Request for Critical Areas Review

Planning & Development Services · 1800 Continental Place · Mount Vernon WA 98273
voice 360-416-1320 · inspections 360-416-1330 · www.skagitcounty.net/planning

Permit #:
Received by:

Critical areas review ensures that your project does not injure shorelines, streams, lakes, wetlands, sensitive habitat areas, and aquifer recharge areas, that development is protected from geological hazard and frequently flooded areas, and that your project complies with rules for shoreline protection.

Project Information

Site Address: None | City: Marblemount | Zip: 98267

Parcel No(s): P45543, P128574, P45550, P45548, part of P45548 and P45541

Zoning: Varies, see Other Comments | UGA: ◉ No ○ Yes, which:

Project Description: The proposed project includes site clearing, operation, and reclamation of a bedrock quarry on Rockport Cascade Road approximately one mile south of Marblemount, WA. The project would occur in four steps: 1) Boundary Line Adjustments, Clearing Site, and Building Access Road for Forest Practice Conversion, 2) Mining Within the MRO Overlay Area, 3) Possible Quarry Expansion Contingent on MRO Boundary Change, and 4) Quarry Reclamation.

Directions to site and access instructions: From I-5 at Cook Road, travel east on Cook Road to Borseth St in Sedro-Woolley (4.4 miles). Follow WA-20 E for 32.5 miles. Turn right on SR 530 then turn left on Rockport Cascade Road. Site is approximately 9 miles northeast on Rockport Road on the right.

Required Attachments

- ☑ Contact Information & Signature Form
- ☑ Critical Areas Checklist (next page)
- ☑ Assessor's map on 8 ½ x 11 paper with the subject parcel identified
- ☑ Site plan including:
  - ☑ requested review area clearly identified (at minimum, the project area)
    Consider including any future areas of property development within your requested review area. Doing so may help you avoid having to do critical areas review again for future permit applications. If there are no critical areas on the property and its immediate vicinity, you should consider specifying the entire property as the review area.
  - ☑ roads and other landmarks that can help identify the project area
  - ☑ any existing structures on site

Site Visit

If a visit to your property is required to check for the presence of critical areas, do you wish to be present?

- ◉ No (usually completed in 1-2 weeks)
- ○ Yes (additional coordination is required; usually completed in 3-4 weeks)

Contact Information & Signature Form

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voice 360-416-1320 · inspections 360-416-1330 · www.skagitcounty.net/planning

Permit #:
Received by:

Attach this form to a permit application that requires it. A permit application will not be accepted without this form.

By signing this form, the undersigned certifies that the statements, answers, and information both on this form and the remainder of this permit application are true and correct to the best of his or her knowledge and belief.

Applicant/Contact

Name: Kiewit Infrastructure Co. Mailing Address: 2200 Columbia House Blvd
City, State: Vancouver, WA Zip: 98661 Phone: (360) 693-1478
Email: chuck.nylund@kiewit.com

Property Owner

☐ Same as applicant ■ Multiple owners (attach additional page)

Name: See additional page Mailing Address:
City, State: Zip: Phone:
Email:

Contractor

☐ None ☒ Same as applicant ☐ Same as property owner

Name: Mailing Address:
City, State: Zip: Phone:
Email: License #: Expires:

Financing[1]

■ None ☐ Lender below is providing construction financing ☐ Firm below has issued payment bond

Name: Mailing Address:
City, State: Zip: Phone:

Signature

☐ I am the owner of the subject property and I grant permission to field staff to enter the site to verify the presence or absence of critical areas and perform inspections of work proposed by this application; OR

■ I have the consent of the owners of the subject property and have attached Agent Authorization Form(s) (SCC 14.06.090); OR

☐ This is a mechanical/plumbing permit; ownership certification is not required.

Signature(s): Date: Jan 22, 2019
Printed Name: Charles Dale Nylund
Title: Estimating Director
Company: Kiewit Infrastructure Co.

[1] Required by RCW 19.27.095(2)(d).

Marblemount Quarry
Additional Sheet
Skagit County Contact Information & Signature Forms

Property Owner

Skagit County Parcel #s: P45541, P45548
Name: Kiewit Infrastructure Co.
Mailing Address: 2200 Columbia House Blvd
City, State: Vancouver, WA
Zip: 98661
Phone: (360) 693-1478
Email: chuck.nylund@kiewit.com

Property Owner

Skagit County Parcel #: P45543
Name: A. Ann Parker, Trustee
Mailing Address: P.O. Box 8
City, State: Hamilton, WA
Zip: 98255
Phone: (360) 826-1109
Email: johnecakes@aol.com

Property Owners

Skagit County Parcel #s: P128574, P45550, P120304
Name: Kevin Ashenfelter
Name: Sue Ashenfelter
Mailing Address: PO Box 249
City, State: Marblemount, WA
Zip: 98267
Phone: (360) 770-4506
Email: ashenfs@outlook.com

Kiewit

SUP

Agent Authorization Form

Planning & Development Services · 1800 Continental Place · Mount Vernon WA 98273
voice 360-416-1320 · inspections 360-416-1330 · www.skagitcounty.net/planning

Permit #:
Received by:

Use this form to authorize someone other than the property owner to apply for permits for the subject property.

Project Site

Property Address: P45548 and P45541; Rockport Cascade Road

City, State, Zip: Marblemount, WA 98267

Authorization Statement

I/we, as the owners of the property identified above, authorize Charles Dale Nylund, Kiewit Infrastructure Co. to act as agent to submit applications, receive correspondence regarding the application, and sign title notices on my behalf.

I/we grant permission to field staff to enter the site to verify the presence or absence of critical areas and perform inspections of work proposed by this application.

Property Owner Signature(s)

Signature:	[signature]	Signature:	
Printed Name:	CHARLES D. NYLUND	Printed Name:	
Title:	ESTIMATING DIRECTOR Co.	Title:	
Company:	KIEWIT INFRASTRUCTURE INC	Company:	
Date:	FEB 19, 2019 DRC FOR CN 2/20/19	Date:	

Notarization

I certify that I know or have satisfactory evidence that CHARLES D. NYLUND is/are the person(s) who appeared before me, and said person(s) acknowledged that he/she signed this instrument and acknowledged it to be his/her free and voluntary act for the uses and purposes mentioned in the instrument.

Dated: 2/19/2019

COREY ROBIN ANDERSON NOTARY PUBLIC STATE OF WASHINGTON COMM. EXP. 12/07/2022 COMM. NO. 125650

(Notary seal or stamp above)

[signature]
Signature of Notary Public

COREY ROBIN ANDERSON
Printed Name of Notary Public

My appointment expires 12/7/2022

Agent Authorization Form

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voice 360-416-1320 · inspections 360-416-1330 · www.skagitcounty.net/planning

Permit #:
Received by:

Use this form to authorize someone other than the property owner to apply for permits for the subject property.

Project Site

Property Address: P45543, Rockport Cascade Road

City, State, Zip: Marblemount, WA 98267

Authorization Statement

I/we, as the owners of the property identified above, authorize Charles Dale Nylund, Kiewit Infrastructure Co. to act as agent to submit applications, receive correspondence regarding the application, and sign title notices on my behalf.

I/we grant permission to field staff to enter the site to verify the presence or absence of critical areas and perform inspections of work proposed by this application.

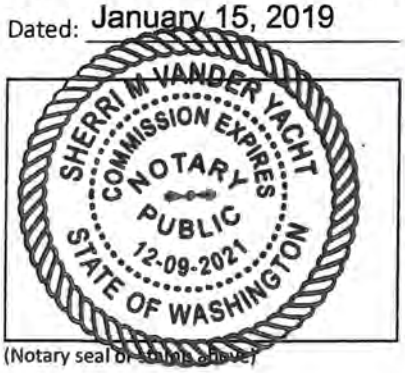
Property Owner Signature(s)

Signature:	A. Ann Parker	Signature:	
Printed Name:	A. Ann Parker	Printed Name:	
Title:	Trustee	Title:	
Company:	Cunningham Family Trust	Company:	
Date:	January 15, 2019	Date:	

Notarization

I certify that I know or have satisfactory evidence that A. Ann Parker is/are the person(s) who appeared before me, and said person(s) acknowledged that he/she signed this instrument and acknowledged it to be his/her free and voluntary act for the uses and purposes mentioned in the instrument.

Dated: January 15, 2019



(Notary seal or stamp above)

Signature of Notary Public

Printed Name of Notary Public

My appointment expires 12-9-21

CAO

Permit #:
Received by:

Agent Authorization Form

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voice 360-416-1320 · inspections 360-416-1330 · www.skagitcounty.net/planning

Use this form to authorize someone other than the property owner to apply for permits for the subject property.

Project Site

Property Address: P45550, P128574, P120304; Rockport Cascade Road

City, State, Zip: Marblemount, WA 98267

Authorization Statement

I/we, as the owners of the property identified above, authorize Charles Dale Nylund, Kiewit Infrastructure Co. to act as agent to submit applications, receive correspondence regarding the application, and sign title notices on my behalf.

I/we grant permission to field staff to enter the site to verify the presence or absence of critical areas and perform inspections of work proposed by this application.

Property Owner Signature(s)

Signature:	Kevin E. Ashenfelter	Signature:	Sue Ashenfelter
Printed Name:	Kevin Ashenfelter	Printed Name:	Sue Ashenfelter
Title:		Title:	
Company:		Company:	
Date:		Date:	

Notarization

I certify that I know or have satisfactory evidence that Kevin Ashenfelter and Sue Ashenfelter is/are the person(s) who appeared before me, and said person(s) acknowledged that he/she signed this instrument and acknowledged it to be his/her free and voluntary act for the uses and purposes mentioned in the instrument.

Dated: 1/16/2019

MILLIE A. FOSBERG NOTARY PUBLIC COMMISSION EXPIRES 06-01-2019 STATE OF WASHINGTON

(Notary seal or stamp above)

Millie A. Fosberg
Signature of Notary Public

Millie A Fosberg
Printed Name of Notary Public

My appointment expires 06 01 2019

MILLIE A. FOSBERG NOTARY PUBLIC COMMISSION EXPIRES 06-01-2019 STATE OF WASHINGTON

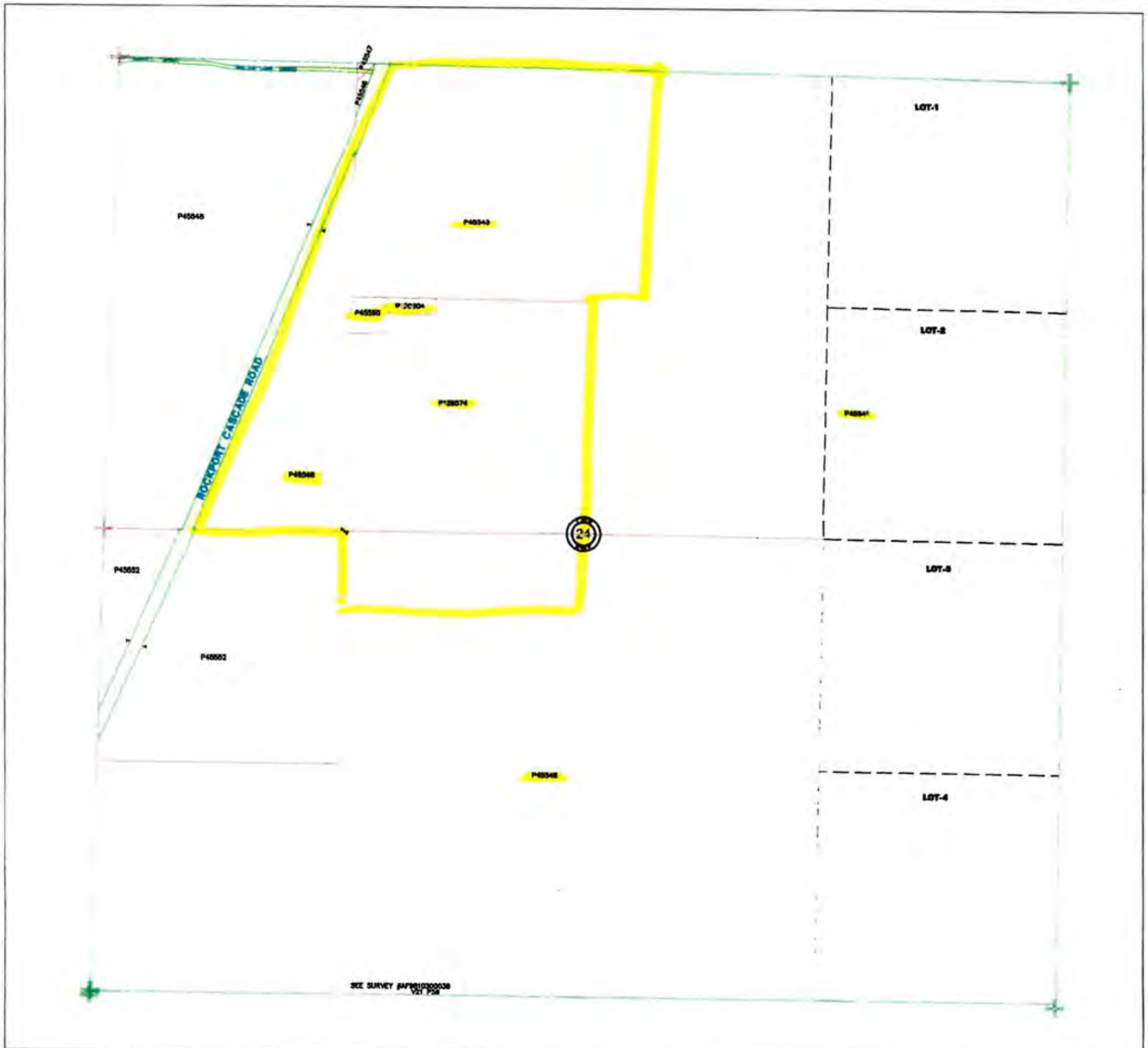
Critical Areas Checklist

Please answer the following questions concerning Critical Area indicators located on or within 300 feet of the review area.

1. Are you aware of any environmental documentation that has been prepared related to critical areas that includes the subject area? Attach any existing documentation.	◉Yes ○No ○Unknown
2. Are there any surface waters (including year-round and seasonal streams, saltwater, lakes, ponds, bogs, fens, swamps, marshes)?	◉Yes ○No ○Unknown
3. Is there vegetation that is associated with wetlands?	○Yes ◉No ○Unknown
4. Have any wetlands been identified?	○Yes ◉No ○Unknown
5. Are there areas where the ground is consistently inundated or saturated with water?	○Yes ◉No ○Unknown
6. Are there any State or Federally listed sensitive, endangered or threatened species and habitats?	◉Yes ○No ○Unknown
7. Are there slopes of 15% or greater?	◉Yes ○No ○Unknown
8. Are there any landslide hazard areas?	◉Yes ○No ○Unknown
9. Is the project located within a Flood Hazard Zone?	○Yes ◉No ○Unknown

Provide any other comments:

Zoning:
P45543 RRc-NRL with MRO Overlay
P120304 SF-NRL with MRO Overlay
P45550 SF-NRL with MRO Overlay
P128574 SF-NRL with Partial MRO Overlay (west half of parcel)
P45548 RRc-NRL with MRO Overlay on northwestern portion, SF-NRL with partial MRO Overlay on southern portion, IF-NRL on southeastern portion
P45541 SF-NRL on western portion and IF-NRL on eastern portion



SKAGIT COUNTY

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

T 35 N R 10 E

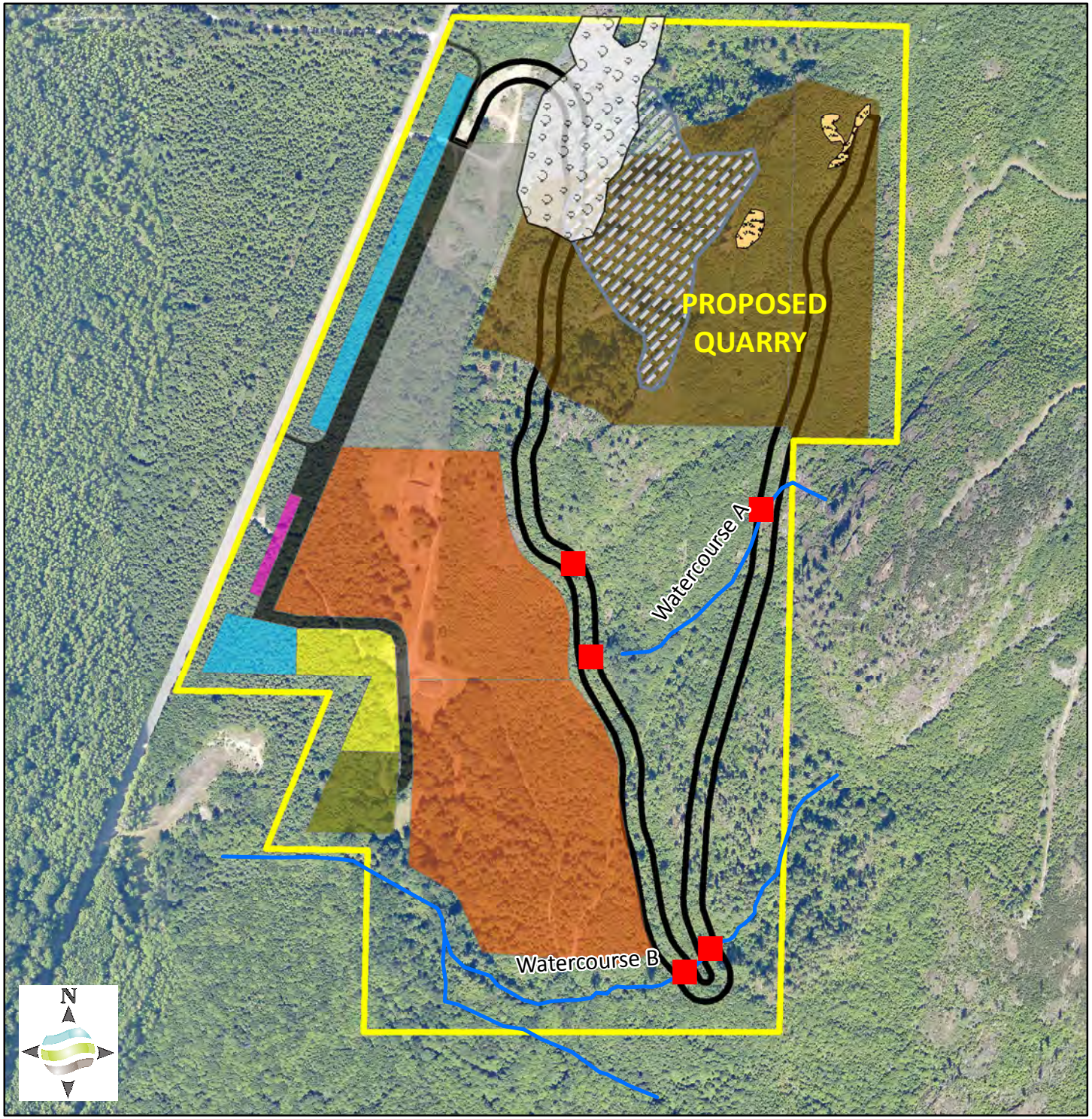
N
W E
S

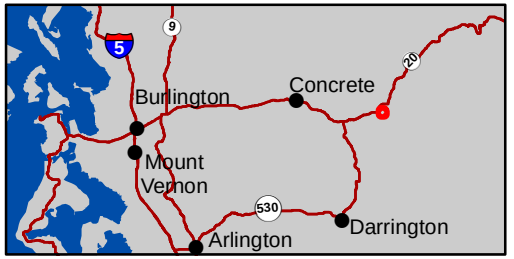
0 400
Scale in feet

	DATE	INIT.
DRAWN BY	5/2/96	AF
REVISED	4/10/14	DP
PLOTTED	4/10/14	DP

MAP PRODUCED BY SKAGIT COUNTY MAPPING SERVICES

Section 24
T 35 N R 10 E





- Proposed Culvert
- Watercourses
- Talus
- Snags
- balds
- Project Boundary

Proposed Quarry Activies

- Armor Stone Stockpiling and Crushing
- Access/Scale Roads
- Explosives Storage Exclusion Area
- Undersized Stockpile Area
- Misc. Structures Footprint
- Quarry Footprint
- Soil Stockpile
- Stormwater Facilities
- Proposed Access Road

Miles
0 0.05 0.1 0.2

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info@elementsolutions.org
Phone: 360.671.9172

