained within codes from other sources and the limited available BAS information.

3.3.2 *Landslide Hazard Areas*

Designation/definition of landslide hazard areas in the City appears to be in general accordance with our technical and regulatory experience, information contained within codes from other sources and the limited BAS information published.

Dissimilar to most Puget Sound jurisdictions, the City has significant areas with exposed bedrock, and stability considerations of rock are not currently included in the current City code. It may be appropriate to

include a definition where exposed rock conditions occur and meet specific criteria that would require being addressed as a landslide hazard area.

3.3.2.1 SLOPE STABILITY ANALYSIS

The current City code states that the proposed development should not decrease the factor of safety for landslide occurrences below 1.5 for static conditions and 1.2 for dynamic conditions, based on a minimum horizontal acceleration as established by the current version of the IBC. The City code does not state when a quantitative analysis should be completed. The Skagit County code requires a slope stability analysis be completed when the property owner would like to decrease the buffer from their 30-foot minimum and the minimum factor of safety should be a minimum of 1.5 for static and 1.25 for seismic conditions or 10 feet whichever is greater.

Many codes do not include specific slope stability analysis and performance standards. Some of the jurisdictions who have experienced significant development in landslide areas (such as City of Seattle and Island County), include language that can require one or both.

3.3.2.2 BUFFERS

The current City code lists the standard buffer as 50 feet from the closest edge of the landslide hazard area. The “buffer” can be reduced by a maximum of 25 percent if the qualified professional can demonstrate adequate protection or can be increased by the planning director. Because most of the steep slopes in the City are on small, developed properties, it may be appropriate to use a different height methodology (such as H/3 similar to the IBC, or half the slope height) or a minimum, whichever is greater. A minimum setback of 15 feet might be considered and more consistent with the minimum setbacks of some other codes. It may also be appropriate to include language that the director can include vegetation or other measures in the setback area/buffer to minimize impacts and resist erosion.

3.3.2.3 INFILTRATION NEAR SLOPES

It is recognized that infiltration of stormwater is a preferred stormwater practice in Western Washington. However, infiltration of stormwater on or adjacent to a steep slope can adversely impact slope stability and life safety. Therefore, we recommend that stormwater infiltration in landslide hazard areas be evaluated by a qualified professional to determine that it would not adversely affect stability in the area and/or provide appropriate design and mitigation measures.

3.3.2.4 PROPERTY COVENANT

A property covenant is included when developments occur in landslide hazard areas in the City of Everett, City of Seattle and Island County critical areas regulations. It may be appropriate for the City to consider this addition to the CAO to protect the City from liability.

3.3.2.5 FORMAL PEER REVIEW

The City does not have staff capable of doing a professional review of geotechnical/geologic reports submitted for evaluation of landslide hazard areas. The current code may require a formal peer review of a critical area report to consider the potential impacts and liability associated with landslides.

3.3.3 Seismic Hazard Areas

Development standards for Seismic Hazard Areas in the City are in general accordance with our technical and regulatory experience, information contained within codes from other sources and the BAS information.

3.3.4 Mine Hazards

Historical coal mines were not identified in the City or immediate vicinity. Two historical mineral mines were identified in the City but we could not find any published references indicating extent and/or any risk or impacts associated with development. If a concern exists from a life safety or property standpoint, these mines could be identified with an appropriate risk statement. Further research would be necessary to evaluate these historical mines and any associated risk related to future development.

Many jurisdictions do not include development language related to coal mines or mines if these hazards are not identified in the area. In the absence of published information regarding mines in the City and immediate area, we conclude that mines may be designated/defined in accordance with the WAC but classified as “no risk” in the City code unless new information is obtained in the future. Under these circumstances, development regulations related to addressing mines could be removed from the updated GHA section of the CAO code.

3.3.5 Volcanic Hazards

The City does not appear to be at risk of volcanic hazards. Many jurisdictions do not include development regulations related to volcanic hazards if the area is not at risk of significant impact other than airborne particulates. We conclude that volcanic hazards may be classified as “no risk” in the updated City CAO code. Therefore, development requirements related to addressing volcanic hazards could be removed from the updated GHA section of the CAO code.