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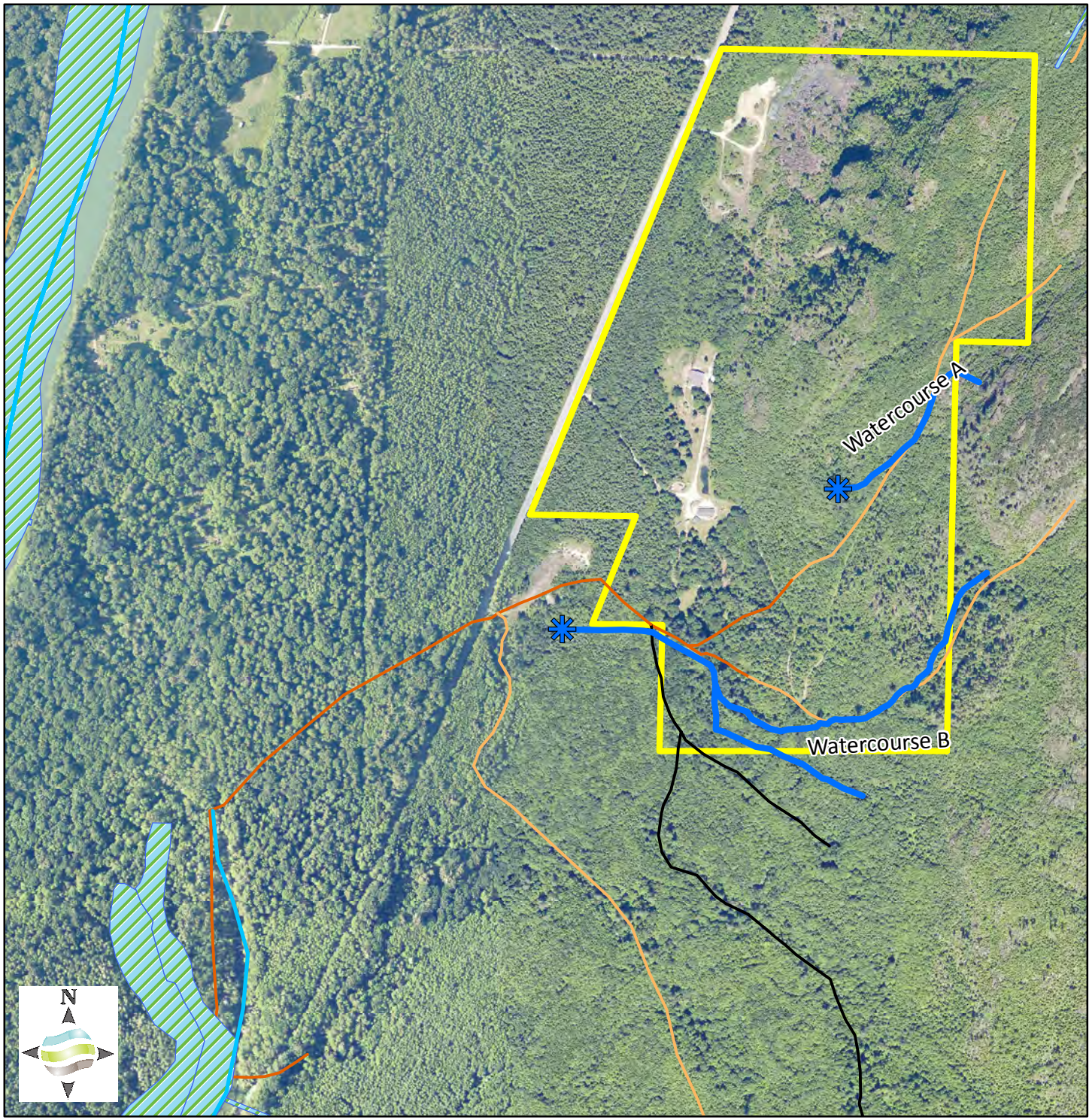
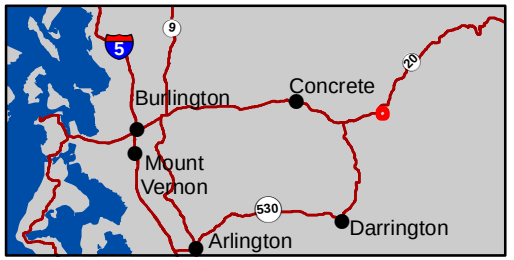
FIGURE 2

Proposed Project within Action Area showing Critical Areas and Priority Habitats

Date: 2/6/2019

Path: P:\Pse Project\2017008\ENVRMNT\GIS\BA\Fig_2_BA.mxd





Project Boundary

Infiltration Ares

Feild-verified Watercourses

WDFW Fish Bearing Streams Data

USFWS NWI Wetland Data

DNR Stream Type Data

Fishbearing

Non-Fishbearing

Shoreline

Untyped

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FIGURE 3

Vicinity streams and wetlands
as mapped by WDFW, DNR, or USFWS

Date: 2/6/2019

Path: P:\Pse Project\2017008\ENVRMNT\GIS\BA\Fig_3_BA.mxd

SKAGIT COUNTY CRITICAL AREAS REPORT
GEOLOGICALLY HAZARDOUS AREAS (SCC 14.24.400)
MARBLEMOUNT QUARRY

Submitted to: Chuck Nylund

Kiewit Infrastructure Company

January 15, 2019

Submitted by:
Element Solutions
909 Squalicum Way
Suite 111
Bellingham, WA 98225
Office | (360) 671-9172
info@elementsolutions.org

Table of Contents

1. INTRODUCTION

1.1 Purpose

Element Solutions (Element) was retained by the client to provide professional consulting services to identify the potential occurrence of regulated environmental areas and evaluate any potential impacts from the proposed project action to comply with environmental regulatory code. The proposed project action is the development of a rock quarry, as described in detail in **Section 1.2**. The subject property is located near Marblemount in Skagit County, Washington (**Figure 1**) and includes Tax Parcels P45543, P45550, P120304, P128574, and parts of P45548 and P45541 as detailed in **Section 1.3**. The subject property was identified by Skagit County as potentially containing regulated environmental areas as defined under Skagit County Critical Areas Ordinance (SCC 14.24) as detailed in **Section 1.4**. Pursuant to the review and reporting requirements specified in this code, the objectives of the assessment were to evaluate and describe, to the extent feasible, the 1) existing site conditions, 2) occurrence, functions, and processes of regulated areas, and 3) potential impact from the proposed project action on regulated areas. Recommendations for avoiding, minimizing and/or mitigating potential impacts as relevant are provided in accordance with the assessment and reporting requirements specified in the regulatory code.

1.2 Proposed Project Action

Brief Description

The Proposed Project includes boundary line adjustments, site clearing, site grading, road building, quarry operations, and reclamation of a bedrock quarry on Rockport Cascade Road approximately one mile south of Marblemount, WA (**Figure 1**). The Proposed Project will involve development activities on parcels P45543, P128574, P120304, P45550, and parts of P45548 and P45541 (**Figure 2**). A majority of the mining would take place on P45543, which has been used as a small-scale quarry (under 3 acres) over the past several decades. The overall project limit footprint at full buildout is approximately 120 acres. At full buildout, the proposed mining footprint would encompass approximately 30 acres (20 acres proposed for Phase I); quarry operations—including roads, stockpile areas, stormwater management, and operations areas—would encompass approximately 60 acres; and approximately 30 acres would be retained vegetation areas.

Currently, stands of second-growth timber cover a majority of the site and an approximately 800-foot-high rock face dominates P45543. This rock face consists of Shuksan greenschist, which is the desired quarry stone source.

The proposed project would occur in four steps:

1. Boundary Line Adjustment, Site Clearing, Preparation, and Building Access Road for Forest Practice Conversion;
2. Mining within the MRO Overlay Area;
3. Possible Quarry Expansion, Contingent on MRO Boundary Change, and;
4. Quarry Reclamation.

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Step 1 – Boundary Line Adjustment, Site Clearing, Preparation, and Building Access Road for Forest Practice Conversion would include acquiring and performing boundary line adjustments on P128574. The property line would be adjusted to encompass approximately 10.2 acres of P45541. Additionally, an approximately 20.2-acre portion of P45548 would also be boundary line adjusted to P128574. Step 1 also includes clearing, removing stumps, site grading, and road construction on Parcels P45543, P45550, P120304, P128574, and parts of P45548 and P45541. Marketable timber will be removed from the site. An approximately 6,700-foot gravel access road would be built to access the top and eastern portions of the project site. Wood mulch and top soil would be stockpiled on site for future reclamation. Access to the site would include building two new access driveways on Rockport Cascade Road and decommissioning the two existing access points. Grading and roadways for quarry operations and stormwater management will be constructed on the western portion of the project limits. The road providing access to the eastern portion of the site would be designed to meet or exceed Skagit County standards, Washington Department of Natural Resources (DNR) Forest Practice and Mining standards, and any other standards appropriate for its use. Following site clearing and preparation, the road would be used to access the top of the quarry and for hauling rocks to the bottom for processing.

Step 2 – Mining within the MRO Overlay Area would include establishing the quarry on P45543 within the current MRO boundary per the Mining Site Plan. Step 2 would also include the construction of mining operation areas and support facilities, including an armor stone staging area in the western portion of P45543. This step would also involve constructing portable offices/storage structures, a truck loadout scale, a heavy equipment and employee parking area, a fueling station, maintenance shops, and storage facilities for blasting equipment. An undersized rock stockpile area would be established within the existing MRO area on P128574 and a potential future phase undersized rock stockpile area has been designated if the MRO boundary is successfully expanded (see Step 3). Rock mining would be conducted using a "top down" approach, such that rock would be transported to the stockpile or staging areas by truck, instead of being cast off the cliff face. The land use to the south, east, and west is secondary and industrial forestry and the land use to the north is rural residential. A minimum 100-foot setback would be maintained along adjacent property lines or bordering quarry activities. A 50-foot vegetative buffer would be maintained on Rockport Cascade Road.

Step 3 – Possible Quarry Expansion, Contingent on MRO Boundary Change, would include quarry and undersized rock stockpile area expansions. Step 3 is dependent upon an expansion of the MRO through the Skagit County Comprehensive Plan Amendment process. Once the MRO overlay is expanded, the quarry area would expand approximately 10 acres into P45541, and the undersized rock stockpile area described in Step 2 would expand to the south (approximately 20 acres) onto P45548 to accommodate the additional undersized rocks from the expanded quarry. The mining activities of Step 3 would be the same as those in Step 2.

Step 4 – Quarry Reclamation would include full reclamation of all the affected parcels following decommissioning of the quarry, roads, and supporting mining operations. The full lifespan of the quarry would be up to 100 years or whenever the source of rock is exhausted. The Mining Reclamation Plan is consistent with DNR surface quarry reclamation regulations. The land will be restored to forestry land use following reclamation.

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1.3 Location and Physiography

The study area is located in unincorporated Skagit County in the NE ¼ of the NW ¼ of Section 24 and the SW ¼ of Section 13, Township 35 North, and Range 10 East of the Willamette Meridian. The subject parcel is approximately 1.25 miles south of Marblemount and 0.5 miles east of the Skagit River (**Figure 1**). Existing access to the site is possible from Rockport Cascade Road via a short gravel driveway and turnaround. Ground surface elevations in the study area vicinity range from approximately 300 feet along the western parcel boundary to approximately 1,200 feet at the crest of the rock outcrop (all elevations NAVD 88). The presumed hydrologic gradient is roughly easterly to westerly; no wetlands are mapped in or adjacent to the study area nor were any observed on site. Two small watercourses were identified in the southern portion of the site during the field reconnaissance (**Figure 2**).

1.4 Geologically Hazardous Areas Designation and Applicable Code

SCC regulates Geologically Hazardous Areas through Title 14, Chapter 14.24, and Article 4 – Geologically Hazardous Areas. General "Geologically Hazardous Areas" as defined in Section 14.24.400 of the SCC are described in the following statement:

"Geologically hazardous areas shall be designated consistent with the definitions provided in WAC 365-190-080(4). These include areas susceptible to the effects of erosion, sliding, earthquake, or other geologic events. They pose a threat to the health and safety of citizens when incompatible residential, commercial, industrial, or infrastructure development is sited in areas of a hazard. Geologic hazards pose a risk to life, property, and resources when steep slopes are destabilized by inappropriate activities and development or when structures or facilities are sited in areas susceptible to natural or human-caused geologic events. Some geologic hazards can be reduced or mitigated by engineering, design, or modified construction practices so that risks to health and safety are acceptable. When technology cannot reduce risks to acceptable levels, building and other construction in, above and below geologically hazardous areas should be avoided."

More specifically, hazard classes are defined by the criteria listed below:

Erosion Hazard Areas

SCC 14.24.410(1) states that Erosion Hazard Areas specifically include:

a) Areas with gradients greater than or equal to 30%.

b) Areas located within the following map units: No. 1 Andic Cryochrepts, Nos. 3 and 4 Andic Xerocrepts, No. 13 Birdsview, Nos. 47 and 48 Dystric Xerochrepts, Nos. 50 and 51 Dystic Xerorthents, Nos. 63 and 65 Guemes, No. 69 Hoogdal, No. 90 Lithic Haploxerolls, No. 91 Marblemount, No. 99 Mundt and Nos. 150 and 151 Typic Croyorthods or mapped severe erosion hazard, as identified in the U.S. Department of Agriculture Natural Resources Conservation Service Soil Survey of Skagit County Area, WA (1989).

c) Coastal beaches or bluffs.

d) Areas designated in the Department of Ecology, Coastal Zone Atlas, Washington, Volume Two Skagit County (1978) as U (Unstable), UB (Unstable Bluff), URS (Unstable Recent Slide), or UOS (Unstable Old Slide).

e) Areas susceptible to rapid stream incision and stream bank erosion.

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Landslide Hazard Areas

In regard to Landslide Hazards, SCC 14.24.410(2) states that "landslide hazards are areas potentially subject to landslides based on a combination of geologic, topographic and hydrologic factors."

These areas may include:

a) Areas designated in the Department of Ecology, Coastal Zone Atlas, Washington, Volume Two, Skagit County (1978) as U (Unstable), UB (Unstable Bluff), URS (Unstable Recent Slide), or UOS (Unstable Old Slide).

b) Slopes having gradients of 15% or greater:

   (i) That intersect geologic contacts with permeable sediments overlying low-permeability sediment or bedrock and springs or groundwater seepage are present; or

   (ii) That are parallel or subparallel to planes of weakness (such as bedding planes, joint systems, and fault planes) in subsurface materials.

c) Slopes of 40% or steeper and with a vertical relief of 10 feet or more.

d) Areas of previous failure such as earth slumps, earthflows, mudflows, lahars, debris flows, rock slides, landslides or other failures as observed in the field or as indicated on maps or in technical reports published by the U.S. Geological Survey, the Geology and Earth Resources Division of DNR, or other documents authorized by government agencies.

e) Potentially unstable areas resulting from rapid stream incision, stream bank erosion, and undercutting by wave action.

f) Coastal bluffs.

g) Slopes with a gradient greater than 80% and subject to rock fall.

h) Areas that are at risk from snow avalanches.

i) Areas designated on the Skagit County Alluvial Fan Study Orthophoto Maps as alluvial fans or as identified by the Administrative Official during site inspection.

j) Areas located in a narrow canyon potentially subject to inundation by debris flows or catastrophic flooding.

k) Those areas delineated by the U.S. Department of Agriculture's Natural Resources Conservation Service Soil Survey of Skagit County as "severe" (Table 9) limitation for building development.

Seismic Hazard Areas

SCC 14.24.410(3) states that Seismic Hazard areas specifically include "areas (that) are subject to severe risk of damage as a result of earthquake-induced ground shaking, slope failure, settlement, soil liquefaction or surface faulting." These Seismic Hazard Areas include:

a) Areas located within a high liquefaction susceptibility area as indicated on the Liquefaction Susceptibility Map of Skagit County issued by Washington Department of Natural Resources dated September 3, 2004, or as amended thereafter. A site assessment is not required for

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high liquefaction hazard areas for single-family residence proposals unless other criteria provided in this Section apply.

b) Areas located within 1/4 mile of an active fault as indicated on investigative maps or described in studies by the United States Geologic Survey (USGS), Geology and Earth Resources Division of the Washington Department of Natural Resources, or other documents authorized by government agencies, or as identified during site inspection.

c) Those known or suspected erosion and landslide hazards referenced in Subsections (1) and (2) of this Section.

d) Tsunami and seiche hazard areas include coastal areas and lake shoreline areas susceptible to flooding, inundation, debris impact, and/or mass wasting as the result of coastal or inland wave action generated by seismic events or other geologic events.

Skagit County does not require a site assessment for tsunami and seiche hazard areas.

Volcanic Hazard Areas

SCC 14.24.410(4) states that Volcanic Hazard Areas are areas that "are subject to pyroclastic flows, lava flows, debris avalanche, and inundation by debris flows, mudflows, lahars or related flooding resulting from volcanic activity. Suspect volcanic hazards include those areas indicated in the USGS Open-File Report 95-499 as the volcanic hazard zone for Glacier Peak, Washington; or in the USGS Open-File Report 95-498 as the volcanic hazard area of Mount Baker, Washington."

Skagit County does not require a site assessment for Volcanic Hazard Areas unless other Critical Areas designations also apply to the subject site.

Mine Hazard Areas

SCC 14.24.410(5) states that Mine Hazard Areas are "as designated on the Department of Natural Resources Map: Coal Measures of Skagit County (1924) or within 200 feet of any other current or historic mine operations determined to be a suspect or known geologically hazardous area by the Administrative Official."

In SCC 14.24.430, Skagit County has defined a series of requirements which apply to all development activities occurring within Geologically Hazardous Areas. The requirements include a mitigation plan prepared by an environmental professional describing the proposed project and discussing the design measures being utilized to avoid and minimize impacts to the Critical Areas described above. Mitigation plans must include "the location and methods of drainage, locations and methods of erosion control, a vegetation management and/or restoration plan and/or other means for maintaining long-term stability of geologic hazards."

In addition, the plan should also address "the potential impact of mitigation on the hazard area, the subject property and affected adjacent properties." Mitigation plans must be approved by the Administrative Official, and must be implemented as a condition of project approval.

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1.5 Mitigation Standards

As described in SCC 14.24.430(1), Mitigation Standards may include:

a) A temporary erosion and sedimentation control plan prepared in accordance with the requirements of Chapter 14.32 SCC (Drainage Ordinance), as amended.

b) A drainage plan for the collection, transport, treatment, discharge and/or recycling of water in accordance with the requirements of Chapter 14.32 SCC, as amended. Surface drainage shall not be directed across the face of a landslide hazard (including marine bluffs or ravines). If drainage must be discharged from the hazard area into adjacent waters, it shall be collected above the hazard and directed to the water by tight line drain and provided with an energy dissipating device at the point of discharge.

c) All proposals involving excavation and/or placement of fill shall be subject to structural review under the appropriate provisions of the International Building Code (IBC) as amended by Skagit County.

d) Critical facilities as defined under Chapter 14.04 SCC shall not be sited within designated geologically hazardous areas with the exception of volcanic hazard areas. No critical facilities shall be located within 1/4 mile of an active fault.

e) All infiltration systems, such as stormwater detention and retention facilities and curtain drains utilizing buried pipe or French drains, are prohibited in geologically hazardous areas and their buffers unless the mitigation plan indicates such facilities or systems will not affect slope stability.

f) Existing vegetation shall be maintained in landslide and erosion hazard areas and associated buffers. Any replanting that occurs shall consist of native trees, shrubs, and ground cover that is compatible with the existing surrounding native vegetation, meets the objectives of erosion prevention and site stabilization, and does not require permanent irrigation for long-term survival. Normal nondestructive pruning and trimming of vegetation for maintenance purposes; or thinning of limbs of individual trees to provide a view corridor, shall not be subject to these requirements.

g) A minimum buffer width of 30 feet shall be established from the top, toe and all edges of all landslide and erosion hazard areas. For landslide and erosion hazard areas with a vertical relief greater than 50 feet, the minimum buffer shall be 50 feet. The buffer may be increased by the Administrative Official for development adjacent to a marine bluff or ravine which is designated as Unstable in the Coastal Zone Atlas, Washington, Volume Two, Skagit County (1978) or where the Administrative Official determines a larger buffer is necessary to prevent risk of damage to existing and proposed development.

h) Structural development proposals within seismic hazard areas shall meet all applicable provisions of the IBC as amended by Skagit County. The Administrative Official shall evaluate documentation submitted pursuant to SCC 14.24.420(2) and condition permit approvals to minimize the risk on both the subject property and affected adjacent properties. All conditions shall be based on known, available, and reasonable methods of prevention, control and treatment. Evaluation of geotechnical reports may also constitute grounds for denial of the proposal.

i) No residential structures shall be located in geologic hazard areas or their buffers if that hazard cannot be fully mitigated.

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Landslide or Erosion Hazard Buffer Reduction

As described in SCC 14.24.430 (2), buffers of landslide or erosion hazard areas may be reduced to a minimum of 10 feet for development meeting all of the following criteria:

a) No reasonable alternative to buffer reduction exists; and

b) A site assessment is submitted and certifies that:

(i) There is a minimal hazard in the vicinity of the proposed development as proven by evidence of no landslide activity in the past; and

(ii) A quantitative slope stability analysis indicates no significant risk to the development proposal and adjacent properties; or the geologically hazardous area can be modified; or the development proposal can be designed so that the hazard is eliminated. The quantitative analysis shall include the minimum setback allowed for development as indicated by a slope stability model with respect to a minimum factor of safety of 1.5 for static conditions, 1.25 for seismic conditions, or 10 feet, whichever results in the greater setback. The elements of the quantitative site assessment shall be determined by the Administrative Official and may include 1 or more of the following:

A. Subsurface exploration, to include at least 1 boring with sample collection for laboratory analysis.

B. Laboratory analysis shall assess the soil characteristics and include sieve analysis, moisture, angle of internal friction, and cohesion.

C. Utilizing the information from the subsurface exploration and laboratory analysis, the quantitative site assessment shall include slope stability modeling with factor of safety analysis. The analysis shall indicate the factor of safety within 50 feet of the top and toe of geologic hazards; and

(iii) The development will not significantly increase surface water discharge or sedimentation to adjacent properties beyond pre-development conditions; and

(iv) The development will not decrease slope stability on adjacent properties; and

(v) Such alterations will not adversely impact other critical areas.

2. Geologically Hazardous Areas Assessment

2.1 Methods

The following assessment integrates the best available science to characterize the existing conditions at the subject site and utilizes both desktop and field assessment methods. Analyses were conducted by a qualified professional and include previous studies and information as well as new interpretations based on professional judgment and experience. Evaluation of impacts uses industry and regulatory standards. Assessment methods integrated both desktop and field assessment methods as described below.

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2.2 Existing Conditions Characterization - Desktop Analysis

2.2.1 Spatial Data

The desktop analysis utilized in this assessment was conducted by licensed geologist and is built on previous studies and information performed by others; however, it includes new interpretations based on professional judgment and experience. The desktop data is inventoried below in Table 1.

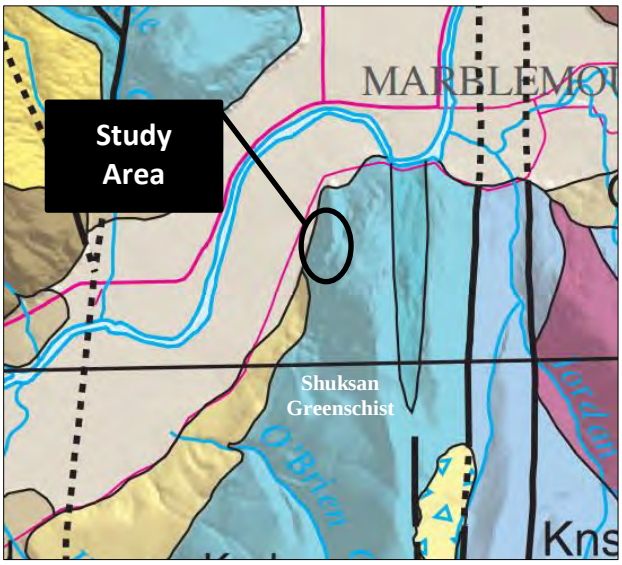
Table 1: Data Used for Desktop Analysis

Data	Format	Date	Source
Aerial photography (NAIP Orthophoto)	SID	2011 - 2017	USDA and Skagit County
LiDAR	Bare earth grid	2006 and 2016	PSLC and WADNR
Geology	Shapefile	2006	DNR 1:100,000 Digital Geology
Soils	Accessed online	Current	USDA/NRCS Web Soil Survey
Topographic Contour Map	Shapefile	2016	Generated from LiDAR

2.2.2 Previous Studies and Information

Geologic Mapping and Literature Review

The study area occurs within a tectonically active, accretionary terrane. The Shuksan Greenschist is a member of the Easton Metamorphic suite, which also includes Darrington Phyllite, a metasedimentary unit which stratigraphically overlies the Shuksan Greenschist (see illustration at right adapted from Dragovich et. al., 2003). The oceanic shale and sandstone protolith of the Darrington Phyllite was deposited on top of the oceanic basalt protolith of the Shuksan Greenschist, which originally formed in the Middle and Late Jurassic and was metamorphosed in the Early Cretaceous (Brown, 1987). The Shuksan Greenschist is described as follows:



"*The Shuksan Greenschist is a fine-grained but well-recrystallized metamorphic rock, commonly containing sodic amphiboles.*" - Tabor et. al, 2003

"*Predominantly fine grained greenschist and (or) blueschist derived mostly from probable Jurassic ocean-floor basalt. Blueschist contains an unusual dark-blue amphibole. The crystals are typically very small and, even with a hand lens, are not easily distinguished.*" - Tabor and Haugerud, 2009

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"*Mostly well-recrystallized and strongly S1-foliated metabasaltic greenschist or blueschist; greenschist is shades of greenish gray and weathered to light olive gray; blueschist is bluish gray to bluish green; locally includes quartzite (metachert) and graphitic phyllite interlayers; commonly layered on a centimeter scale and contains conspicuous epidote and (or) quartz segregations; S1 foliation and layering are commonly folded on an outcrop scale.*" - Dragovich at. al., 2003

Bedrock Structure

The Shuksan Greenschist outcrops along the western flank of the North Cascades in Washington State in a fragmented, north-south trending belt roughly 111 miles long. The metamorphic facies (blueschist and/or greenschist) are consistent with low temperature, high-pressure subduction zone metamorphism (estimated 330 – 400°C and 7 – 9 kilobars) which began roughly 144 – 164 million years ago (Ma) (Brown, 1986). Emplacement occurred with uplift and imbrication due to thrust faulting and displacement along high-angle north-south trending strike-slip faults; the time of emplacement has been roughly constrained to between 75 Ma and 105 Ma. As described in Brown, 1986, fault zones in the Shuksan Greenschist are "characterized by the development of mylonite, typically 1 to 2 m thick, and showing minor new crystallization of quartz, chlorite, muscovite, stilpnomelane, and calcite."

2.3 Existing Condition Characterization - Field Assessment

A field visit of the subject property was conducted by a qualified Element environmental professional on October 22, 2018. The investigation consisted of walking the site focusing on the areas identified in the desktop analysis. The following subsections describe conditions that were observed while in the field.

In summary, the site consists of two distinct geomorphic conditions: natural, steep bedrock foothill topography, including cliffs with talus, and a low gradient Holocene alluvial terrace (**Figure 2**). The site ranges from sparsely vegetated to densely vegetated. A forest fire in ~1998 burnt most of the timber on the foothills in the project vicinity and young timber stands are reestablishing in the burnt areas. The alluvial terrace has been historically logged and cleared and is sparsely vegetated. Two small watercourses flow down the steep topographic areas and infiltrate into the alluvial terrace east of the proposed quarry. A proposed access road will cross these watercourses. No seeps or flowing streams were observed in the area where quarrying is proposed. The proposed mining will take place within the steep bedrock while the quarry operations will primarily take place within the alluvial terrace. The access road will cross steep slopes to access the east, upper portions of the subject site. The steep slopes were generally found to be bedrock with shallow soils, colluvium, and talus. The steep bedrock cliffs and slopes create the potential for geologically hazardous areas. The presence of talus indicates that rockfall processes occur intermittently at this site. Talus ranges in size from small particulate to boulders in excess of 10-foot in diameter. No evidence in the field or in the desktop analysis revealed any historic deep-seated landslide occurrence within the subject site.

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2.4 Assessment of Critical Areas

Table 3 summarizes the geologic hazards as defined by SCC 14.24 that were identified as potentially occurring at this site:

Table 3: Geological Hazard Summary for Subject Area

Critical Area	Present on Subject Property?
Landslide Hazard Critical Area	**Yes**
Seismic Hazard Critical Area	**Yes**
Alluvial Fan Hazard Critical Area	**No**
Volcanic Hazard Critical Area	**No**
Erosion Hazard Critical Area	**Yes**
Tsunami and Seiche Hazard Critical Area	**No**
Mine Hazard Critical Area	**No**

2.4.1 Rockfall Geologic Hazards

A primary focus for this project site was determined to be the potential for rockfall occurrence. A rockfall hazard study was completed by Shannon and Wilson, Inc. on December 26, 2018 for the purposes of evaluating potential rockfall impacts to the Cascade Rockport Road (Appendix A). The analysis utilized RocFall™ version 6.011 to predict probable rockfall runout potential for a range of potential rockfall scenarios. Rockfall hazards are possible from slopes 40% or greater as identified in SCC 14.24 (**Figure 3**). Rockfall hazards could be encountered during the road building and quarrying activities as well as potentially occurring intermittently without obvious triggers.

2.4.2 Seismic Hazards

Seismic activity is likely to occur in the vicinity of the subject area in the future. The magnitude of seismicity may range for small, imperceptible events to significant ground motion for larger magnitude events. During significant ground motion, rockfall and other landsliding may result as well as potential liquefaction of saturated soils.

2.4.3 Erosion Hazards

Erosion hazards can occur on steeper slopes comprised of erodible soils. Channeling or rilling can result and sediment can be transported downgradient. Slopes that are disturbed, regraded, cleared, or otherwise modified are more susceptible to erosion processes.

2.5 Risk Analysis

To understand the risk of geologic hazards at the subject site, it is necessary to first define *hazard* and *risk*. *Hazards* are defined as sources of danger. In this analysis, relevant geologic hazards as defined in SCC 14.24.410 include the following:

- **Landslide Hazards**, which involve the mass movement of earth, rock, and/or debris downslope;
- **Seismic Hazards**, which involve ground motions and earth processes either directly or indirectly caused by an earthquake;

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- **Erosion Hazards**, which involve the removal and transport of soil or sediment by mechanical or chemical means.

Risk is defined as an integration of the probability of an occurrence of a hazard combined with the potential effects, or consequences, if the hazard does occur. Therefore, frequency and effect are captured by discussions of risk rather than hazard. The effects of erosion are that ecological systems and infrastructure/private property management costs can be impacted. The effects of earthquakes and landslides are that the built environment could be damaged and the result may adversely impact human safety and/or ecological systems. Table 4 is a sample chart illustrating different levels of relative risk:

Table 4: Relative Risk Table

Probability	Low	Medium	High
Consequence	RELATIVE RISK		
Minor	Low	Moderate	Moderately High
Moderate	Moderate	Moderately High	High
Severe	Moderately High	High	Very High

The geologic risk that exists at the site is divided between risk to the public and occupational risk. For this analysis, the public risk is the subject of focus for analysis. Occupational risk will be evaluated through a separate geotechnical analysis being conducted in coordination with the DNR surface mining review process. The DNR geotechnical analysis will look at geologic risks related to the mining operations following state and federal code requirements for occupational safety. The geotechnical analysis cannot be completed until the access road is complete to allow for the investigation.

Potential risk to the public may exist from rockfall hazard occurrence. Rockfall occurrence will be greatest during the road construction. The road will be constructed as a full or partial bench and will utilize embankment fill. During the benching and grading process, rockfalls may be triggered. While rockfalls are a natural process that occur intermittently on steep bedrock landforms, the temporary disturbance during road building will increase the rockfall occurrence in the areas at and immediately adjacent to the road construction. The analysis conducted by Shannon and Wilson (2018) concluded that rockfall is unlikely to travel as far as the Rockport Cascade Road, the closest point that the public can get to the quarrying and road building activities. Therefore, the change in relative risk to the public as a result of this proposed project is low. The residential property to the north of the quarry site is currently within a potential rockfall hazard area as evidenced by the talus present at that site; however, the property it is not within the footprint of rockfall that is anticipated to be potentially dislodged by the road construction or quarrying activities. The change to risk resulting from the proposed project, therefore, is low.

The project occurs within a seismically-active area. During seismic events, the potential for rockfall is increased. This project will not increase the likelihood of potential seismicity occurrences; therefore, the existing geological risk associated with seismicity is considered existing background risk and will be unaffected by the proposed project activities. All structures being used for this project are modular, transportable and temporary structures occupied only during business hours. No permanent dwellings are proposed; therefore, the risk to structural damage from seismic shaking is low.

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Potential risk from erosion of disturbed and altererd slopes is probable, particularly during construction. Risk can be mitigated with construction techniques and materials. There is no significant threat to public safety or other critical areas anticipated if the potential for erosion is adequately mitigated; therefore, the risk is low.

2.6 Changes in Conditions

Certain changes to the site conditions, anthropogenic or natural, can change the probability of hazard occurrence or consequence. Potential changes may include (but are not limited to) slope loading, grading, subsurface or surface hydrologic alterations, seismic deformation, soil disturbance, and de-vegetation. In the event that such changes significantly alter the site conditions in ways other than those explicitly described in this report, the findings presented in this analysis should be considered obsolete until a reassessment of site conditions and relative risk is performed.

2.7 Limitations

No subsurface evaluation or bedrock mechanics analyses were performed in this assessment, and as such all conditions below grade are inferred from surficial topographic indicators, exposed geology, and visual observation of several shallow hand dug test pits and soil probing (≤ 24 inches below ground surface). The bedrock cliffs could not be visually inspected at the time of the site assessment due to physical access limitations; the cliffs are too steep to ascend/descend from the subject parcel without technical rigging. In recognition of the reasonable feasibility constraints of this assessment, no warrantee regarding the competency, composition, or quality of any geologic site characteristic that was not directly evaluated is expressed or implied by this communication.

3. SUMMARY OF FINDINGS AND RECOMMENDATIONS

3.1 Summary of Findings

The subject parcel contains slopes that are regulated Critical Areas due to the presence of Landslide, Erosion, and Seismic Geologically Hazardous Areas as defined in SCC 14.24.410, and as such is subject to the Mitigation Standards and Critical Area buffers described in SCC 14.24.430. This includes the establishment of setbacks from the top, toe, and edge of all landslide hazard areas. Pursuant to SCC 14.24.430.1(h), structural development in the subject parcel area must be constructed in conformance with IBC standards as amended by Skagit County. Talus deposition at the base of the steep slopes in the subject area indicates that rockfall has occurred in the area historically and may continue to occur periodically in the future, with or without parcel development. Isolated rockfall is a natural geologic process and should be expected as a background condition. Modeling determined that rockfall runout is unlikely to propogate as far as the public road either as a natural occurrence or because of the proposed development, therefore the risk for public impacts is low. No indicators of historic landslides were observed during the field and desktop assessment of the Project Limits, and the presence of shallow, competent bedrock across the site suggests a low probability for significant landslides. Steep areas that are developed, modified, or disturbed during quarry or road development and operations are susceptible to erosion hazard occurrence in the future.

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3.2 Recommendations

The following recommendations were developed to further reduce the risk associated with landslide, erosion, and/or seismic hazards in the study area:

1) **A minimum 200-foot setback from the toe of slopes exceeding 40 percent grade is recommended for any structures that are to be occupied regularly by employees**, with the exception of the access road, as shown in Figure 3.
    a. If a reduction to the recommended setback is desired, more detailed geotechnical evaluation is recommended.
    b. During times of blasting, rock moving, or if rockfall activity is observed, the 200-foot setback area should be avoided until conditions stabilize.
    c. The 200-foot setback area should be signed and notice of rockfall hazards identified.

2) Signage at the top of steep slopes would be utilized to warn employees or site users of the hazardous steep slope conditions.

3) A geotechnical engineer would be available for site inspection during the construction of the road to help determine suitability of cuts and fills and to identify potential geologically hazardous conditions that may be encountered.

4) A site-specific construction stormwater pollution prevention plan would be developed in conformance with the requirements of SCC 14.32 and other applicable stormwater regulatory code. At a minimum, the plan should include the following Best Management Practices (BMPs) for Temporary Erosion and Sediment Control (TESC):
    a. Native vegetation would be left in place wherever possible, while restoration of native vegetation and appropriate landscaping techniques may be implemented to enhance soil stability and reduce erosion in impacted areas.
    b. Clearing limits would be clearly demarcated with flagging, lathe, and/or high visibility construction fencing prior to the onset of construction activities and would be visible to equipment operators in the proposed development area.
    c. BMPs would be established if erosion is anticipated or occurring such that it may cause erosion and mobilization of sediments that could potentially leave the site or enter areas where they could pose a risk to other critical areas.

5) Pursuant to SCC 14.24.430.1(b), a site-specific plan for the collection, transport, treatment, discharge and/or recycling of stormwater would be developed in conformance with the requirements of SCC 14.32.

In the event that *any* of the following conditions are encountered during excavation or grading activities, contact Element or a similarly qualified geotechnical professional for additional site evaluation:

- Highly fractured bedrock, fault breccia, large cracks or voids.
- Groundwater springs, seepage, or saturation.
- Fine-grained (silt or clay dominant) sediment.

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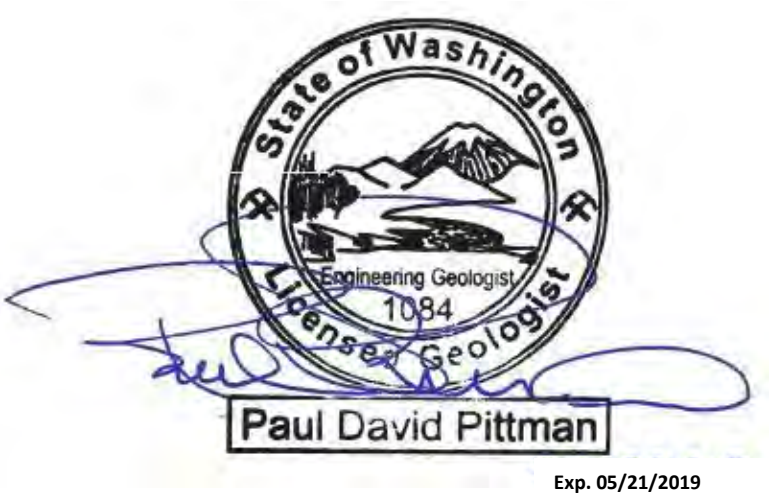
4. CLOSURE

This report was prepared and submitted by:



Exp. 05/21/2019

Paul Pittman, MS, LEG
Earth & Environmental Sciences Manager,
Principal

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References

Brown, E. H. (1986). Geology of the Shuksan Suite, North Cascades, Washington, USA. *Geological Society of America Memoirs*, *164*, 143-154.

Dragovich, J. D., Stanton, B. W., Lingley Jr, W. S., Griesel, G. A., & Polenz, M. (2003). Geologic map of the Mount Higgins 7.5-minute quadrangle. Skagit and Snohomish Counties, Washington: Washington Division of Geology and Earth Resources Open-File Report, 12.

Haugerud, R. A., & Tabor, R. W. (2009). Geologic Map of the North Cascade Range, Washington: US Geological Survey Scientific Investigations Map 2940, 2 sheets, scale 1: 200,000; 2 pamphlets, 29 p. and 23 p.

Shannon and Wilson (2018). Rockfall Hazard Study, Proposed Marblemount Quarry, Skagit County, Washington. Technial study prepared for Kiewit Infrastructure West Company.

Tabor, R. W., Haugerud, R. A., Hildreth, W., & Brown, E. H. (2003). Geologic Map of the Mount Baker 30 by 60 Minute Quadrangle, Washington. SEA, 500, 500.

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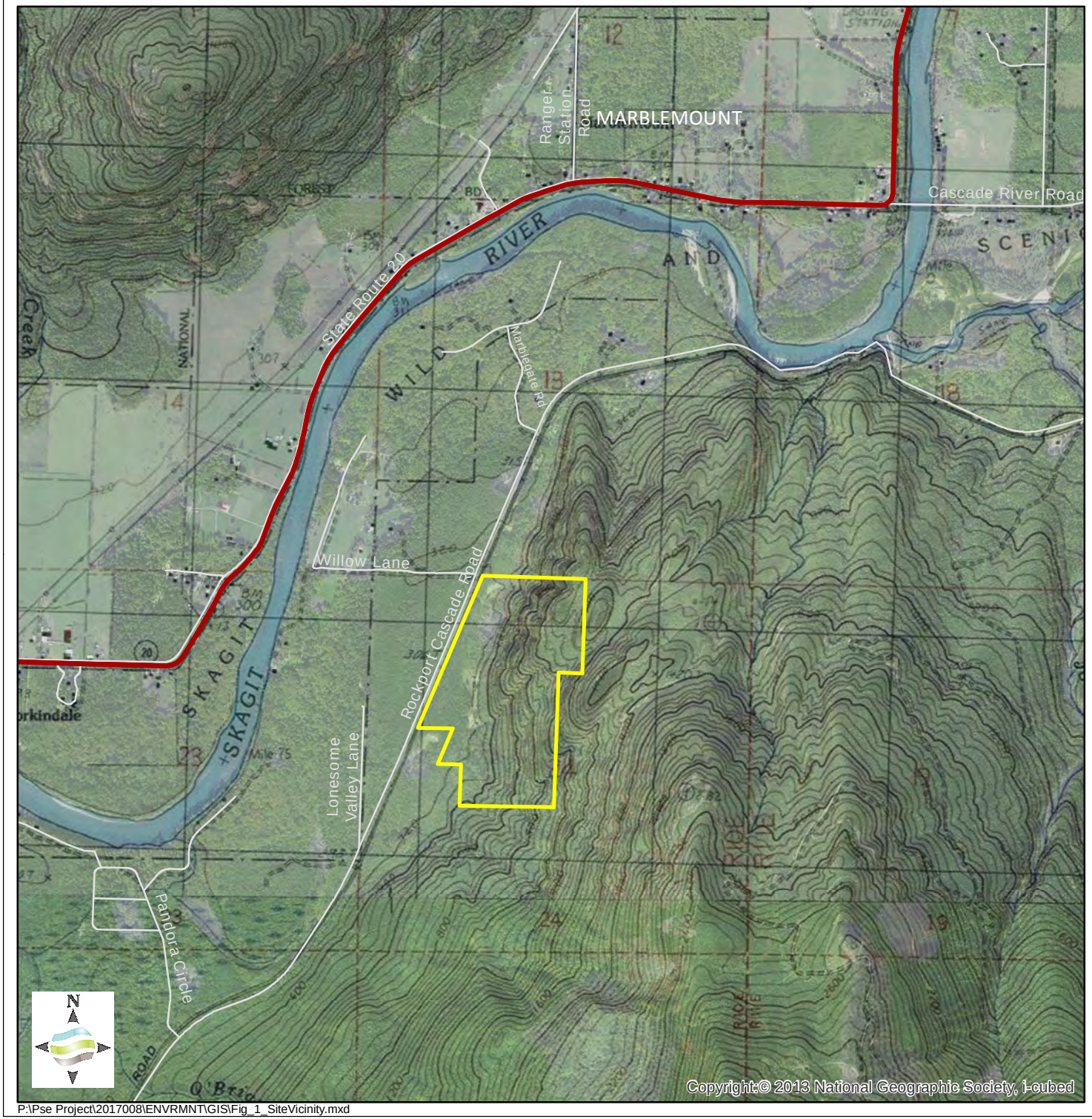
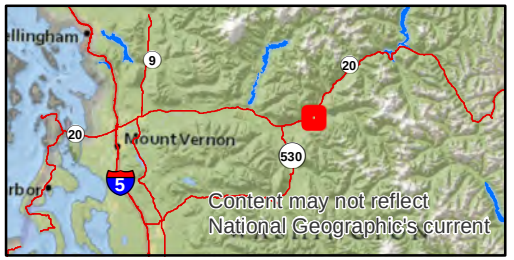
Figures