3.3.6 Tsunami Hazards

In our opinion, the City code for Tsunami Hazard areas is in general accordance with our technical and regulatory experience, information contained within codes from other sources and the limited available BAS information.

3.3.7 Vegetation Management

Most of the codes state that removal of vegetation is prohibited in erosion or landslide hazard areas unless it is part of an approved plan (i.e. clearing and grading shall be limited to the approved development). Vegetation management or restoration plans prepared by qualified professionals are sometimes required to maintain slope stability. Some exceptions can be established, including removal due to established disease infestation, tree fall or other hazard. As previously mentioned, the Whatcom County code requires vegetation within the landslide setback area/buffer or the director can require other measures to stabilize the soil. Current City code mentions that a mitigation plan should include a vegetation management plan and/or replanting plan in 17.70.240.

3.3.8 Maps

We recommend the CAO should include the addition of the following map:

Dolcimascolo, Alexander; Eungard, D. W.; Allen, Corina; LeVeque, R. J.; Adams, L. M.; Arcas, Diego; Titov, V. V.; González, F. I.; Moore, Christopher; Garrison-Laney, C. E.; Walsh, T. J., 2022, Tsunami hazard maps of the Puget Sound and adjacent waters—Model results from an extended L1 Mw 9.0 Cascadia subduction zone megathrust earthquake scenario: Washington Geological Survey Map Series 2021-01, 16 sheets, scale 1:48,000, 49 p. text.

4.0 Limitations

We have prepared this report for use by the City in revising the existing AMC Critical Areas Regulations. Our interpretations and recommendations are based on our review of select scientific maps and literature, information provided by the City, and our technical and regulatory experience.

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

5.0 GHA References

American Society of Civil Engineers (ASCE). 2021. Tsunami Hazard Tool, Version 2022-01. Last updated December 1, 2021. Available at <https://asce7tsunami.online>.

City of Anacortes. 2022. “City of Anacortes Municipal Code, 2022.”

City of Anacortes. 2025. “City of Anacortes Municipal Code, Chapter 19.70.”

City of Anacortes. 2025. “City of Anacortes Municipal Code, Ordinance 3064.”

City of Anacortes. 2025. City of Anacortes Interactive Map available at <https://www.anacorteswa.gov/635/GIS-Mapping>

City of Edmonds. 2025. “City of Edmonds Municipal Code, ECDC Chapter 23.80.”

City of Everett. 2025. “City of Everett Municipal Code, EMC Chapter 19.37.”

City of Seattle. “City of Seattle Municipal Code, SMC Chapter 25.09.”

City of Shoreline. 2025. “City of Shoreline Municipal Code, SMC Chapter 20.80.”

Dolcimascolo, Alexander; Eungard, D. W.; Allen, Corina; LeVeque, R. J.; Adams, L. M.; Arcas, Diego; Titov, V. V.; González, F. I.; Moore, Christopher; Garrison-Laney, C. E.; Walsh, T. J. 2022. Tsunami hazard maps of the Puget Sound and adjacent waters—Model results from an extended L1 Mw 9.0 Cascadia subduction zone megathrust earthquake scenario: Washington Geological Survey Map Series 2021-01, 16 sheets, scale 1:48,000, 49 p. text.

GeoEngineers, Inc. (GeoEngineers). 2015. "Geotechnical Engineering Services, Guemes Channel Trail Vegetation and Habitat Management Plan, Guemes Channel Trail, Anacortes, Washington." Prepared for the City of Anacortes. December 21, 2015. GEI File No. 0382-028-00.

International Code Council (ICC). 2024 International Building Code. Country Club Hills, Ill: ICC.

Island County. "County Code, Chapter 17.02."

King County. "King County Municipal Code, Title 21A-Zoning, Chapter 21A-24."

Skagit County. "County Code, Chapter 14.24."

United States Geological Survey (USGS). Quaternary Fault and Fold Database of the United States, <http://earthquake.usgs.gov/hazards/qfaults/>.