Data Credits:
USDA NAIP 2015
WSDOT 2018
Skagit County 2018

Project Limits

Rural Roads

State Highways

Feet
0 1,000 2,000 4,000

1:24,000

1 inch = 2,000 feet

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Figure 1

Marblemount Quarry
Site Vicinity Map

Date: 1/9/2019

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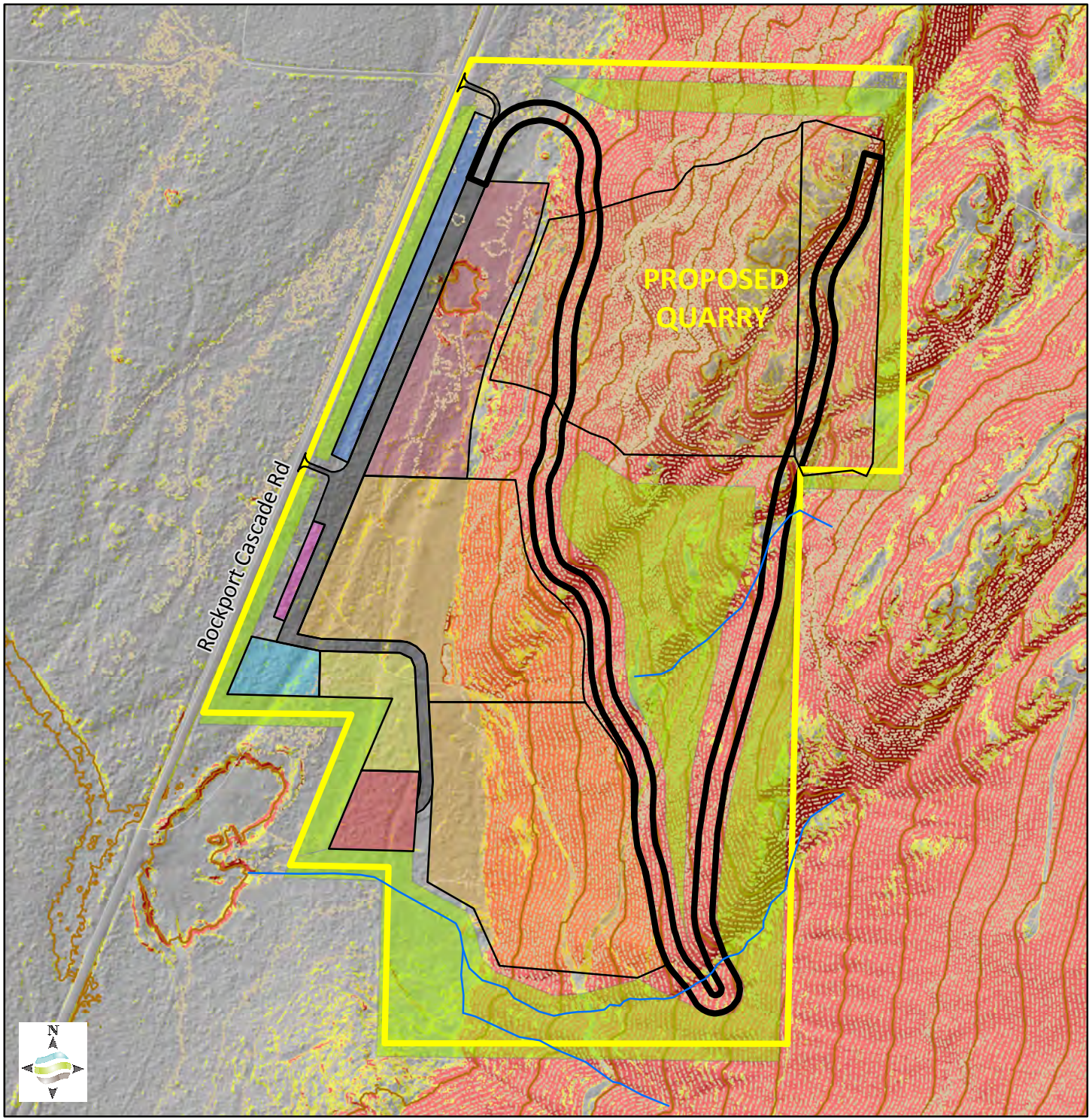

- Observed Surfacewater Flow (Watercourse)
- ProjectBoundary
- Proposed Access Road
- Clearing Limits (Trees Retained)
- Armor Stone Stockpile
- Access/Scale Roads
- Explosives Storage Exclusion Area
- Undersized Stockpile Area
- Misc. Structures Footprint
- Quarry Footprint
- Soil Stockpile
- Stormwater Facility B
- Stormwater Facility A

Contour

- 10 Foot Contours
- 100 Foot Contours

Geohazard Areas

Percent Slopes

- <20%
- 20-40%
- >40%

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FIGURE 2

Marblemount Quarry
Geologically Hazardous Areas

Date: 2/8/2019

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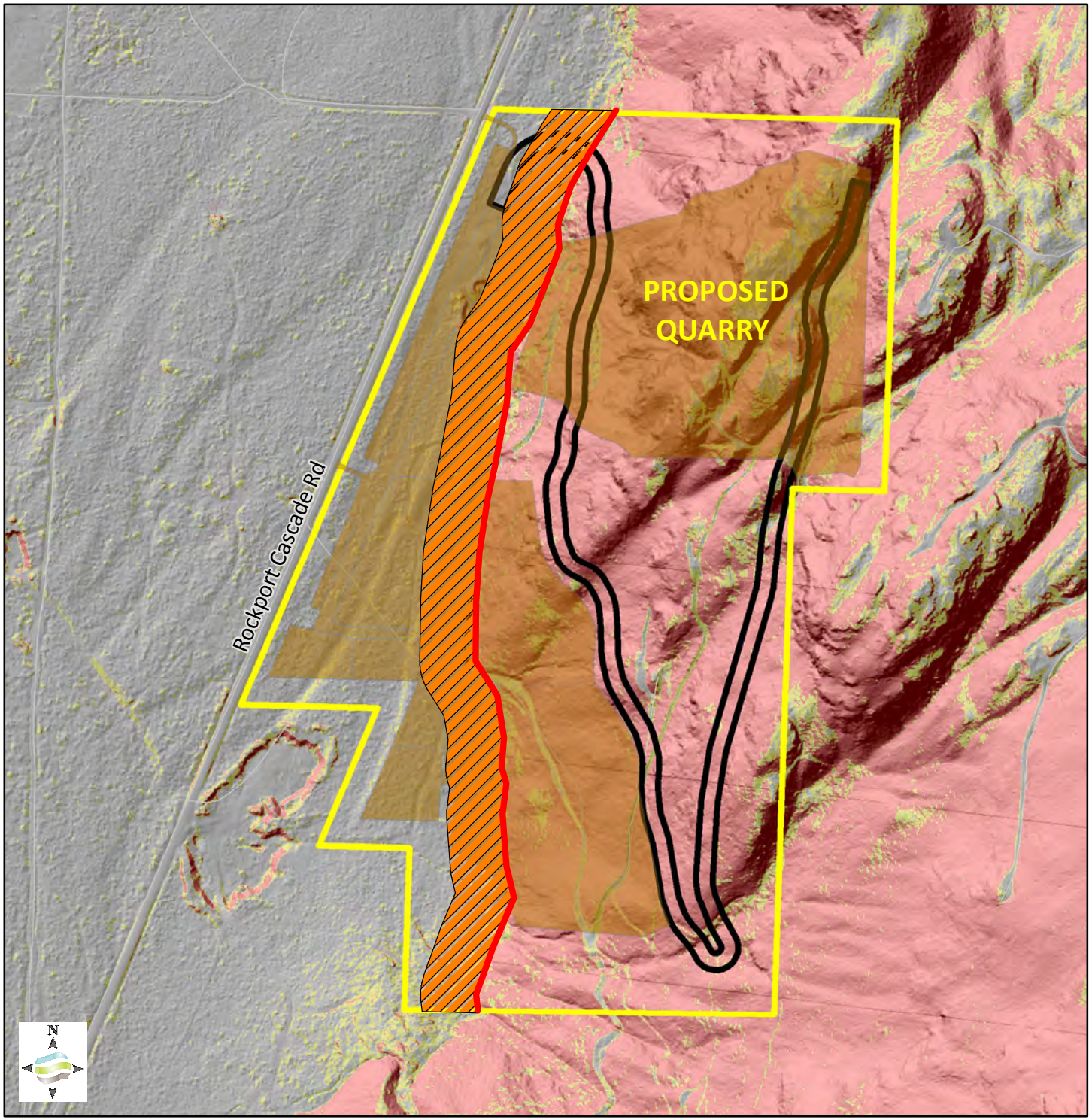

Toe Of Slope
Rock Fall Hazard Area (200 Feet)
Proposed Quarry Activities (Maximum Buildout Potential)
Project Limits
Proposed Access Road

Geohazard Areas

Percent Slopes

<20%
20-40%
>40%

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FIGURE 3

Marblemount Quarry
Rock Fall Hazard Setback Area

Date: 1/10/2019

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Appendix A – Shannon and Wilson Rockfall Hazard Study, December 26, 2018

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

December 26, 2018

Kiewit Infrastructure West Company
2200 Columbia House Boulevard
Vancouver, Washington 98661

Attn: Mr. Chuck Nylund

RE: ROCKFALL HAZARD STUDY, PROPOSED MARBLEMOUNT QUARRY, SKAGIT COUNTY, WASHINGTON

We understand that Kiewit Infrastructure West Companies (Kiewit) is proposing to expand an existing quarry near Marblemount, Washington. In accordance with our proposal dated November 27, 2018, this letter report presents the results of a limited rockfall hazard evaluation to support the Washington State Environmental Policy Act (SEPA) permitting review process. Our scope of services for this project included the following tasks:

- Completing a brief site reconnaissance on December 12, 2018;
- Reviewing available site data and developing topographic cross sections;
- Performing rockfall modeling simulations to evaluate potential hazards to nearby public roadways and structures; and
- Writing this letter report.

This study is limited to evaluating rockfall hazards along the nearby Cascade Rockport Road (the Road) and residential structures near the base of the slope.

Our services were conducted in general accordance with our approved proposal dated November 27, 2018, approved by Kiewit on December 3, 2018, and our Master Services Agreement with Kiewit dated September 4, 2018.

PROJECT UNDERSTANDING

The project site is located along the left bank of the Skagit River about 1 mile south of Marblemount, Washington (see Figure 1). We understand that Kiewit is studying development of the Marblemount Quarry as a source of rock for jetty construction and similar future projects.

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We understand that Kiewit chose the Marblemount site for further study due to the presence of metabasalt bedrock (greenstone and greenschist), which exhibits a relatively high unit weight appropriate for use as armor stone. We understand a small existing quarry operation is present at the site.

Preliminary plans provided by Pacific Survey & Engineering, Inc. (PSE) dated November 14, 2018 (PSE, 2018), show the development would include constructing a new, approximately 6,700-foot-long haul road with 12 percent grade to access the top of the quarry excavation at approximate elevation 1085 feet (see Figure 2). The haul road would be approximately 45 feet wide with excavation slopes of ¼ horizontal to 1 vertical (¼H:1V). At build-out, the quarry would consist of an approximately 765-foot-high and 1,000-foot-wide excavation involving approximately 9.5 million cubic yards of excavation. Preliminary plans indicate that quarry slopes will consist of a benched configuration with 40-foot-high ¼H:1V cut slopes and 20-foot-wide horizontal benches.

We understand that the proposed quarry development sequence would consist of constructing the quarry haul road, followed by sequential quarry excavations in "lifts" proceeding from the top down. Each lift would be excavated horizontally to the proposed quarry extent before advancing the next lift. The haul road would be used to transport the rock to the base of the slope.

SITE GEOLOGIC CONDITIONS

We reviewed the published geologic map (Misch, 1979) for the site, which shows bedrock consists of Early Cretaceous age (approximately 100 to 145 million-year-old) metabasaltic greenschist and blueschist of the Shuksan Metamorphic Suite. Misch (1979) indicates that Shuksan Metamorphic Suite rocks at the site dip to the east, or into the proposed quarry and haul road slopes. Misch (1979) maps undifferentiated Quaternary (less than about 1.2-million-year-old) soil deposits in the low-relief Skagit River valley to the west of the proposed quarry slopes. These deposits are likely alluvium (river-deposited soils).

SITE RECONNAISSANCE

On December 12, 2018, a Shannon & Wilson, Inc. geotechnical engineer made a limited geotechnical reconnaissance visit to evaluate conditions pertinent to rockfall analysis. Our reconnaissance included:

- Observing and photographing existing slope conditions and ground cover at the proposed quarry and haul road;
- Observing potential rockfall sources; and
- Observing typical size and shape of individual rockfall boulders and typical rockfall runout extents at and beyond the toe of slope.

The reconnaissance visit did not include geologic mapping, evaluation of rock mass structural conditions, or slope stability evaluations. Our observations are summarized below.

Existing Slope Conditions and Cover

Overall slopes at the proposed quarry site are about 800 feet high. The natural slopes average about 45 degrees (1H:1V). The upper face of the existing slopes at the proposed quarry consist of sparsely forested slopes underlain by rock, with cliff bands more than about 100 feet high that slope in excess 70 degrees (about 1/3H:1V). Locally, the cliff bands overhang. A talus apron is present below the cliff bands that is about 300 feet high at the base of the proposed quarry slope. The talus slopes about 35 to 40 degrees and includes boulders up to about 40 feet in diameter. The current quarry operator has mined aggregate from this talus slope.

The existing slopes along the haul road alignment are up to about 900 feet high and stand at an overall angle of about 35 degrees (about 1.3H:1V). These slopes are vegetated with sparse to immature forest cover and are underlain by boulder colluvium (slope-derived soil) deposits and intermittent bedrock exposures. The forest covering these slopes burned in the late 1990s; therefore, the most trees are about 20 years old.

The Skagit River floodplain extends beyond the base of the slope. The floodplain consists of low-relief, approximately level ground underlain by alluvial (river-deposited) soil. The area between the Road and the toe of slope is underlain by river terraces that were deposited when the river level was higher than its current level. The soil visible in pits excavated in the terrace deposits typically consist of silty sand with gravelly interbeds and lenses. This area is covered by forest vegetation with clearings around residential structures and the quarry operation.

Potential Rockfall Sources

During the reconnaissance we observed few obvious indications of recent rockfall sources. We anticipate that rockfall on existing slopes likely originates from many locations, primarily steep cliff bands. Rockfall may also originate from boulder colluvium soils.

Observed Rockfall Debris Characteristics

As indicated by the presence of talus deposits and a relative lack of large vegetation, the base of the proposed quarry slope appears to be the most active area of existing rockfall. The talus apron consists of a bouldery deposit with a visually estimated median boulder dimension of about 5 feet. Boulders were typically subangular and roughly equidimensional to slightly elongate in shape.

In the talus aprons below the proposed quarry slope, we noted about 10 individual boulders with a maximum dimension greater than 20 feet, and about 30 individual boulders with maximum dimension between 10 and 20 feet. Most exposed boulders larger than about 10 feet in maximum dimension occurred in the lower half of the talus apron slopes.

We made a reconnaissance of the floodplain near the toe of the slope. We observed that most boulders were located within about 10 feet of the slope toe. The maximum observed runout (most distant boulder) was about 90 feet from the talus slope toe.

We noted relatively few boulders beyond the toe of slope below the base of the proposed haul road slope. In this area, we noted several large boulders had fallen to at or near the base of slope, with no evidence of boulder runout beyond the base of slope. The residents reported that a rockfall occurred between their primary residence and the barn. They reported that a car-size boulder came to a rest near the slope toe. We observed a boulder in the area that had little moss on it. The boulder was about 15 feet vertically above the toe of slope and was about 5 feet in diameter.

ROCKFALL HAZARD EVALUATION

The purpose of rockfall modeling is to evaluate the probable range of trajectory, velocity, energy, bounce height, and runout distance of rocks traveling down a slope. Because the project design is preliminary, we limited our rockfall analysis study to evaluate whether the proposed quarry and haul road may change the probable range of rockfall runout distances relative to the Road and residential structures at the base of the slope. The limited study did not include efforts to evaluate operational rockfall hazards along the proposed haul road and quarry excavation.

Model Setup

We utilized the program RocFall^{TM} version 6.011 (RocScience, Inc., 2018) for our study. We considered two ground surface topographic profiles, one along the proposed quarry excavation

(Profile A), and the other along the proposed haul road above an existing residential structure (Profile B). For each profile, we considered existing conditions and estimated final conditions based on preliminary survey and design (PSE, 2018). Plan locations of the profiles are shown on Figure 2. Topographic profiles are shown in Figures 3 through 7.

For each analysis case, we defined ground cover conditions and estimated accompanying physical parameters for the rockfall model (coefficients of normal and tangential restitution and surface friction) based on published values tabulated in Turner and Duffy (2012). We then assigned rockfall origination points ("seeders") on each model to simulate randomly distributed rockfall sources on the slope face (for back-analysis), point sources for likely locations of future rockfall sources (edges of cuts), or point sources for conservative forward analysis (assuming top-of slope). We then assigned mass and unit weight of rocks to approximate "small" and "large" metabasalt boulders with mean mass of 50 and 10,000 kips to generally approximate the range of boulder sizes observed during reconnaissance.

We utilized "lump mass" analysis procedure that considers falling rocks to be point masses with an infinitesimal area. In our opinion, a more involved effort to utilize "rigid body" modeling techniques that estimate the size and shape of boulders is not warranted given:

- The additional variables and associated uncertainty involved (rock shape, dynamic and rolling friction parameters);
- The preliminary nature of the current quarry and haul road design; and
- The limited goals of the study, namely to estimate changes in the distribution of rockfall runout distances following construction of the haul road and quarry.

Profile A Methodology and Results

- **Case 1** - *A conservative back-analysis case to determine parameters required for runout to reach the Road.* This case considered a point seeder at the top of the existing slope to simulate fugitive rocks issuing from the edge of the initial, highest quarry excavation lift. Starting with published rebound parameters and a rolling friction angle of 30 degrees, we noted that the runout distribution did not extend more than about 100 feet beyond the base of slope (similar to field observations). We then incrementally reduced the rolling friction for slope materials to allow rocks to runout nearer to the Road, which is located about 450 feet beyond the slope toe. As shown on Figure 3, a friction parameter of 10 degrees (an unrealistically low value) still did not allow runout within about 200 feet of the Road. This case is summarized on Figure 3.

- **Case 2** – *A conservative case to evaluate rockfall runout distribution at quarry build-out.* This case considered a point seeder at the top of the slope to result in the highest likely rockfall energies. This case also assumed clean bedrock benches and erosion of the downhill edges of each bench ("crest loss"). Even with conservative parameters, most rockfall is arrested on benches. Our analyses indicated about 1 percent of total rocks reach the bottom of the pit. Of those, the analysis indicated no rocks would roll out beyond about 200 feet from base of slope. This case is summarized on Figure 4.

Profile B Methodology and Results

- **Case 3** – *A back-analysis case to calibrate parameters to approximate observed boulder runout conditions on existing slope.* Because rockfall sources are not obvious in this area, we considered a line seeder from the top to the base of the slope to simulate random rockfall origin. To allow some rocks to roll to the base of the hill, we used rebound parameters approximating bedrock and reduced the rolling friction angle to 25 degrees. These surface parameters were used on the slope for forward analysis cases as described below. This case is summarized on Figure 5.
- **Case 4** – *Forward analysis to evaluate effect of haul road cuts on runout.* This case considered construction of 45-foot-wide haul road cuts with ¼H:1V slopes and same parameters as described above, notably use of a line seeder from top to base of slope and the same rebound parameters approximating a bedrock surface. As shown on Figure 6, the section includes two intercepts of the proposed haul road at approximate Stations 25+50 and 46+25, or elevations 616 and 887 feet, respectively. The results of this case suggest that the proposed haul road will overall act as catchment when considering rocks originating from random locations on the slope. This case is summarized on Figure 6.
- **Case 5** – *Forward analysis to evaluate effect of point rockfall sources from cuts on runout.* This case considers the same geometry and slope parameters as Case 4 but includes two point rockfall seeders instead of a random line seeder, each located at the downhill edge of the haul road cut. To simulate rocks loosened by mechanical excavation activities or haul road traffic, we assigned an initial, nominal horizontal velocity of 1 foot per second away from the cut. This case suggests that rocks falling from the edges of cuts have a higher probability of rolling to the base of slope than randomly seeded rocks. This case also indicates that rocks originating at the edge of cut will not be more likely to run out farther than randomly seeded rocks. This case is summarized on Figure 7.

CONCLUSIONS

Based on the results of our study, it is our opinion that quarry and haul road construction should not significantly increase the likelihood that rockfall will impact Rockport Cascade Road.

Further, we believe natural and mining or construction related rockfall is unlikely to run out more than 100 feet from the existing toe of the slope.

In our opinion, existing rockfall runout observed during the December 2018 reconnaissance suggests that residential structures at the base of the slope are subject to infrequent rockfall impacts under current conditions. Our modeling suggests that rockfall runouts may increase near residential structures due to construction of the haul road. We also anticipate that construction activities will greatly increase the number of rockfall events capable of impacting the residential structures.