Walsh, T.J, Titov, V. V., Venturato, A.J, Mofjeld, H. O., & Gonzalez, F. I. 2003. "Tsunami hazard map of the Elliott Bay area, Seattle, Washington: Modeled tsunami inundation from a Seattle Fault earthquake." Wash. Div. Geol. Earth Resource. Open File Rep. 14

Washington State Department of Commerce, Critical Areas Protection available at <https://www.commerce.wa.gov/growth-management/ecosystem-planning/critical-areas/>

Washington Department of Natural Resources (WADNR) Geologic Information Portal available at <https://dnr.wa.gov/washington-geological-survey/publications-and-data/geologic-information-portal>.

Washington State Department of Natural Resources (WADNR). 2005. "Tsunami Hazard Map of the Anacortes-Whidbey Island Area, Washington: Modeled Tsunami Inundation from a Cascadia Subduction Zone Earthquake."

Washington State Legislature. 1990. "Growth Management Act of 1990, Revised Code of Washington (RCW) 36.70A."

Washington State Legislature. 2025. "Washington Administrative Code."

Planning Commission Agenda Bill

Meeting Date: August 11, 2026

Agenda Item: 6.b.

Subject: Shoreline Master Program Periodic Update - Updated Gap Analysis and Consistency Review

Staff Contact: Libby Grage, John Coleman

Approved for Submittal to Commission by

Libby Grage
John Coleman

Action Type

Discussion

Summary Statement: Staff will present the *Updated Gap Analysis and Consistency Review* completed for the ongoing Shoreline Master Program periodic update.

Background: See the attached *Updated Gap Analysis and Consistency Review*, dated August 7, 2026.

Previous Action: Past meetings and documents related to the SMP Periodic Update are included on the SMP Update webpage located here:

<https://www.anacorteswa.gov/1095/SMP-Update>

Competing Viewpoints Considered:

Recommended Motion: N/A - Discussion Only

Alternative Actions:

Attachments (listed in order presented):

1. Updated Gap Analysis and Consistency Review

Anacortes Shoreline Master Program Periodic Update

Updated Gap Analysis and Consistency Review

RCW 90.58.080 Periodic Review

August 7, 2026

Executive Summary

The City of Anacortes initiated the periodic update of its Shoreline Master Program (SMP) in 2019 in accordance with Chapter 90.58 RCW. That effort included preparation of a comprehensive [gap analysis](#), development of proposed amendments, public outreach, review by the Washington State Department of Ecology, and consideration by the Planning Commission and City Council.

The proposed amendments were prepared in coordination with the City's then-pending critical areas regulations update. Ecology issued an [Initial Determination of Consistency](#) for the SMP update in 2021, and the Planning Commission recommended approval of the proposed amendments in April 2022. Before local adoption could be completed, appeals of the critical areas regulations update interrupted the coordinated update process, and the City paused the SMP periodic update.

The City re-initiated the SMP periodic update in March 2026. During the intervening period:

- the appeals of the critical area regulations update were resolved,
- the City updated its floodplain management regulations in 2021,
- the City adopted the 2025–2045 Comprehensive Plan and associated development regulations,
- the City completed a 2024 Shoreline Master Program Compliance Assessment, and
- the City initiated a new periodic update of the critical areas regulations.

This report evaluates whether changes in state law, local plans and regulations, changed circumstances, implementation experience, and other new information warrant additional revisions to the proposed SMP amendments.

The review concludes that the proposed amendments remain an appropriate basis for completing the City's ongoing SMP periodic update. Targeted amendments are recommended to maintain consistency with the adopted Comprehensive Plan and current development regulations, incorporate applicable recommendations from the 2024 SMP Compliance Assessment, address changes in state law, and improve implementation. No significant inconsistencies were identified that would require substantial revision of the proposed policy or regulatory framework.

1. Background & Purpose

The Shoreline Management Act (Chapter 90.58 RCW) requires local governments to periodically review and, if necessary, revise their Shoreline Master Programs to maintain compliance with state law, ensure consistency with local comprehensive plans and development regulations, and consider changed circumstances, new information, and improved data.

The City initiated its Shoreline Master Program periodic update in 2019 and prepared proposed amendments. Although the proposed amendments underwent public review, Department of Ecology review, Planning Commission review, and City Council consideration, they were not adopted before the update process was paused.