LIMITATIONS

While rockfall simulations are useful to evaluate potential distributions of rockfall, they have several important limitations. Rockfall simulations can only model the behavior of individual, intact rocks. Large-scale rock instabilities could potentially form due to excavation of the haul road and quarry. Such large-scale rock failures can result in debris avalanches capable of running out over distances much longer than individual rockfalls due to complex interactions beyond the capability of currently available analysis tools. Evaluation of rock slope stability during haul road and quarry construction is beyond the scope of this limited study.

Similarly, rockfall modeling software cannot evaluate the *amount* or number of rocks that may fall from a slope. However, we anticipate that construction activities and associated disturbances may cause more frequent rockfall events on the slopes in question as compared to current frequency of rockfalls originating from native slopes. Depending on construction techniques used and efforts to contain rockfall during excavation, denudation of slopes due to repeated rockfall may change ground conditions and allow for longer runouts over time. If significant denudation or accumulations of rockfall debris occur during construction, we recommend additional study to reevaluate potential impacts to the traveling public along Rockport Cascade Road.

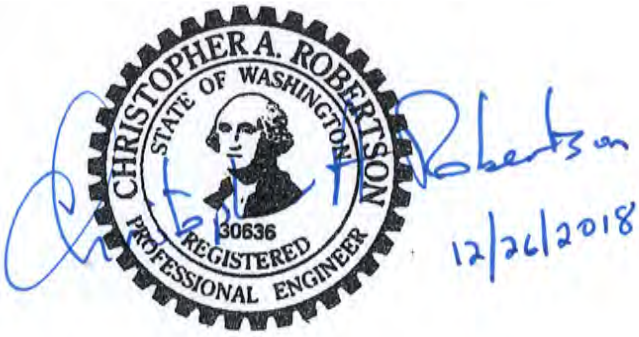
This modeling effort was limited to evaluation of two cross-sections considering the preliminary quarry and haul road design as indicated on plans provided by PSE in November 2018 (PSE, 2018). If the design is changed before or during construction, additional analysis may be necessary to evaluate potential impacts to Rockport Cascade Road.

CLOSURE

We appreciate the opportunity to be of service to Kiewit. If you have questions or comments regarding this report, please contact me at 720-258-4129 or mtg@shanwil.com.

Sincerely,

SHANNON & WILSON, INC.



Christopher A. Robertson, PE
Vice President

MTG:KDD:CAR/mtg

Enc: Figure 1 – Vicinity Map
Figure 2 – Site Plan
Figure 3 – Case 1, Profile A, Existing Conditions with Conservative Parameters
Figure 4 – Case 2, Profile A, Final Conditions
Figure 5 – Case 3, Profile B, Existing Conditions
Figure 6 – Case 4, Profile B, Final Conditions with Dispersed Rockfall Source
Figure 7 – Case 5, Profile B, Final Conditions with Point Rockfall Sources at Cuts

REFERENCES

Misch, Peter, 1979, Geologic map of the Marblemount quadrangle, Washington: Washington Division of Geology and Earth Resources, Geologic Map GM-23, scale 1:48,000

Pacific Survey & Engineering, Inc., 2018, Jetty Stone Quarry Reclamation Plan: Pacific Survey & Engineering plan set, November 21, 12 p.

Rocscience, Inc., 2018, RocFall (v. 6.011): Toronto, Ontario, Rocscience, Inc.

Turner, A.K. and Duffy, J.D., 2012, Evaluation of Rockfall Mechanics, *in* A.K. Turner and R.L. Schuster, eds., Rockfall Characterization and Control: Washington, D.C., Transportation Research Board of the National Academies, p. 333.

0 10 20

Approximate Scale in Miles

NOTE

Map adapted from aerial imagery provided by Google Earth Pro, reproduced by permission granted by Google Earth ™ Mapping Service.

Rockfall Hazard Study
Marblemount Quarry
Skagit County, Washington

VICINITY MAP

December 2018 102282-001

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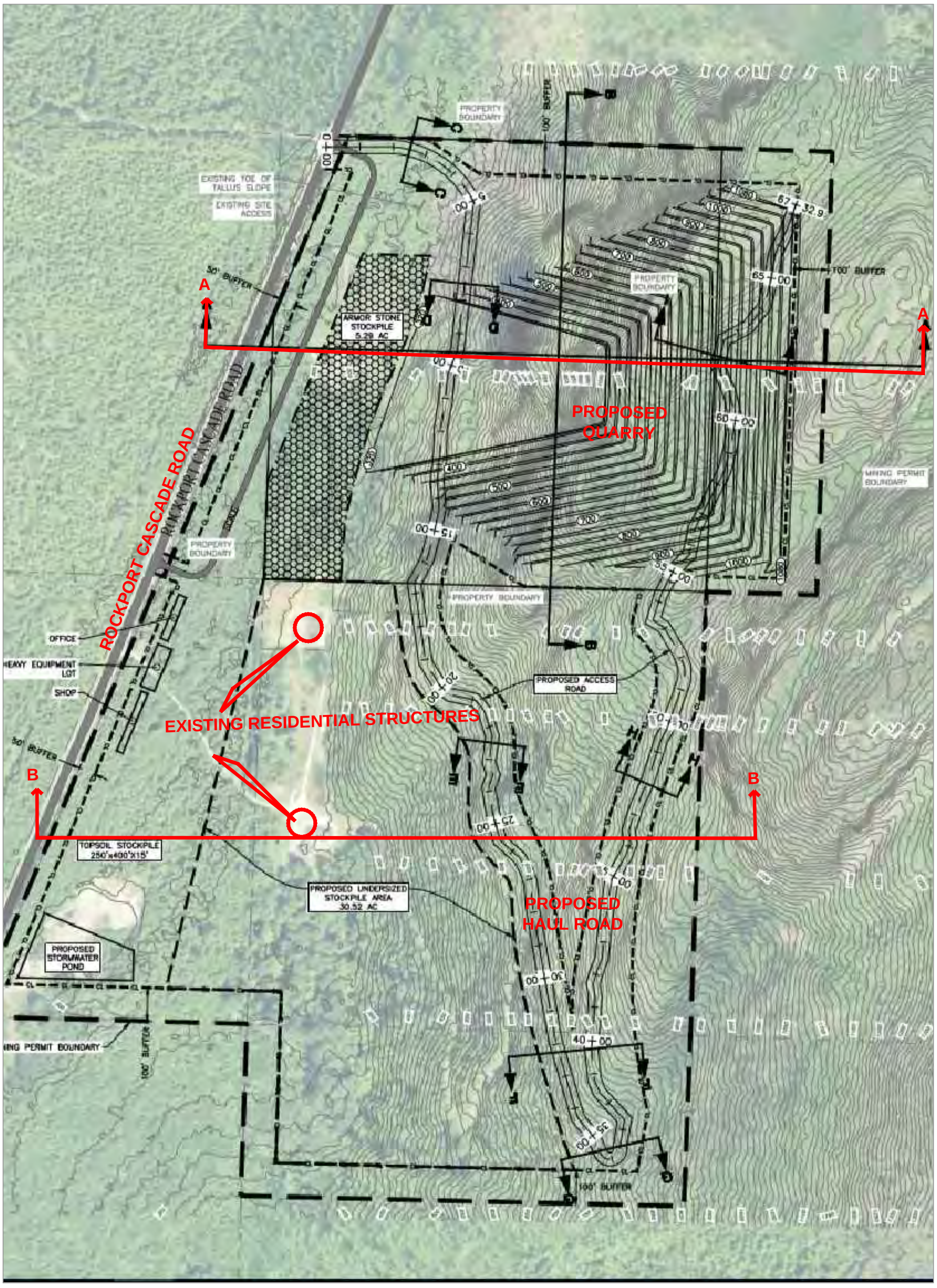
FIG. 1

Filename: I:\EF\DEN\102000s\102282 Marblemount Qua\001 Phase 1 - Rockf\Drafting\Fig.1 Vicinity Map.dwg Date: 12-26-2018 Login: mtg

Filename: I:\EF\DEN\102000s\102282 Marblemount Qua\001 Phase 1 - Rockf\Drafting\Fig2.dwg Date: 12-26-2018 Login: mtg



LEGEND

Topographic Profile Used for Rockfall Hazard Analysis

NOTE

Drawing adapted from plan set provided by Pacific Engineering & Survey titled "Marblemount_Prelim_2018.11.27_Reduced_.pdf" dated November 21, 2018.

SCALE

0 300 600

Approximate Scale in Feet

Rockfall Hazard Study
Proposed Marblemount Quarry
Skagit County, Washington

SITE PLAN

December 2018 102282-001

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FIG. 2

FIG. 2

Seeder Name	Number of Rocks	Rock Types	Horizontal Velocity (ft/s)	Vertical Velocity (ft/s)	Rotational Velocity (rads/s)	Initial Rotation (deg)
Seeder 1	1000	Small Metabasalt Big Metabasalt	3	0	0	Uniform Mean: 0 Rel. Min: 0 Rel. Max: 360

Existing Conditions, Conservative Case: Set rolling friction angle to 10 degrees conservative assumption). Rockfall point seeder at crest of slope (conservative assumption) Lump mass rocks do not runout to public highway.

Material Name	Color	Normal Restitution	Tangential Restitution	Friction Angle	Slope Roughness (deg)
Bedrock Outcrops		Normal Mean: 0.35 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	Normal Mean: 0.85 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	10	Normal Mean: 3 Std Dev: 1 Rel. Min: 3 Rel. Max: 3
Talus Cover with Vegetation		Normal Mean: 0.3 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	Normal Mean: 0.82 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	10	Normal Mean: 3 Std Dev: 1 Rel. Min: 3 Rel. Max: 3
Soft Soil Some Vegetation		Normal Mean: 0.3 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	Normal Mean: 0.8 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	10	Normal Mean: 3 Std Dev: 1 Rel. Min: 3 Rel. Max: 3

Rock Name	Color	Mass (lb)	Density (lb/ft3)
Small Metabasalt		Normal Mean: 50000 Std Dev: 15000 Rel. Min: 45000 Rel. Max: 45000	180
Big Metabasalt		Normal Mean: 1e+006 Std Dev: 250000 Rel. Min: 750000 Rel. Max: 750000	180

Public Highway

1200
1000
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200
0
200
400
600
800
1000
1200
1400
1600
1800
2000

NOTES:

1. Figure not to scale.
2. Surface topography developed from AutoCAD file titled "ACAD-2017008_ecP_RP_2018.12.10.dwg" provided by Pacific Survey & Engineering on December 10, 2018.
3. Rockfall trajectories and display obtained with RocScience RocFall™ version 6.011 software.

FIG. 3
Sheet 1 of 2

Rockfall Hazard Study
Proposed Marblemount Quarry
Skagit County, Washington

CASE 1 - PROFILE A
EXISTING CONDITIONS WITH CONSERVATIVE PARAMETERS

December 2018 102282-001

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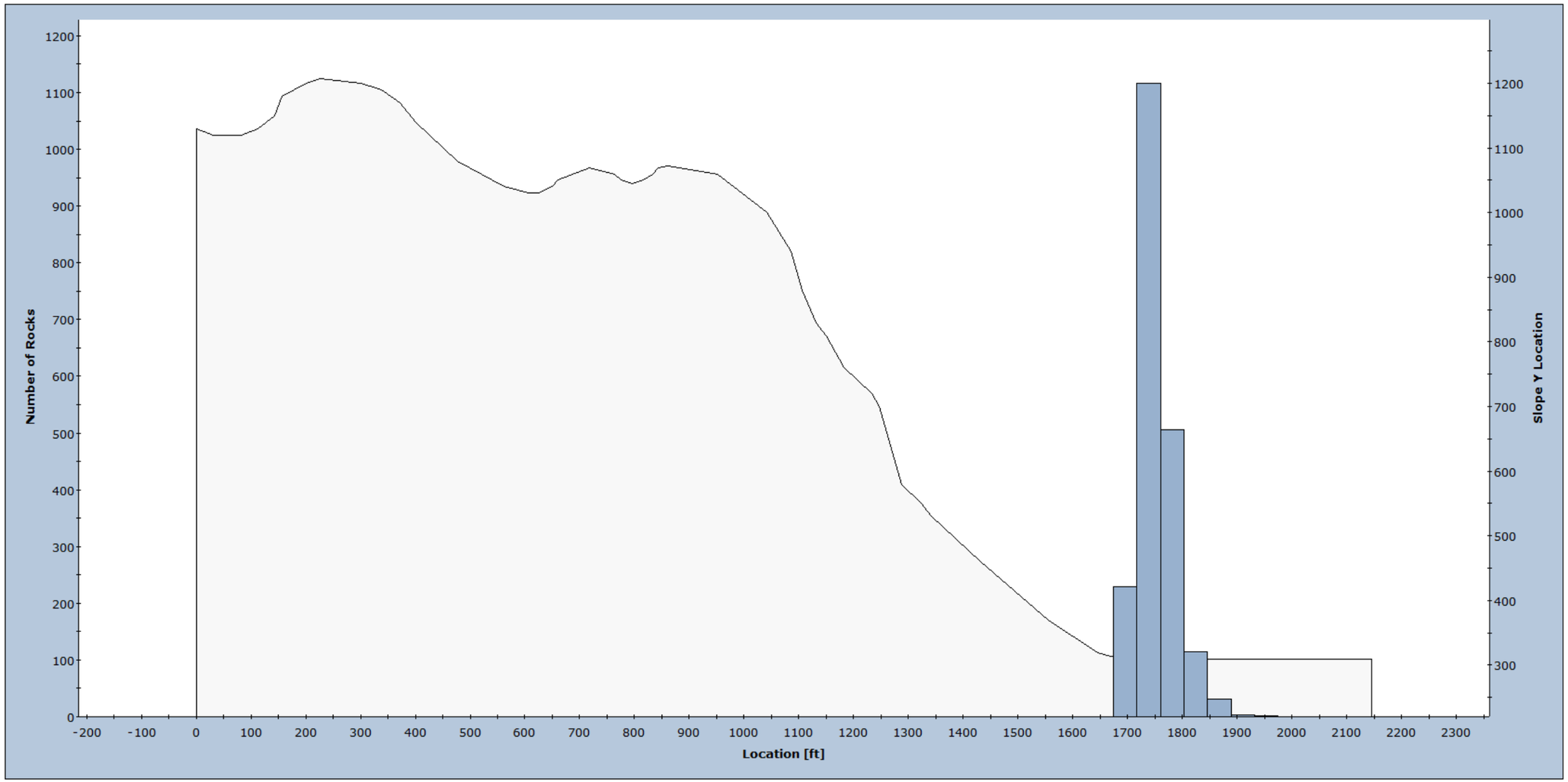
FIG. 3
Sheet 1 of 2

Distribution of Rock Path End Locations



Total number of rock paths: 2000

NOTES:

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Rockfall Hazard Study
Proposed Marblemount Quarry
Skagit County, Washington

CASE 1 - PROFILE A
EXISTING CONDITIONS WITH CONSERVATIVE PARAMETERS

December 2018 102282-001

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FIG. 3
Sheet 2 of 2

FIG. 3
Sheet 2 of 2

Rock Name	Color	Mass (lb)	Density (lb/ft3)
Small Metabasalt		Normal Mean: 50000 Std Dev: 15000 Rel. Min: 45000 Rel. Max: 45000	180
Big Metabasalt		Normal Mean: 1e+006 Std Dev: 300000 Rel. Min: 900000 Rel. Max: 900000	180

Material Name	Color	Normal Restitution	Tangential Restitution	Friction Angle	Slope Roughness (deg)
Bedrock Outcrops		Normal Mean: 0.35 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	Normal Mean: 0.85 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	30	Normal Mean: 3 Std Dev: 1 Rel. Min: 3 Rel. Max: 3
Floodplain Soil		Normal Mean: 0.3 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	Normal Mean: 0.78 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	30	Normal Mean: 3 Std Dev: 1 Rel. Min: 3 Rel. Max: 3

Seeder Name	Number of Rocks	Rock Types	Horizontal Velocity (ft/s)	Vertical Velocity (ft/s)	Rotational Velocity (rads/s)	Initial Rotation (deg)
Seeder 1	1000	Small Metabasalt Big Metabasalt	0	0	0	Uniform Mean: 0 Rel. Min: 0 Rel. Max: 360

"Realistic" Parameters (from Hoek, 1987): Assume all rocks fall from top of highest bench slope. Assume crest loss of 4 feet on all bench slopes. Assume clean bedrock surface on benches and at base of quarry. Bench slopes catch majority of rockfall. No runout beyond 200 feet from base-of-slope.

Public Highway

1200
1000
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1200
1400
1600
1800
2000

NOTES:

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Rockfall Hazard Study
Proposed Marblemount Quarry
Skagit County, Washington

CASE 2 - PROFILE A
FINAL CONDITIONS

December 2018 102282-001

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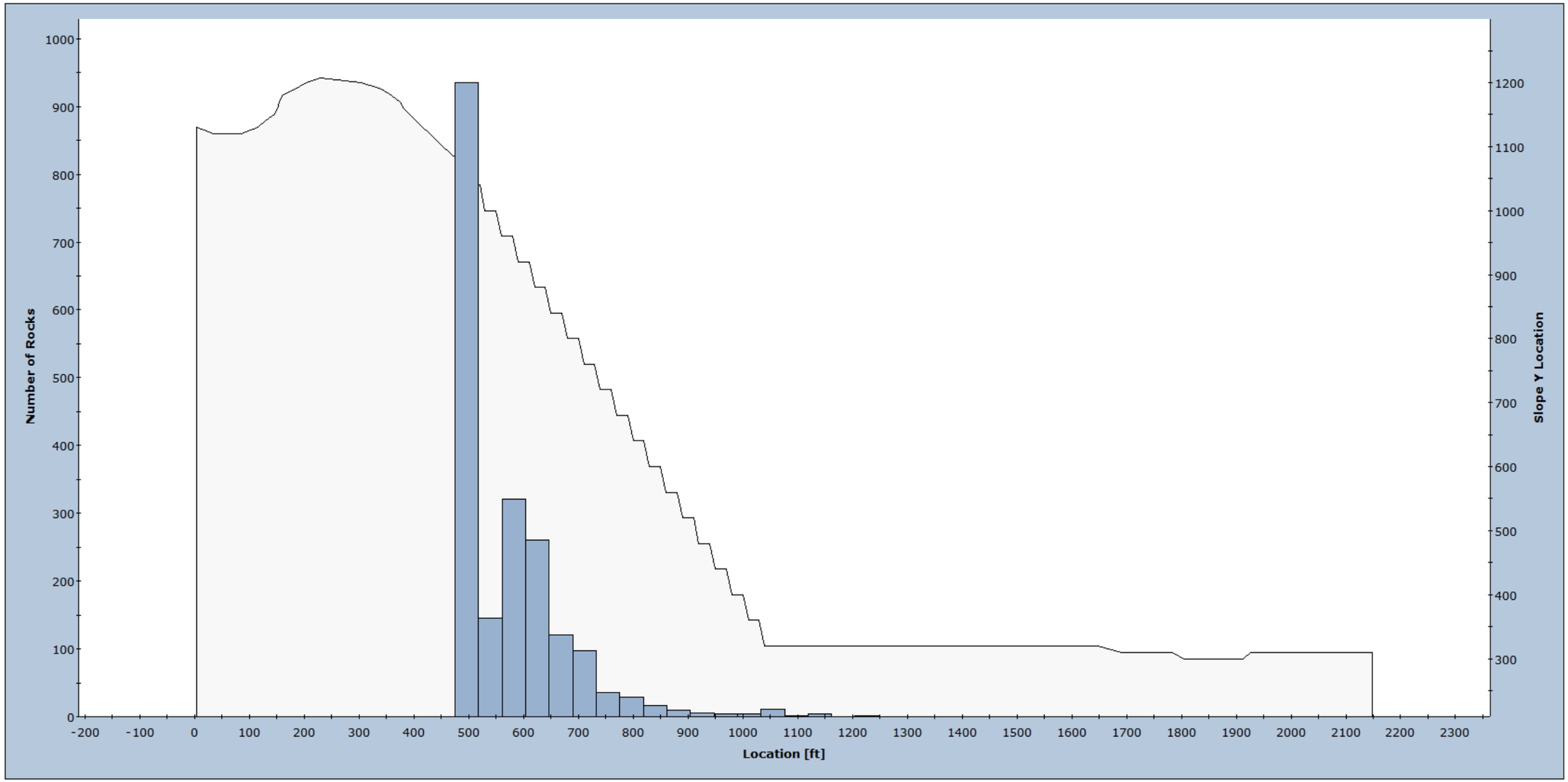
FIG. 4
Sheet 1 of 2

FIG. 4
Sheet 1 of 2

Distribution of Rock Path End Locations



Total number of rock paths: 2000

NOTES:

1. Figure not to scale.
2. Surface topography developed from AutoCAD file titled "ACAD-2017008_ecP_RP_2018.12.10.dwg" provided by Pacific Survey & Engineering on December 10, 2018.
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Rockfall Hazard Study
Proposed Marblemount Quarry
Skagit County, Washington

CASE 2 - PROFILE A
FINAL CONDITIONS

December 2018 102282-001

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FIG. 4
Sheet 2 of 2

FIG. 4
Sheet 2 of 2

Rock Name	Color	Mass (lb)	Density (lb/ft3)
Small Metabasalt		Normal Mean: 50000 Std Dev: 15000 Rel. Min: 45000 Rel. Max: 45000	180
Big Metabasalt		Normal Mean: 1e+006 Std Dev: 250000 Rel. Min: 750000 Rel. Max: 750000	180

Seeder Name	Number of Rocks	Rock Types	Horizontal Velocity (ft/s)	Vertical Velocity (ft/s)	Rotational Velocity (rads/s)	Initial Rotation (deg)
Seeder 1	1000	Small Metabasalt Big Metabasalt	0	0	0	Uniform Mean: 0 Rel. Min: 0 Rel. Max: 360

"Realistic" Case (from Hoek, 1987): Assume bedrock surface with reduced friction angle to allow some boulders to runout to base of slope. Likely a conservative model. Use line seeder on slope running from base to top of bedrock slope (rockfall sources not well-defined; seeder at top of slope is not the most conservative case for this profile).