For purposes of this report, “SMP Amendment Package” refers to the most recent package of proposed SMP amendments released for public review, which included the following:

- [Draft Shoreline Element of the Comprehensive Plan](#)
- [Draft AMC Chapter 19.72 \(Shorelines\)](#)
- [Draft Shoreline Restoration Plan Addendum](#)
- [Revised shoreline environment designation maps](#), and
- Associated supporting documents prepared as part of the City’s SMP periodic update initiated in 2019.

The purpose of this document is to evaluate whether additional amendments to the SMP Amendment Package are warranted based on changes occurring since preparation of the SMP Amendment Package. This document does not initiate a new periodic review or replace the previous gap analysis. Rather, it documents the additional review completed after the periodic update was paused to support completion of the City’s ongoing SMP periodic update.

Consistent with RCW 90.58.080, this review addresses the following questions:

1. Have amendments to the Shoreline Management Act or Shoreline Master Program Guidelines created a need for revisions to the SMP Amendment Package?
2. Does the SMP Amendment Package remain consistent with the adopted Comprehensive Plan and current development regulations?
3. Have changed circumstances, new information, or implementation experience identified additional amendments that should be incorporated before adoption?

The review concludes with targeted amendments recommended for consideration as part of completing the City’s Shoreline Master Program periodic update.

2. Review of State Law and Shoreline Master Program Guidelines

Staff reviewed amendments to Chapter 90.58 RCW and the Shoreline Master Program Guidelines adopted since completion of the 2020 SMP Gap Analysis to determine whether revisions to the SMP Amendment Package are warranted. Table 2 summarizes those legislative changes and the recommended response.

Table 2. State Legislative Changes Since 2019.

#	RCW Section	Legislative Change	Recommended Action
1	RCW 90.58.030 (2019)	Expanded the definition of qualifying fish habitat enhancement projects to include restoration of native kelp, eelgrass beds, and native oysters. These projects may qualify for exemption from substantial development permit requirements when meeting statutory criteria.	Review shoreline exemption provisions to ensure reference to fish habitat enhancement projects reflect current statute.
2	RCW 90.58.030 (2019)	Clarified that disposal for dredged material at approved Dredged Material Management Program (DMMP) sites is exempt from substantial development permits under specified circumstances.	Verify exemption language if applicable to dredged material disposal activities within City shoreline jurisdiction.
3	RCW 90.58.030 (2019)	Updated the cost threshold used in the exemption for construction of freshwater docks through the Office of Financial Management adjustment process.	Update dollar amounts.
4	RCW 90.58.080 (2020)	Revised the periodic review schedule, moving jurisdictions to a revised review cycle and updating implementation tables.	Administrative only. No substantive shoreline policy changes required. Anacortes's next periodic update is due in 2030.
5	RCW 90.58.630 (2023)	Directs the Department of Ecology to amend the Shoreline Master Program Guidelines to address the impacts of sea level rise and increased storm severity. Ecology is currently conducting that rulemaking, with adoption anticipated in early 2027.	Targeted amendments are recommended, where appropriate, to maintain consistency between the Climate and Shoreline Elements. Comprehensive shoreline regulatory amendments specifically addressing sea level rise should be evaluated following Ecology's adoption of the revised SMP Guidelines to ensure consistency with statewide

#	RCW Section	Legislative Change	Recommended Action
			requirements. The City will continue to monitor Ecology's rulemaking and evaluate whether additional amendments are warranted.

Similarly, review of WAC Chapters 173-18, 173-20, 173-22, 173-26, and 173-27 found no recently adopted amendments requiring substantial revision of the SMP Amendment Package.

3. Review of Comprehensive Plan and Development Regulation Consistency

3.1 Overview

RCW 90.58.080(1)(a)(ii) requires local governments to review changes to the Comprehensive Plan and development regulations to determine whether Shoreline Master Program policies and regulations remain consistent with those documents. WAC 173-26-191 recognizes shoreline policies as an element of the Comprehensive Plan and shoreline regulations as development regulations. WAC 173-26-211 further directs local governments to ensure consistency among shoreline environment designations, land use designations, zoning, and implementing regulations.

This review compared the SMP Amendment Package with the adopted 2025–2045 Comprehensive Plan and the City's current development regulations contained in AMC Titles 18 and 19.

Overall, the review concludes that the SMP Amendment Package remains generally consistent with the City's current planning framework. The SMP Amendment Package also remains an appropriate basis for completing the City's ongoing SMP periodic update.