Material Name	Color	Normal Restitution	Tangential Restitution	Friction Angle	Slope Roughness (deg)
Bedrock Outcrops		Normal Mean: 0.35 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	Normal Mean: 0.85 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	25	Normal Mean: 3 Std Dev: 1 Rel. Min: 3 Rel. Max: 3
Soft Soil Some Vegetation		Normal Mean: 0.3 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	Normal Mean: 0.8 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	30	Normal Mean: 3 Std Dev: 1 Rel. Min: 3 Rel. Max: 3

Public Highway

1400
1200
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1600
1800
2000
2200
2400

NOTES:

1. Figure not to scale.
2. Surface topography developed from AutoCAD file titled "ACAD-2017008_ecP_RP_2018.12.10.dwg" provided by Pacific Survey & Engineering on December 10, 2018.
3. Rockfall trajectories and display obtained with RocScience RocFall™ version 6.011 software.

Rockfall Hazard Study
Proposed Marblemount Quarry
Skagit County, Washington

CASE 3 - PROFILE B
EXISTING CONDITIONS

December 2018 102282-001

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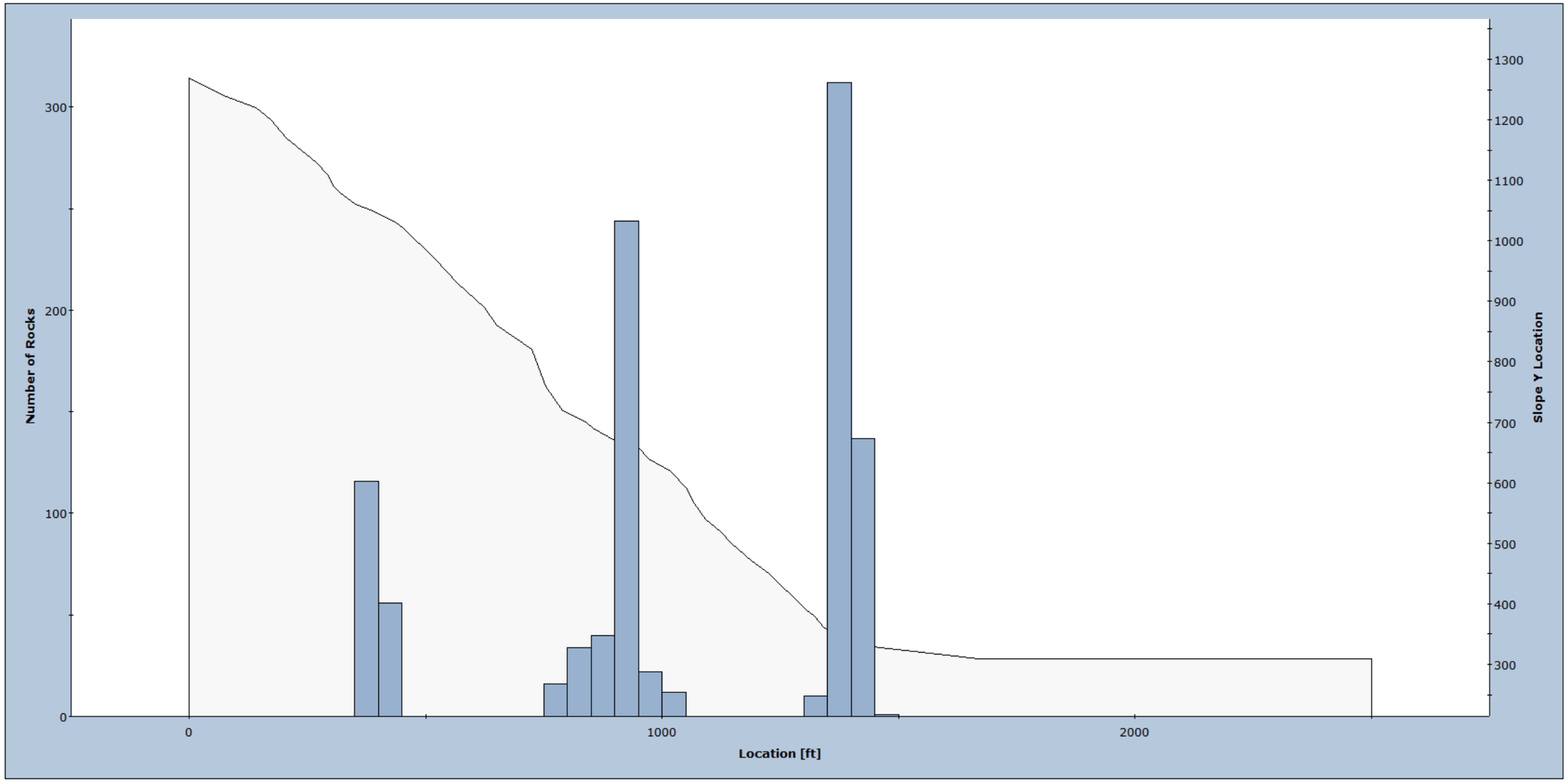
FIG. 5
Sheet 1 of 2

FIG. 5
Sheet 1 of 2

Distribution of Rock Path End Locations



Total number of rock paths: 1000

NOTES:

1. Figure not to scale.
2. Surface topography developed from AutoCAD file titled "ACAD-2017008_ecP_RP_2018.12.10.dwg" provided by Pacific Survey & Engineering on December 10, 2018.
3. Rockfall trajectories and display obtained with RocScience RocFall™ version 6.011 software.

Rockfall Hazard Study
Proposed Marblemount Quarry
Skagit County, Washington

CASE 3 - PROFILE B
EXISTING CONDITIONS

December 2018 102282-001

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FIG. 5
Sheet 2 of 2

FIG. 5
Sheet 2 of 2

Rock Name	Color	Mass (lb)	Density (lb/ft3)
Small Metabasalt		Normal Mean: 50000 Std Dev: 15000 Rel. Min: 45000 Rel. Max: 45000	180
Big Metabasalt		Normal Mean: 1e+006 Std Dev: 250000 Rel. Min: 750000 Rel. Max: 750000	180

Seeder Name	Number of Rocks	Rock Types	Horizontal Velocity (ft/s)	Vertical Velocity (ft/s)	Rotational Velocity (rads/s)	Initial Rotation (deg)
Seeder 1	1000	Small Metabasalt Big Metabasalt	0	0	0	Uniform Mean: 0 Rel. Min: 0 Rel. Max: 360

"Realistic" Case (from Hoek, 1987): Assume bedrock surface with reduced friction angle to allow some boulders to runout to base of slope. Likely a conservative model. Use line seeder on slope running from base to top of bedrock slope (rockfall sources not well-defined; seeder at top of slope is not the most conservative case for this profile). Road cuts generally act as catchment, reducing total number of rocks reaching base of slope.

Material Name	Color	Normal Restitution	Tangential Restitution	Friction Angle	Slope Roughness (deg)
Bedrock Outcrops		Normal Mean: 0.35 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	Normal Mean: 0.85 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	25	Normal Mean: 3 Std Dev: 1 Rel. Min: 3 Rel. Max: 3
Soft Soil Some Vegetation		Normal Mean: 0.3 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	Normal Mean: 0.8 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	30	Normal Mean: 3 Std Dev: 1 Rel. Min: 3 Rel. Max: 3

Public Highway

1400
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2200
2400

NOTES:

1. Figure not to scale.
2. Surface topography developed from AutoCAD file titled "ACAD-2017008_ecP_RP_2018.12.10.dwg" provided by Pacific Survey & Engineering on December 10, 2018.
3. Rockfall trajectories and display obtained with RocScience RocFall™ version 6.011 software.

Rockfall Hazard Study
Proposed Marblemount Quarry
Skagit County, Washington

CASE 4 - PROFILE B
FINAL CONDITIONS WITH DISPERSED ROCKFALL SOURCE

December 2018 102282-001

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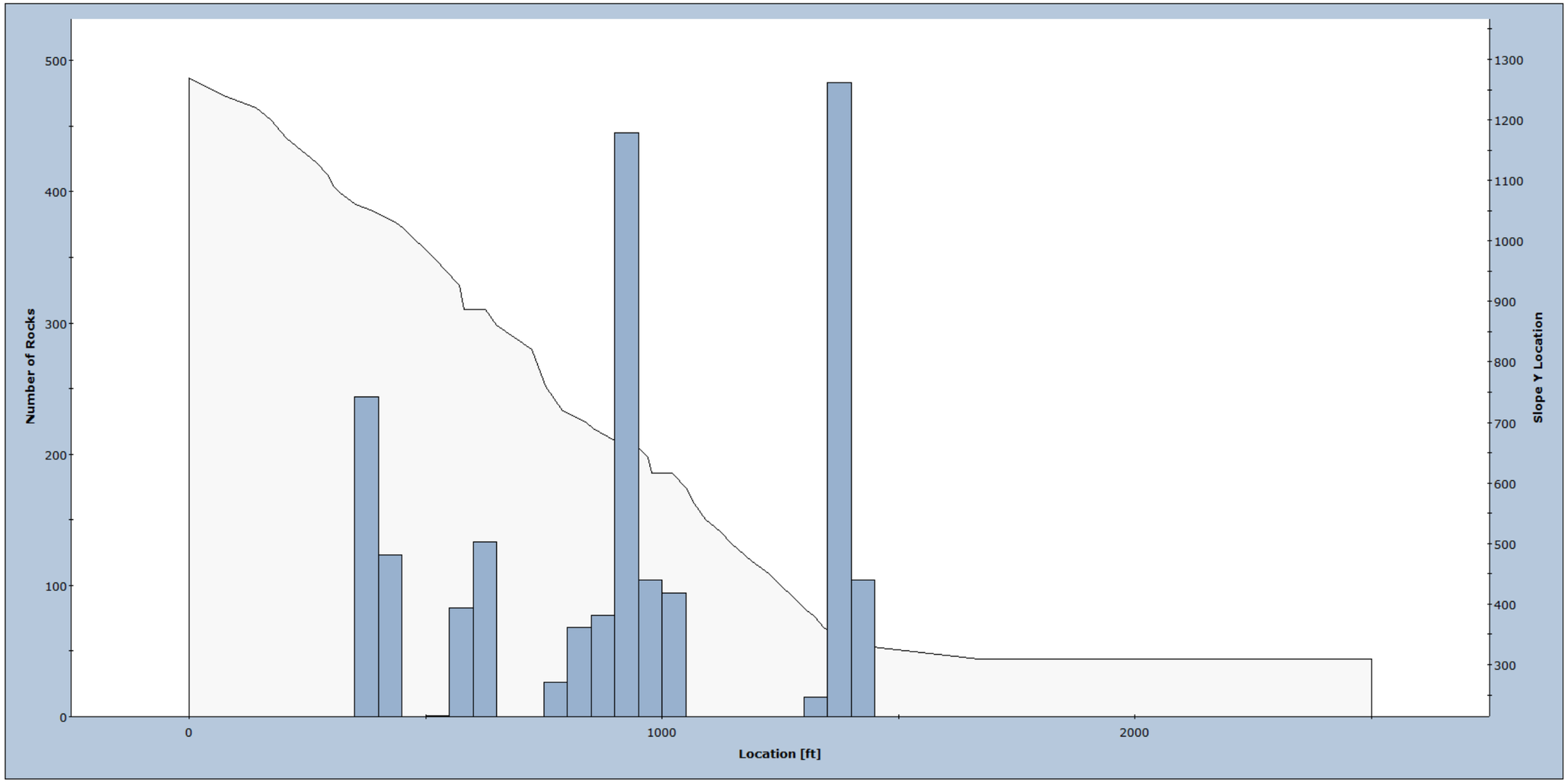
FIG. 6
Sheet 1 of 2

FIG. 6
Sheet 1 of 2

Distribution of Rock Path End Locations



Total number of rock paths: 2000

NOTES:

1. Figure not to scale.
2. Surface topography developed from AutoCAD file titled "ACAD-2017008_ecP_RP_2018.12.10.dwg" provided by Pacific Survey & Engineering on December 10, 2018.
3. Rockfall trajectories and display obtained with RocScience RocFall™ version 6.011 software.

Rockfall Hazard Study
Proposed Marblemount Quarry
Skagit County, Washington

CASE 4 - PROFILE B
FINAL CONDITIONS WITH DISPERSED ROCKFALL SOURCE

December 2018 102282-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 6
Sheet 2 of 2

FIG. 6
Sheet 2 of 2

Rock Name	Color	Mass (lb)	Density (lb/ft3)
Small Metabasalt		Normal Mean: 50000 Std Dev: 15000 Rel. Min: 45000 Rel. Max: 45000	180
Big Metabasalt		Normal Mean: 1e+006 Std Dev: 250000 Rel. Min: 750000 Rel. Max: 750000	180

Seeder Name	Number of Rocks	Rock Types	Horizontal Velocity (ft/s)	Vertical Velocity (ft/s)	Rotational Velocity (rads/s)	Initial Rotation (deg)
Seeder 2	1000	Small Metabasalt Big Metabasalt	1	0	0	Uniform Mean: 0 Rel. Min: 0 Rel. Max: 360

"Realistic" Case (from Hoek, 1987) - Rockfall originating from cut edge only: Assume bedrock surface with reduced friction angle to allow some boulders to runout to base of slope. Likely a conservative model. Use point seeders to simulate concentrated source areas at cut edges. Road cuts generally act as catchment, reducing total number of rocks reaching base of slope.

Material Name	Color	Normal Restitution	Tangential Restitution	Friction Angle	Slope Roughness (deg)
Bedrock Outcrops		Normal Mean: 0.35 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	Normal Mean: 0.85 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	25	Normal Mean: 3 Std Dev: 1 Rel. Min: 3 Rel. Max: 3
Soft Soil Some Vegetation		Normal Mean: 0.3 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	Normal Mean: 0.8 Std Dev: 0.04 Rel. Min: 0.12 Rel. Max: 0.12	30	Normal Mean: 3 Std Dev: 1 Rel. Min: 3 Rel. Max: 3

Public Highway

1400
1200
1000
800
600
400
200
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400

NOTES:

1. Figure not to scale.
2. Surface topography developed from AutoCAD file titled "ACAD-2017008_ecP_RP_2018.12.10.dwg" provided by Pacific Survey & Engineering on December 10, 2018.
3. Rockfall trajectories and display obtained with RocScience RocFall™ version 6.011 software.

Rockfall Hazard Study
Proposed Marblemount Quarry
Skagit County, Washington

CASE 5 - PROFILE B
FINAL CONDITIONS WITH POINT ROCKFALL SOURCES AT CUTS

December 2018 102282-001

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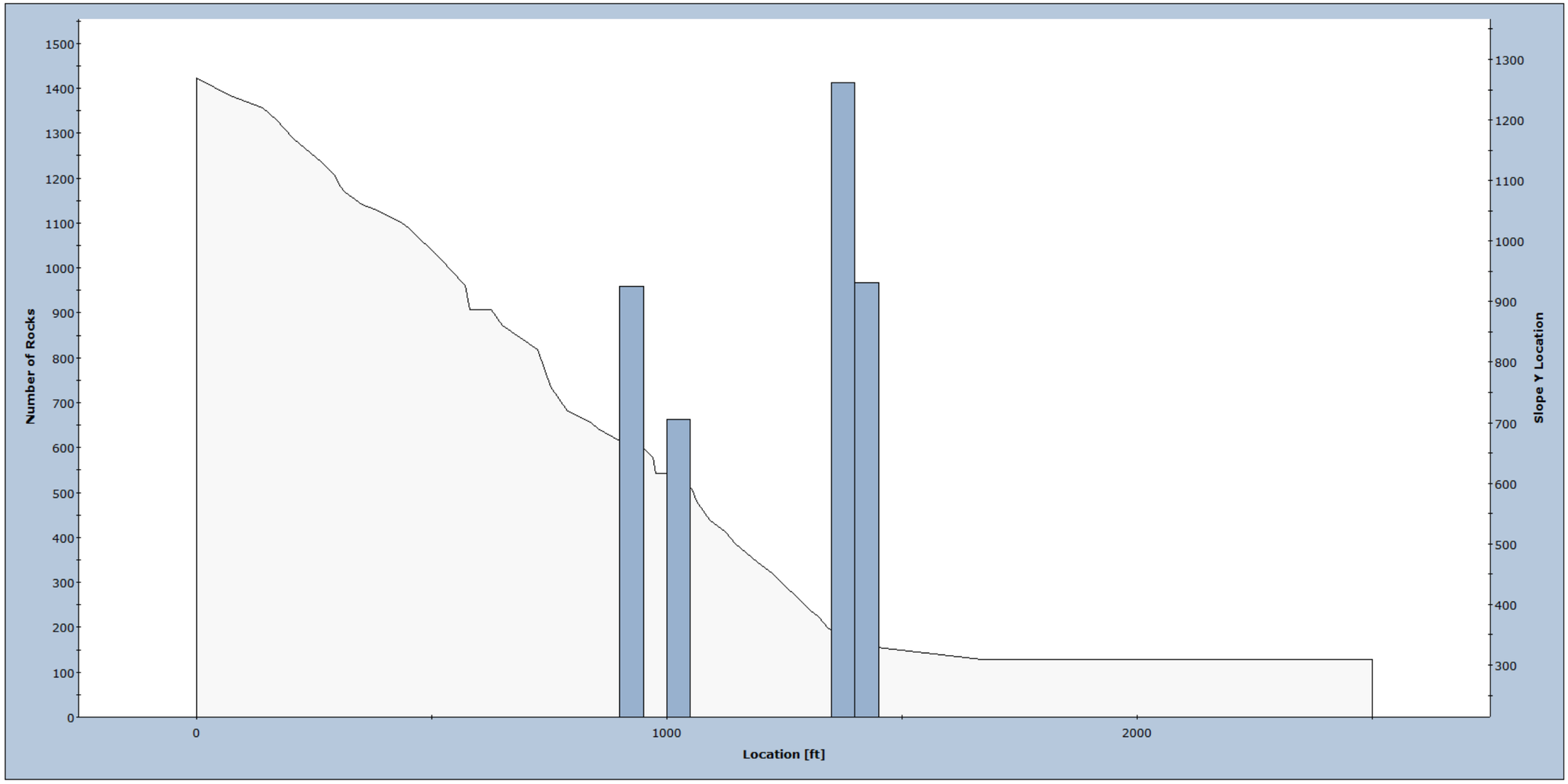
Geotechnical and Environmental Consultants

FIG. 7
Sheet 1 of 2

FIG. 7
Sheet 1 of 2

Distribution of Rock Path End Locations



Total number of rock paths: 4000

NOTES:

1. Figure not to scale.
2. Surface topography developed from AutoCAD file titled "ACAD-2017008_ecP_RP_2018.12.10.dwg" provided by Pacific Survey & Engineering on December 10, 2018.
3. Rockfall trajectories and display obtained with RocScience RocFall™ version 6.011 software.

Rockfall Hazard Study
Proposed Marblemount Quarry
Skagit County, Washington

CASE 5 - PROFILE B
FINAL CONDITIONS WITH POINT ROCKFALL SOURCES AT CUTS

December 2018 102282-001

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FIG. 7
Sheet 2 of 2

FIG. 7
Sheet 2 of 2

BIOLOGICAL ASSESSMENT

SKAGIT COUNTY CRITICAL AREAS REPORT
FISH AND WILDLIFE HABITAT CONSERVATION AREAS ASSESSMENT
MARBLEMOUNT QUARRY PROJECT
ROCKPORT CASCADES ROAD, MARBLEMOUNT, WA
APNs P45543, P128574, P120304, P45550, P45548, AND P45541

Prepared for Kiewit Infrastructure Co.

January 15, 2019

Submitted by:
Element Solutions
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January 15, 2019

Prepared for: Chuck Nylund
Kiewit Infrastructure Co.
2200 Colombia House Blvd
Vancouver, WA, 98661
360-693-1478
chuck.nylund@kiewit.com

Subject: **Biological Assessment and Skagit County Critical Areas HCA Report for the Proposed Marblemount Quarry**
Rockport Cascades Road, Marblemount, WA.
APNs P45543, P128574, P120304, P45550, P45548, and P45541

Dear Mr. Nylund,

The attached Biological Assessment for the proposed Marblemount Quarry project was compiled using information provided by Kiewit Infrastructure Co., a review of public information, an on-site investigation of the subject area, and the professional judgment of Element Solutions environmental specialists. The work included several evaluations to determine the presence, location, and characteristics of federally-listed species and critical habitats within or adjacent to the Action Area. We also assessed relative impacts to critical habitats that may occur from the proposed project actions and have provided options for reducing, eliminating, and/or mitigating these potential impacts.

This report is intended to provide you with the baseline environmental information to further advise planning-level decisions and guide the project towards jurisdictional compliance. The project occurs within multiple federal, state and local agency jurisdictions. The policies for permit review must comply with the federal requirements of Section 7 of the Endangered Species Act and appropriate state and local codes, including but not limited to Hydraulic Code, Shoreline Master Program, and Sections 10, 401, and 404 of the Federal Register. Species and/or habitats identified by U.S. Fish and Wildlife Service, National Marine Fisheries Service, Washington Department of Fish and Wildlife, and Skagit County with the potential to be impacted by the proposed project are identified and evaluated for an effects determination. Should you have any questions concerning this report, please contact us at (360) 671-9172 or at ppittman@elementsolutions.org.

Sincerely,

Paul Pittman, MS, LEG
Earth and Environmental Sciences Manager - Principal

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EXECUTIVE SUMMARY

Element Solutions (Element) was retained by the client, Kiewit Infrastructure Co., to provide professional consulting services to conduct a biological assessment (BA) and identify the potential occurrence of regulated Critical Areas in the Action Area. Scientists also evaluated potential impacts from the proposed project action to comply with applicable Skagit County, Washington State, and federal environmental regulatory codes. The proposed project action is a rock quarry occurring on subject tax parcels P45543, P128574, P120304, P45550, P45548, and P45541. These parcels were identified by Skagit County as potentially containing regulated critical areas defined under Skagit County Critical Areas Ordinance (SCC 14.24) and potentially under the jurisdiction of Washington State and federal regulations.

Following the appropriate BMPs would control and minimize impacts from mining activities; therefore, our determination of effects is that the overall proposed project **May Affect, Is Not Likely to Adversely Affect** Federally-listed and State-listed species that may inhabit the Action Area. The proposed Quarry project would directly impact Skagit County Critical Area buffers and Washington State Priority habitats in the Action Area. However, the project also proposes habitat enhancement and reclamation plans that would account for these impacts in a "no net loss" scenario. By adhering to minimization and habitat enhancement strategies, employing appropriate BMPs and stormwater treatment, the proposed Project Action is not expected to result in a net loss of habitat functions.

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QUALIFICATIONS OF AUTHORS

Adam Crispin, Environmental Scientist and Aquatic Ecologist, has more than 7 years of experience conducting biological assessments and evaluations of wetlands and streams. Mr. Crispin has led regional water quality monitoring programs in northern California with the California Department of Fish and Wildlife. He also has a wide range of expertise, including salmonid habitat restoration, streamflow monitoring, benthic macroinvertebrate taxonomy, freshwater algae analysis, and water chemistry analysis. He has also led monitoring efforts for many aquatic species, including Pacific salmonids and ranid frogs. Adam has completed a 40-hour wetland delineation training from the Wetland Training Institute and holds certificates for wetland plant and hydric soil identification from Department of Ecology. He is a certified forage fish biologist and has been trained by the Washington Department of Fish and Wildlife. He is currently pursuing a Master's degree in Aquatic Ecology at Western Washington University.

John Blum is a Project Manager/Senior Fisheries Scientist with more than 35 years of experience as a fisheries biologist and consultant in instream flow analysis, habitat assessment, Endangered Species Act (ESA) studies, fisheries research, enhancement, management, water resources and endangered species assessment, FERC regulatory licensing and relicensing studies, and expert witness testimony. He has a M.S. in Fisheries from the University of Washington and a B.S. in Environmental Biology and a B.S. in Business in Business Management from Eastern Illinois University. In his role as a senior fisheries biologist and consultant, Mr. Blum has managed more than 60 fisheries and aquatic resources impact assessments in the Northwest in both fresh and marine waters.

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1 INTRODUCTION AND BACKGROUND

1.1 Purpose and Need

Element Solutions (Element) was retained by the client, Kiewit Infrastructure Company (Kiewit), to provide professional consulting services to conduct a biological assessment (BA) and identify the potential occurrence of regulated critical areas in the Action Area. Scientists also evaluated potential impacts from the proposed project action to comply with applicable Skagit County, Washington State, and federal environmental regulatory codes. The proposed project action is a rock quarry, as described in detail in Section 1.3. The subject parcels (tax parcels P45543, P128574, P120304, P45550, P45548, and P45541) were identified by Skagit County as potentially containing regulated critical areas defined under Skagit County Critical Areas Ordinance (SCC 14.24) and potentially under the jurisdiction of Washington State and federal regulations as detailed in Section 1.4.

Pursuant to the review and reporting requirements specified in this code, the objectives of the assessment were to evaluate and describe, to the extent feasible: 1) the existing site conditions; 2) the occurrence, functions, and processes of regulated areas, and 3) the potential impact from the proposed project action on regulated areas. Recommendations for avoiding, minimizing and/or mitigating potential impacts as relevant are provided in Section 4 in accordance with the assessment and reporting requirements specified in the regulatory code.

1.1.1 Project Background

The purpose of the proposed Marblemount Quarry project (Project) is to supply jetty stone for several projects of nationwide significance on the west coast of Oregon and especially the Mouth of the Columbia River (MCR). Jetty stone requires unique physical properties that few available quarry sources along the west coast of the Unites States can provide. The previous primary source of jetty stone was the Beaver Lake Quarry, which is now nearly depleted. The rock at the Marblemount Quarry site meets the jetty stone requirements, which is why this site was selected. No other viable, ready-to-permit jetty stone sources have been identified.

The existing Marblemount Quarry is within the Mineral Resource Overlay (MRO) designation in the Skagit County Comprehensive Plan. A Conditional Use Permit was previously granted for quarry rock removal at this site; however, the scale of the quarry operations and footprint have expanded. This necessitates a modified and updated Special Use Permit, expansion of the MRO through a Skagit County Comprehensive Plan Amendment update, and Department of Natural Resources (DNR) Reclamation Plan. In all, over a dozen local and state regulatory permits are needed for the modified quarry project.

1.1.2 Organization of this Report

In Section 1, we introduce the proposed project by describing the location and setting of the Action Area. In the remainder of this report presents our findings in the following Sections:

- A description of the relevant code guiding this assessment in **Section 2.**

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- A description of the proposed Project Action, the potential extent of project impacts and Action Area in **Section 3.**
- The current status of Federally-listed species, Washington State Priority Habitats and Species, and Critical Areas that could inhabit the Action Area in **Section 4**.
- The established Environmental Baseline of the Action Area including existing habitat conditions, indicators of species presence, and evaluation of watercourses in the Action Area in **Section 5**.
- Federally Endangered Species Act Effects Determinations in **Section 6.**
- The proposed impacts to Critical Area buffers and Washington State Priority Habitats are described in **Section 7.**
- Our conclusions and recommendations for responsible development and project completion, including a recommended habitat enhancement plan are provided in **Section 8.**
- A report closure and author signatures are provided in **Section 9**, with subsequent chapters including References, Figures and Appendices.

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2 APPLICABLE ENVIRONMENTAL CODE

2.1 Federal Regulations

This BA has been prepared in general accordance with Section 7(c) of the Federal ESA of 1973 and includes elements to satisfy additional guidelines set forth in the Federal Migratory Bird Treaty Act of 1918 (16 United States Code 703-712) and Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson Stevens Act; 50 CFR 600). U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA) Fisheries have federal jurisdiction over all ESA-listed species - aquatic, marine, and terrestrial species - in and around the Action Area.

In summary, the following federal regulations apply to this assessment:

- Section 404 of the Federal Water Pollution Control Act (Clean Water Act, P.L. 92-500, as amended)
- Section 401 of the Clean Water Act
- Section 10 of the Rivers and Harbors Act of 1899
- Coastal Zone Management Act
- Endangered Species Act of 1973
- National Historic Preservation Act
- Magnuson-Stevens Act
- Migratory Bird Treaty Act
- Fish and Wildlife Coordination Act of 1934 (revised 1995)

2.2 State Regulations

Washington State governs critical areas primarily through the Growth Management Act (GMA) and the Shoreline Management Act (SMA). The GMA (Revised Code of Washington [RCW] 36.70A.172 and RCW 36.70A.170) delegates the authority to describe and regulate critical areas to the local county or city regulatory agencies and states, “In designating and protecting critical areas under this chapter, counties and cities shall include the best available science in developing policies and development regulations to protect the functions and values of critical areas. In addition, counties and cities shall give special consideration to conservation or protection measures necessary to preserve or enhance anadromous fisheries.” While the cities and counties have been granted authority for general oversight of critical areas protection, Washington State retains its right to regulate critical areas under RCW 90.48.030, which states, “The Department shall have the jurisdiction to control and prevent the pollution of streams, lakes, rivers, ponds, inland waters, salt waters, water courses, and other surface and underground waters of the state of Washington.”

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In summary, the following Washington state regulations and standards may also apply for this assessment:

- GMA
- SMA (RCW 36.70A.175 and RCW 90.58.380)

The State of Washington, through the Washington Department of Ecology (Ecology), can delegate its authority to local agencies, but it retains its right to regulate critical areas under RCW 90.48.030.

2.2.1 State Priority Habitats and Species

Species and habitats that receive special protections and/or considerations within the county, Washington State, and Federal jurisdictions are listed on the Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) List, USFWS, and NOAA Fisheries. Priority species are fish and wildlife species that require protective measures and/or management. Species identified and mapped as priority species fit one or more of the following criteria:

1) State and/or Federally-listed species legally designated as Endangered, Threatened, or Sensitive, or candidate species that will be reviewed by agency(s) for possible listing as Endangered, Threatened, or Sensitive.

2) Vulnerable Aggregations, which include species or groups of animals susceptible to significant population declines.

3) Species of recreational, commercial, and/or tribal importance for ceremonial and subsistence purposes, and are biologically or ecologically vulnerable to decline or are dependent on habitats that are highly vulnerable or are in limited availability.

Habitats that receive special protections or management considerations are habitats with unique or significant value to many species or specific protected species. Priority habitats have one or more of the following attributes:

- Comparatively high fish and wildlife density
- Comparatively high fish and wildlife species diversity
- Important fish and wildlife breeding habitat
- Important fish and wildlife seasonal ranges
- Important fish and wildlife movement corridors
- Limited availability
- High vulnerability to habitat alteration
- Unique or dependent species

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The Action Area (see Section 3.2) was evaluated to determine if priority habitats and/or species are present. The site access and mining plan then considered to determine the potential effects on the species and habitats present on and in the property vicinity and site-specific best management practices (BMPs) were recommended and are summarized in this report.

2.3 Skagit County Critical Areas Ordinance

The standard critical areas review and site assessment procedures as described in SCC 14.24.080 and the Fish and Wildlife Habitat Conservation Area site assessment requirements in SCC 14.23.520, as defined by Skagit County were used in this assessment. The following critical areas were identified as occurring on or proximate to the Action Area:

- Fish and Wildlife Habitat Conservation Areas

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3 PROPOSED PROJECT ACTION

3.1 Proposed Action Components

The Proposed Project includes boundary line adjustments, site clearing, site grading road building, quarry operations, and reclamation of a bedrock quarry on Rockport Cascade Road approximately one mile south of Marblemount, WA (Figure 1). The Proposed Project will involve development activities on parcels P45543, P128574, P120304, P45550, and parts of P45548 and P45541. A majority of the mining would take place on P45543, which has been used as a small-scale quarry (under 3 acres) over the past several decades. The overall project limit footprint at full buildout is approximately 120 acres. At full buildout, the proposed mining footprint would encompass approximately 30 acres (20 acres proposed for Phase I); quarry operations—including roads, stockpile areas, stormwater management, and operations areas—would encompass approximately 60 acres; and approximately 30 acres would be retained vegetation areas.
Currently, stands of second-growth timber cover a majority of the site and an approximately 800-foot-high rock face dominates P45543. This rock face consists of Shuksan greenschist, which is the desired quarry stone source.

The proposed project would occur in four steps:

1. Boundary Line Adjustment, Clearing and Building Access Road for Forest Practice Conversion.
2. Mining within the MRO Overlay Area.
3. Possible quarry expansion contingent on MRO boundary change.
4. Quarry Reclamation.

Step 1 – Boundary Line Adjustment, Site Clearing, Preparation and Building Access Road for Forest Practice Conversion would include acquiring and performing boundary line adjustments on P128574. The property line would be adjusted to encompass approximately 10.2 acres of P45541. Additionally, an approximately 20.2-acre portion of P45548 would also be boundary line adjusted to P128574. Step 1 also includes clearing, removing stumps, and site grading, and road construction on Parcels P45543, P45550, P120304, P128574, and parts of P45548 and P45541. Marketable timber will be removed from the site. An approximately 6,700-foot gravel access road would be built to access the top and eastern portions of the project site. Wood mulch and top soil would be stockpiled on site for future reclamation. Access to the site would include building two new access driveways on Rockport Cascade Road and decommissioning the two existing access points. Grading and roadways for quarry operations and stormwater management will be constructed on the western portion of the project limits. The road to access the eastern portion of the site would be designed to meet or exceed Skagit County standards, Washington Department of Natural Resources (DNR) Forest Practice and Mining standards, and any other standards appropriate for its use. Following site clearing and preparation, the road would be used to access the top of the quarry and for hauling rocks to the bottom for processing.

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Step 2 – Mining Activities. The quarry would be established on P45543 within the current MRO boundary per the Mining Site Plan. Step 2 would also include constructing mining operation areas and support facilities, including an armor stone staging area in the western portion of P45543. This step would also involve constructing portable offices/storage structures, truck loadout scale, a heavy equipment and employee parking area, a fueling station, maintenance shops, and storage facilities for blasting equipment. An undersized rock stockpile area would be established within the existing MRO area on P128574 and a potential future phase undersized rock stockpile area has been designated if the MRO boundary is successfully expanded (see Step 3). Rock mining would be conducted using a "top down" approach such that rock would not be cast off the cliff face. Instead, rock would be transported to the stockpile or staging areas by truck. The land use to the south, east, and west is secondary and industrial forestry and the land use to the north is rural residential. A minimum 100-foot setback would be maintained along adjacent property lines or bordering quarry activities. A 50-foot vegetative buffer would be maintained on Rockport Cascade Road.

Step 3 – Expanded Mining Area would include quarry and undersized rock stockpile area expansion. Step 3 is dependent upon an expansion of the MRO through the Skagit County Comprehensive Plan Amendment process. Once the MRO overlay is expanded, the quarry area would expand approximately 10 acres into P45541 and the undersized rock stockpile area described in Step 2 would expand to the south (approximately 20 acres) onto P45548 to accommodate the additional undersized rocks from the expanded quarry. The mining activities of Step 3 would be the same as those in Step 2.

Step 4 – Quarry Reclamation would include full reclamation of all the affected parcels following decommissioning of the quarry, roads and supporting mining operations. The full lifespan of the quarry would be up to 100 years or whenever the source of rock is exhausted. The Mining Reclamation Plan is consistent with DNR surface quarry reclamation regulations. The land will be restored to forestry land use following reclamation.

3.2 Action Area

The Action Area is defined as the area to be affected directly or indirectly by the federal action (50 CFR §402.02). The Action Area considers the effects of interrelated and interdependent activities and includes the geographic extent of the effects resulting from the proposed action. Information provided in Section 6.2 for each direct, indirect, interrelated, and interdependent effect is used to determine the limits of the effects of the proposed action. The Action Area boundary is thus set as the limits of the effects of the proposed action.

The following sections provide information only on the potential effects that are expected to extend beyond the immediate construction area; this discussion generally describes the expected effect, as well as the anticipated extent of the effect, based on existing information in order to determine the overall extent of the proposed Action Area. For this proposed action, potential effects are expected to be related to water quality (i.e., turbidity) and potential for elevated noise levels produced by construction equipment. Section 6 describes potential effects on the listed species and critical habitat in greater detail.

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3.2.1 Water Quality

The proposed action primarily involves the creation and continued use of a rock quarry, with no proposed impacts to the nearby Skagit River or listed salmonids. There will, however, be temporary impacts to aquatic habitats due to road construction and culvert placement. These culvert installations would occur in non-fish bearing waters and would utilize standard BMPs. Very minor effects to water quality, such as minor and localized increased re-suspended sediment or short-term, minor increased turbidity may occur during culvert placement and road construction, but not at levels that would trigger reductions in dissolved oxygen (DO) concentrations. Based on the proposed construction methods and site conditions, it is expected that there would be no effect to DO levels from the proposed action, and the farthest-reaching water quality impact is determined to be the potential for increased turbidity from activities associated with the continued mining operations. No turbidity is expected to be generated from the quarry reclamation or habitat enhancement, and water quality effects associated with plant installation would be insignificant in the short-term.

3.2.2 Noise and Vibration

Past ambient noise and ground vibration have been generated by activity near the two sporadically-operated rock quarries adjacent to Rockport Cascade Road within the Action Area (Figure 2). During past quarry operations, noise and ground vibrations have been generated by mechanized excavation and hauling equipment, and blasting, as well as vehicle traffic on Rockport Cascade Road.

Overall, the mining activities associated with the proposed action are not expected to generate subsurface vibrations at levels that would impact aquatic species within the two watercourses in the Action Area and the nearby Skagit River. As reported by Kolden and Aimone-Martin (2013), in the most sensitive species of salmonids, embryos begin to experience mortality around peak particle velocities (vibration) of 147 millimeters/second (mm/s). These vibration activities will occur on land approximately 1.3 miles east of the Skagit River, which has documented salmon spawning. Mining activities will likely result in some level of substrate vibrations in and around the site; however, blasting and equiptment vibrations would not likely reach critical vibration velocities as ground vibrations typically dissipate to less than 5 mm/s within a distance of 0.18 miles for a variety of substrate sizes (Fişne et al., 2011).

Significant blasting, crushing, and other vibration and noise-generating activities would be managed to meet regulatory requirements and industry standards. Noise generated by construction equipment will not increase in-water noise levels above disturbance thresholds for fish because these would dissipate before reaching critical salmonid spawning and rearing areas. While there are ESA-listed avian and mammal species present in Skagit County (USFWS, 2018), the surrounding roads, residential, timber, and mineral resource areas of the action area and vicinity do not appear to contain suitable habitat for these species. There are no ESA-listed mammals or avian species present that would be exposed to significantly increased in-air noise levels or below ground vibrations.

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REVEY and Associates (RAI) conducted an evaluation of blasting impacts to evaluate how future blasting at the site can be controlled to protect people, structures, utilities and environmental resources around the site. Where appropriate, specific mitigation measures to prevent or minimize blasting impacts were recommended (RAI, 2019). An additional study examined the effects of noise generated by the Project (BRC Acoustics & Audiovisual Design [BRC], 2019). Their analysis indicated that calculated sound levels from the proposed operations with recommended noise mitigation met application Skagit County Code noise limits at all analysis locations. Further details can be found in Section 6.2.1 and the referenced reports.

3.2.3 Effects of Interrelated and Interdependent Actions

Interrelated actions are those that are part of a larger action and depend on the larger action for their justification (50 CFR 402.02). Interdependent actions have no independent utility apart from the proposed action (50 CFR 402.02). The proposed action includes the effects of interrelated and interdependent actions.

This proposed action includes the construction activities necessary to complete the Marblemount quarry and extract the jetty stone for the proposed purpose. The project will require construction of an access road and stockpile area. There is the potential for erosion to arise from the development of these access and staging areas, although the implementation of BMPs (see Section 3.3) will minimize the potential for runoff containing stormwater pollutants. There are no other projects being considered by Kiewit that require implementation of this proposed action; therefore, there are no effects from interrelated and interdependent actions.

3.2.4 Proposed Action Area Boundary

The proposed Action Area includes all areas that could be directly or indirectly affected by the proposed action. The proposed Action Area boundary is defined as the area encompassing the farthest-reaching effects of the proposed action, based on the effects discussed in the preceding sections. The proposed action would not impact migratory corridors or fish access to habitat. Construction-related noise is not anticipated to reach levels significantly above ambient conditions, due to the presence of the roadway and current mining activities. Construction-induced turbidity due to four culvert installations and placement of the access road is anticipated to be the farthest-reaching effect. Turbidity would be mitigated to the extent practicable by implementation of BMPs described in Section 3.3. All impacted Priority Habitat areas would be mitigated for as addressed specifically in the Reclamation Plan (pending submittal, PSE).

The extent of the Action Area is shown below in Figure 1.

3.3 Conservation Measures and Best Management Practices

The following BMPs are recommended based on professional experience and Washington State Department of Transportation (WSDOT) BMPs for ESA Habitat Protection (WSDOT, 2018). Although no ESA-listed species or critical habitats are present in the area, implementation of the following BMPs would minimize the potential impacts to terrestrial and aquatic habitats:

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- All applicable permits for the project would be obtained prior to construction, and all work would be performed according to the requirements and conditions of these permits.
- The contractor would inspect fuel hoses, oil or fuel transfer valves, and fittings on a regular basis for drips or leaks in order to prevent spills or runoff of petroleum based products in stormwater.
- The contractor would conduct all refueling at least 150 feet from the river.