3.2 Comprehensive Plan Consistency

The City adopted the 2025–2045 Comprehensive Plan following preparation of the SMP Amendment Package. Staff reviewed the Comprehensive Plan to determine whether policy changes require revisions to the proposed Shoreline Element.

The review found that the SMP Amendment Package remains generally consistent with the adopted 2025 Comprehensive Plan. The Comprehensive Plan continues to support the fundamental objectives of the Shoreline Management Act, including protection and restoration of shoreline ecological functions, no net loss of ecological functions, water-dependent and water-oriented uses, shoreline restoration, public access, and protection of the City's maritime economy. These policy directions are reflected in the SMP Amendment Package and do not require substantial revision.

The review identified two areas where updates to the SMP Amendment Package should be considered before adoption.

Table 3.2. Consistency with Comprehensive Plan.

#	Issue	Comprehensive Plan Change	Recommended Action
1	Climate Resilience	The 2025 Comprehensive Plan includes a new Climate Element and expanded policies addressing climate resilience, sea level rise, shoreline hazards, and long-term adaptation. Ecology is currently updating the Shoreline Master Program Guidelines to implement RCW 90.58.630.	Update the proposed Shoreline Element to acknowledge the Climate Element and cross reference appropriate policies regarding climate resilience and protection of shoreline ecological functions. Additional shoreline regulatory amendments addressing sea level rise should be evaluated following adoption of Ecology's revised SMP Guidelines to ensure consistency with statewide requirements.
2	Administrative Updates	Several Comprehensive Plan references, implementation actions, and restoration priorities have been updated since preparation of the SMP Amendment Package.	Update policy references, project descriptions, and implementation actions for consistency with the adopted Comprehensive Plan.

3.3 Development Regulation Consistency

Staff reviewed amendments to AMC Titles 18 and 19 adopted since the SMP Amendment Package to determine whether revisions are necessary to maintain internal consistency.

Overall, the review found that current development regulations remain generally consistent with the proposed shoreline regulations. Most amendments adopted since preparation of the SMP Amendment Package affect administrative procedures, permit processing, code organization, and implementation rather than shoreline policy.

Three areas where revisions are appropriate are discussed in Table 3.3, below.

Table 3.3. Consistency with Development Regulations.

#	Issue	Development Regulation Change	Recommended Action
1	Permit Procedures	Since preparation of the proposed shoreline regulations, the City has continued to refine its permit review procedures, including updates intended to improve coordination among project	Update shoreline permit procedures to coordinate with current Title 19 processes while retaining shoreline-specific requirements mandated by state law.

#	Issue	Development Regulation Change	Recommended Action
		permits and streamline permit review.	
2	Critical Areas Regulations	The City is currently completing another periodic update of the Critical Areas Regulations using current Best Available Science. The shoreline regulations included in the SMP Amendment Package were prepared assuming incorporation by reference of the applicable updated critical area regulations.	Incorporate applicable critical area standards directly into AMC Chapter 19.72 and update them as necessary for consistency with the City's updated Critical Areas Regulations (once adopted) and Shoreline Management Act requirements.
3	Floodplain Management Regulations	The City updated its floodplain management regulations in 2021. The update was informed by a Best Available Science review addressing sea level rise and future flood conditions and occurred after preparation of the proposed shoreline regulations. Flood hazard areas regulated under these provisions overlap with portions of shoreline jurisdiction.	Review and update the proposed shoreline regulations as necessary to maintain consistency with the City's current floodplain management regulations, including applicable standards and references addressing coastal flood hazards and sea level rise.
4	Administrative References	Titles 18 and 19 have been amended since preparation of the SMP Amendment Package, resulting in updated chapter numbering, definitions, and code references.	Update code references, definitions, and cross-references throughout the proposed shoreline regulations.

4. Review of Changed Circumstances, New Information, and Improved Data

RCW 90.58.080(1)(a)(iii) directs local governments to consider whether changed circumstances, new information, or improved data warrant amendments to the Shoreline Master Program during the periodic review process. This review is intended to ensure that shoreline regulations continue to reflect current conditions, scientific information, planning policies, and implementation experience.

Since preparation of the SMP Amendment Package, the City has completed or initiated several planning efforts relevant to shoreline management, including:

- adoption of the 2025–2045 Comprehensive Plan;
- completion of the 2024 Shoreline Master Program Compliance Assessment;

- adoption of updated floodplain management regulations in 2021, informed by Best Available Science review addressing sea level rise and future flood conditions;
- continued implementation of the 2010 Shoreline Master Program;
- ongoing periodic update of the Critical Areas Regulations using current Best Available Science (BAS); and
- continued implementation of the Unified Development Code.

These efforts were reviewed to determine whether they identify substantive issues requiring additional amendments prior to adoption of the Shoreline Master Program update.

The following table summarizes the principal changed circumstances, new information, and implementation experience identified since preparation of the SMP Amendment Package, together with the recommended amendments.

Table 4. Review of Changed Circumstances, New Information & Implementation Experience.

#	Review Topic	Summary of Review	Recommended Amendment
1	Climate Change and Sea Level Rise	Since preparation of the SMP Amendment Package, the City has taken several actions addressing climate change, sea level rise, and coastal flooding hazards. In 2021, the City updated its floodplain management regulations following a Best Available Science review that considered sea level rise and future flood conditions. The City subsequently adopted the 2025 Comprehensive Plan, including a Climate Element that identifies sea level rise as a long-term planning issue. Staff reviewed the updated floodplain regulations and supporting sea level rise information, the Climate Element, current shoreline policies and regulations, and Ecology's ongoing rulemaking implementing RCW 90.58.630. The review found that the existing SMP framework remains generally consistent with the existing SMA and SMP Guidelines. However, targeted updates are appropriate to improve coordination among the SMP, floodplain regulations, and Climate Element.	Update the Shoreline Element and proposed shoreline regulations, as appropriate, to maintain consistency with the City's current floodplain management regulations and Climate Element and to recognize available sea level rise information. More comprehensive shoreline regulatory amendments addressing sea level rise should be evaluated following adoption of Ecology's revised SMP Guidelines to ensure consistency with statewide requirements.

2	2024 SMP Compliance Assessment	The assessment identified opportunities to improve implementation, documentation of no net loss, mitigation sequencing, monitoring, administrative clarity, and consistency with current guidance.	Incorporate the applicable recommendations into the shoreline regulations prior to adoption.
3	Critical Areas Regulations Periodic Update	The City is completing its BAS update. Consultant reports conclude the existing framework remains generally consistent with current science while recommending targeted refinements.	Coordinate the SMP Amendment Package with the final adopted Critical Areas Regulations updates, anticipated by the end of 2026.
4	Shoreline Restoration Planning	Restoration priorities and project status have changed since preparation of the draft Addendum.	Update the Shoreline Restoration Plan Addendum.
5	Implementation Experience	Permit administration has identified opportunities to improve clarity, coordination, and documentation.	Revise administrative provisions and update references.

5. Conclusion

The City has completed the review required by RCW 90.58.080 to determine whether amendments to the Shoreline Master Program Amendment Package are warranted based on changes occurring since preparation of the SMP Amendment Package.

The review included:

- amendments to the Shoreline Management Act and Shoreline Master Program Guidelines;
- changes to the adopted Comprehensive Plan and current development regulations;
- changed circumstances, new information, and implementation experience; and
- recommendations from the 2024 Shoreline Master Program Compliance Assessment.

Based on this review, the staff concludes that the SMP Amendment Package remains generally consistent with current state law, the adopted Comprehensive Plan, and current development regulations. The review did not identify any significant inconsistencies that would require substantial change to the proposed policy or regulatory framework.

Instead, the review identifies targeted amendments necessary to reflect changes occurring since preparation of the SMP Amendment Package, incorporate current planning and regulatory updates, improve implementation, and maintain consistency with current law and City policies.

The review also considered the City's recently adopted Climate Element and Ecology's ongoing rulemaking implementing RCW 90.58.630. Staff conclude that the targeted amendments identified in this report are appropriate to maintain consistency with current law, the Comprehensive Plan, and

current development regulations. Additional shoreline regulatory amendments addressing sea level rise should be evaluated following adoption of Ecology's revised Shoreline Master Program Guidelines.