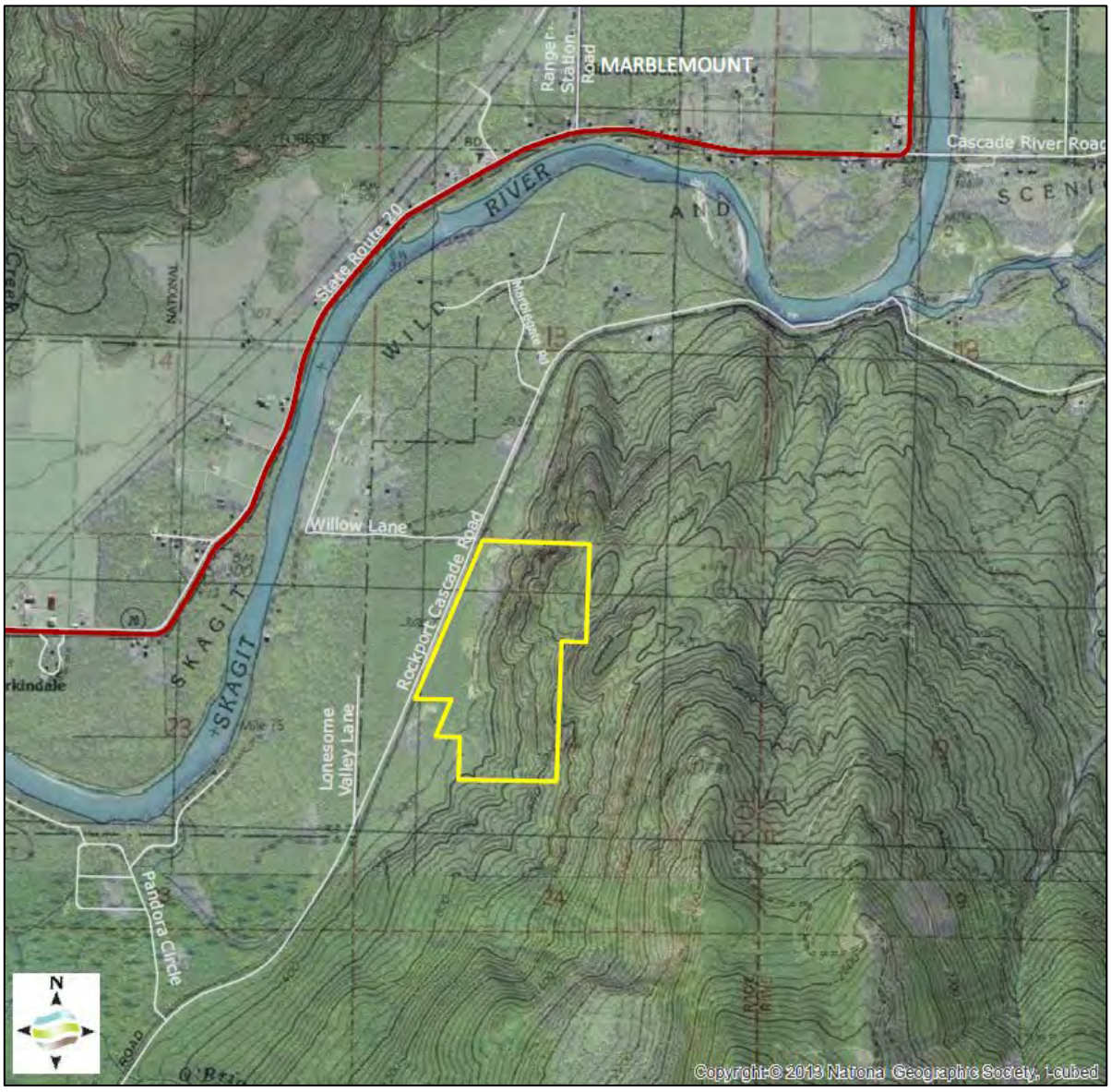

Figure 1. The proposed Action Area (yellow) and Project Vicinity east of the Skagit River and southwest of Marblemount, Washington.

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- The contractor would be responsible for the preparation of a Spill, Prevention, Control, and Countermeasure (SPCC) Plan to be used for the duration of the project. A copy of the SPCC Plan, and any updates, would be maintained at the work site by the contractor and would include the following.
- The SPCC Plan would identify operations involving that handling and storage of petroleum based products and outline potential spill scenarios. The SPCC Plan would outline responsive actions in the event of a spill or release and would describe notification and reporting procedures. The SPCC Plan would outline contractor management elements such as personnel responsibilities, project site security, site inspections, and training.
- The SPCC Plan would outline what measures would be taken by the contractor to prevent the release or spread of hazardous materials, either found on site and encountered during construction but not identified in contract documents, or any hazardous materials that the contractor stores, uses, or generates on the construction site during construction activities. These items include, but are not limited to, gasoline, oils, and chemicals. Hazardous materials are defined in Revised Code of Washington 70.105.010 under "hazardous substance."
- The contractor would maintain at the job site the applicable equipment and material designated in the SPCC Plan.
- The construction contractor would be required to have a spill kit on site at all times.
- Exterior lights would be directed away from watercourses.
- The contractor would limit the use of pesticides within 150 feet of known aquatic or terrestrial habitat areas, except as needed to remove invasive vegetative species and establish native plantings.
- As required by code, the contractor would post conservation signs at the outer edge of the critical area or buffer to clearly indicate the location of the Critical Area.
- Plant an area between the development and the Critical Areas with native vegetation intended to create a barrier to noise and human and domestic animal intrusion and to enhance habitat (see Section 8.3).
- During the summer (July through September), no soils would remain exposed and unworked for more than seven days.
- During the winter (October through June), no soils would remain exposed and unworked for more than two days.
- The mining limits would be controlled and equipment operated in designated areas.
- All areas previously disturbed (clearing and/or fill) would be replanted with dense native vegetation as authorized by Skagit County via the permit process (see also Habitat Enhancement BMPs, Section 8.3.5).

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- Appropriate erosion control measures, including but not limited to coir logs, rock check dams, and hydro-mulch, would be utilized during construction to reduce turbidity, sediment, and/or pollutants from entering surface drainage ditches.
- All construction equipment would be regularly inspected and cleaned to prevent the transfer of pollutants to waterbodies.
- All construction debris or waste would be contained in commercially available containers and removed from the site regularly.
- All human wastewater would be controlled, collected, and managed to conform to Ecology Stormwater Standards.
- No net loss of buffer function and value would be expected if appropriate BMPs are utilized.

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4 STATUS OF CRITICAL AREAS, LISTED SPECIES, AND CRITICAL HABITATS

4.1 Status of Species and Critical Habitat

The following species are specifically identified as protected under the Skagit County Critical Area Ordinance (CAO), or have a state or federal listing as a species or critical habitat. State PHS and USFWS ESA-listed species and critical habitats that could be affected by the proposed project are listed below in Table 1. The web-generated ESA and PHS reports were generated on December 12, 2018 and are provided in Appendix B and Appendix C, respectively.

Table 1. State and Federally-Listed Species and Critical Habitats potentially present in the Action Area.

Common Name	Scientific Name	State/Federal Status	Jurisdiction	Critical Habitat
Birds[1]				
Marbled Murrelet (CA, WA, OR)	*Brachyramphus marmoratus*	Federally Threatened	USFWS	Final designated; none within Action Area
Northern Spotted Owl	*Strix occidentalis caurina*	Federally Threatened	USFWS	Final designated; none within Action Area
Yellow-billed Cuckoo (Western U.S.A DPS)	*Coccyzus americanus*	Federally Threatened	USFWS	Proposed; none within Action Area
Pileated Woodpecker	*Dryocopus pileatus*	State Candidate	WDFW	N/A
Great blue heron	*Ardea herodias*	State monitored	WDFW	N/A
Mammals[2]				
North American wolverine	*Gulo gulo luscus*	Federally Proposed threatened, State Candidate	USFWS, WDFW	None designated
Grey wolf	*Canis lupus*	Federally Endangered, State Endangered (Western WA)	USFWS, WDFW	Final designated; none within Action Area
Grizzly Bear	*Ursus arctos*	Federally Threatened, State Endangered	USFWS, WDFW	Proposed; none within Action Area
Fisher	*Martes pennanti*	Federal Candidate, State Endangered	USFWS, WDFW	None designated

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Common Name	Scientific Name	State/Federal Status	Jurisdiction	Critical Habitat
Canada lynx	*Lynx canadensis*	Federally Threatened, State Endangered	USFWS, WDFW	Final designated; none within Action Area
Cascade red fox	*Vulpes vulpes cascadens*	State Candidate	WDFW	N/A
Marten	*Martes americana*	State monitored	WDFW	N/A
Keen's Myotis	*Myotis keenii*	State Candidate	WDFW	N/A
Townsend's Big-eared bat	*Corynorhinus townsendii*	State Candidate	WDFW	N/A
Fishes (anadromous and freshwater)[3]				
Bull Trout (Coterminous U.S.A.)	*Salvelinus confluentus*	Federally Threatened, State Candidate	USFWS, WDFW	Final designated none within Action Area
Dolly Varden	*Salvelinus malma*	Federally Threatened, State Candidate (Similar appearance)	USFWS, WDFW	None designated
Amphibians				
Oregon spotted frog	*Rana pretiosa*	Federally Threatened, State Endangered	USFWS, WDFW	Proposed; none within Action Area
Western toad	*Anaxyrus boreas*	State Candidate	WDFW	N/A

Notes:
[1]Numerous other PHS bird species, including PHS-monitored waterfowl species may also utilize the Action Area for foraging; however, use is likely sporadic and breeding/nesting do not appear likely.
[2]State monitored bat species may also hunt and roost in the Action Area.
[3]Although these fishes are not indicated in the USFWS Official Species list (Appendix B) they are included due to the proximity of Action Area to the Skagit River, critical habitat for Chinook Salmon and Steelhead.
DPS = Distinct Population Segment
ESU = Evolutionary Significant Unit
USFWS = U.S. Fish and Wildlife Service
NOAA = National Oceanic and Atmospheric Administration

4.2 Federally-Listed Species and Primary Constituent Elements

ESA-protected species fall under two federal jurisdictions: the USFWS for terrestrial and freshwater species, and NOAA Fisheries for anadromous and marine species. The Action Area does not include anadromous or marine habitat, so there are no proposed impacts to anadromous or marine species under NOAA's jurisdiction. Terrestrial and freshwater species could be impacted by the proposed action are included in the USFWS species list (Appendix B). Other federally-listed species in Table 1, such as Fisher, Canada lynx, other listed salmonids, and

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Oregon spotted frog were not indicated in the USFWS species list; therefore, they are not included below.

The U.S. Code of Regulations Title 50, Section 226.212(c) describes Primary Constituent Elements (PCEs) as primary habitat components essential for the conservation of ESA-listed species. The Skagit River is 1.3 miles west of the Action Area and provides critical habitat for listed salmonids and numerous other aquatic species.

4.2.1 Marbled Murrelet

Marbled Murrelet were officially listed under the ESA on September 28, 1992 (USFWS citation: 57 FR 45328). Marbled Murrelet forage almost exclusively in the nearshore marine environment, but travel inland to nest in mature and old growth conifer forests (USFWS, 1997). As a shorebird, Marbled Murrelet are unique in that they nest in large inland trees. Nest trees are typically large diameter (greater than 32 inches [81.3 centimeters] diameter at breast height [DBH]) conifers with large diameter limbs.

Marbled Murrelet feed on small forage fish, mainly Pacific Sand Lance (*Ammodytes personatus*), Pacific Herring (*Clupea pallasii*), Northern Anchovy (*Engraulis mordaz*), Surf Smelt (*Hypomesus pretiosus*), and invertebrates. Preferred foraging habitat contains eelgrass beds, current upwelling, and riptides.

Marbled Murrelet PCEs

Marbled Murrelet PCEs include (USFWS, 2016):

1. Individual trees with potential nesting platforms.
2. Forested areas within 0.5 mile (0.8 kilometer) of individual trees with potential nesting platforms, with a canopy height of at least one-half the site-potential tree height. This includes all such forest, regardless of contiguity.

Marbled Murrelet Critical Habitat

Critical habitat for Marbled Murrelet was designated on October 4, 2011 (USFWS citation: 61 FR 26256) and includes forested areas with potential nesting trees. No Marbled Murrelet critical habitat is found within the Action Area.

4.2.2 Northern Spotted Owl

Northern Spotted Owl became an ESA-listed species on June 26, 1990. Northern Spotted Owl range includes southwestern British Columba, western Washington and Oregon, and northwestern California to Marin County.

Northern Spotted Owl habitat typically includes old growth forests because of the structural characteristics they require for nesting, roosting, and foraging. Northern Spotted Owls require multi-layered, multi-species canopies with moderate to high canopy closure. Large deformities, cavities, snags, and an abundance of dead wood on the ground are all necessary for Northern Spotted Owl habitat. Additionally, Northern Spotted Owl need open space within and below the

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upper canopy to fly. In certain cases, Northern Spotted Owl can be found in younger forests that exhibit structural characteristics of mature forests. The Action Area falls within the Finney Spotted Owl Special Emphasis Area (SOSEA) and is in a section managed for Dispersal Support.

Northern Spotted Owl PCEs

Northern Spotted Owl PCEs include the following four elements and must occur simultaneously (USFWS, 2016):

1. Forest types that may be in early-, mid-, or late-seral stages and that support the Northern Spotted Owl across its geographical range.
2. Habitat that provides for nesting and roosting. In many cases the same habitat also provides for foraging. Nesting and roosting habitat provides structural features for nesting, protection from adverse weather conditions, and cover to reduce predation risks for adults and young. This PCE is found throughout the geographical range of the Northern Spotted Owl, because stand structures at nest sites tend to vary little across the Northern Spotted Owl's range.
3. Habitat that provides for foraging, which varies widely across the Northern Spotted Owl's range, in accordance with ecological conditions and disturbance regimes that influence vegetation structure and prey species distributions. Across most of the owl's range, nesting and roosting habitat is also foraging habitat, but in some regions, Northern Spotted Owl may additionally use other habitat types for foraging as well.
4. Habitat to support the transience and colonization phases of dispersal, which in all cases would optimally be composed of nesting, roosting, or foraging habitat (PCEs 2 or 3), but which may also be composed of other forest types that occur between larger blocks of nesting, roosting, and foraging habitat.

Northern Spotted Owl Critical Habitat

Critical habitat for Northern Spotted Owl was designated on May 6, 1991 (USFWS citation: 56 FR 20816 21016) and includes forested areas with potential nesting trees. No Northern Spotted Owl critical habitat is found within the Action Area.

4.2.3 Yellow-Billed Cuckoo (Western U.S. DPS)

The Western U.S. DPS Yellow-Billed Cuckoo was listed as threatened on October 3, 2014 (USFWS citation: 79 FR 59991). Western Yellow-Billed Cuckoo breed in deciduous, forested, and riparian habitats, typically 25 to 100 acres in area. The species is insectivorous and generally occupies breeding grounds from May through September. They are believed to have been extirpated as a breeder in Washington State (Stokes and Stokes, 1996; Wiles and Kalasz, 2017). WDFW reports that no potential Western Yellow-Billed Cuckoo breeding habitat is located within Washington State (Wiles and Kalasz, 2017).

The Yellow-Billed Cuckoo typically feeds on large insect fauna, including cicadas, caterpillars, katydids, grasshoppers, large beetles, and dragonflies, and tree frogs. In the West, nests are often placed in willows and cottonwoods along streams and rivers. Occasionally Yellow-Billed Cuckoo

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will use alder and tamarack. Nests are constructed from loose sticks and twigs. The shape is usually a flat, oblong platform reaching up to five inches deep and eight inches in diameter.

Yellow-Billed Cuckoo (Western U.S. DPS) PCEs
Yellow-Billed Cuckoo PCEs include (USFS, 2014):

1) Riparian woodlands. Riparian woodlands with mixed willow-cottonwood vegetation, mesquite-thorn-forest vegetation, or a combination of these that contain habitat for nesting and foraging in contiguous or nearly contiguous patches that are greater than 325 ft (100 m) in width and 200 acres or more in extent. These habitat patches contain one or more nesting groves which are generally willow-dominated, have above average (greater than 70 percent) canopy closure, and have a cooler, more humid environment than the surrounding riparian and upland habitats.
2) Adequate prey base. Presence of a prey base consisting of large insect fauna (e.g., cicadas, caterpillars, katydids, grasshoppers, large beetles, dragonflies) and tree frogs for adults and young in breeding areas during the nesting season and in post-breeding dispersal areas.
3) Dynamic riverine processes. River systems that are dynamic and provide hydrologic processes that encourage sediment movement and deposits that allow seedling germination and promote plant growth, maintenance, health, and vigor (e.g. lower gradient streams and broad floodplains, elevated subsurface groundwater table, and perennial rivers and streams). These processes allow habitat to regenerate at regular intervals, leading to riparian vegetation with variously aged patches from young to old.

Yellow-Billed Cuckoo (Western U.S. DPS) Critical Habitat
Critical habitat for the Western Yellow-Billed Cuckoo was designated on August 15, 2014 (USFWS citation: 79 FR 48547) and includes riparian woodlands, adequate prey base during the nesting and post-breeding season, and dynamic riverine processes that allowed seedling germination and habitat regeneration leading to riparian vegetation with variously aged patches from young to old. There is no critical habitat designated in the Action Area.

4.2.4 North American Wolverine

North American wolverine were originally proposed to be listed as threatened on February 4, 2013 (USFWS citation: 78 FR 7863) and the proposal was reopened for review on October 18, 2016 (USFWS citation: 81 FR 71670). At this time, no final rule has been made and the wolverine is still proposed as threatened with no designated PCEs or critical habitat.

Wolverines do not appear to specialize on specific vegetation or geological habitat features. Instead, the species prefers areas that are cold and receive enough winter precipitation to reliably maintain deep persistent snow late into the warm season (Copeland et al., 2010). Western Washington is in the southern portion of the species' range, where warmer ambient temperatures restrict the species to high elevations.

Wolverines are opportunistic feeders that primarily scavenge on carrion. The availability of food is the largest predictor of the range of wolverine. Typically, wolverines have large spatial

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requirements and travel large distances to find food. Ranges can extend from 40 square miles to over 350 square miles (Hornhocker and Hash, 1981; Banci, 1994).

North American Wolverine PCEs
PCEs have not been designated for North American Wolverine.

North American Wolverine Critical Habitat
No critical habitat has been designated for North American Wolverine.

4.2.5 Gray Wolf

The gray wolf was reclassified (from several listed sub-species) and officially listed on June 9, 1977 (USFWS citation: 42 FR 29527 29532). Since its original listing, some populations have been delisted or are proposed to be delisted. Gray wolf, a keystone predator, is an integral component of the ecosystems to which it typically belongs. The wide range of habitats in which wolves can thrive reflects their adaptability as a species, and includes temperate forests, mountains, tundra, taiga, and grasslands. Gray wolves were originally listed as subspecies or as regional populations of subspecies in the contiguous United States and Mexico. In 1978, the USFWS reclassified the gray wolf as an endangered population at the species level (*C. lupus*) throughout the contiguous United States and Mexico, except for the Minnesota gray wolf population, which was classified as threatened (USFWS, 2018).

Gray Wolf PCEs
To our knowledge PCEs for gray wolf have not been designated. Wolf packs in Washington State are closely monitored by WDFW.

Gray Wolf Critical Habitat
Critical habitat for gray wolf was designated March 9, 1978 (USFWS citation: 43 FR 9607 9615), and includes habitat areas in Michigan and Minnesota. There is no critical habitat designated in the state of Washington.

4.2.6 Grizzly Bear

The grizzly bear was listed as a threatened species under the ESA in the lower 48 states on July 28, 1975 (USFWS citation: 40 FR 31736). Grizzly bears are large animals with great metabolic demands requiring extensive home ranges. The search for energy-rich food appears to be a driving force in grizzly bear behavior, habitat selection, and intra/inter-specific interactions. Grizzly bears historically used a wide variety of habitats across the North America, from open to forested, temperate through alpine and arctic habitats, once occurring as far south as Mexico (USFWS, 2018).

Grizzly bears seek out concentrated food sources including carrion, live prey (fish, mammals, insects), and are easily attracted to human food sources including gardens, grain, compost, bird seed, livestock, hunter gut piles, bait, and garbage.

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Grizzly Bear PCEs

PCEs for grizzly bear have not been designated.

Grizzly Bear Critical Habitat

Grizzly bear critical habitat was proposed on November 5, 1976 (USFWS citation: 41 FR 48757 48759); however, critical habitat was never designated. There is no grizzly bear critical habitat designated in the Action Area.

4.2.7 Bull Trout and Dolly Varden (Puget Sound-Coastal)

Bull Trout were listed as threatened in November 1999 (USFWS citation: 64 FR 58910). Until 1978, Bull Trout and their closest relative, Dolly Varden, were considered the same species. Bull Trout have highly specific spawning and rearing habitat requirements. They spawn in cold-water relatively pristine stream habitat, usually with less than 2% gradient (Fraley and Shepard, 1989), and water depths ranging from 4 to 23 inches (10.1 to 58.4 centimeters) (Fraley et al., 1981). Rearing typically occurs in low-velocity streams with large substrate and submerged large woody debris (LWD) (Shepard et al., 1984). The anadromous form of Bull Trout migrates to marine nearshore waters and sometimes into other stream systems to overwinter and mature.

PCEs for Salmonids

The following PCEs were determined essential for the conservation of salmonids, including Bull Trout, and associated critical habitat areas:

1. Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.
2. Migratory habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including, but not limited to permanent, partial, intermittent or seasonal barriers.
3. An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.
4. Complex river, stream, lake, reservoir, and marine shoreline aquatic environments and processes with features such as large wood, side channels, pools, undercut banks and substrates, to provide a variety of depths, gradients, velocities, and structure.
5. Water temperatures ranging from 2 to 15 °C (36 to 59 °F), with adequate thermal refugia available for temperatures at the upper end of this range. Specific temperatures within this range will vary depending on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shade, such as that provided by riparian habitat, and local groundwater influence.
6. Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount (e.g., less than 12 percent) of fine substrate less than 0.85 millimeter (0.03 inch) in diameter and minimal embeddedness of these fines in larger substrates are characteristic of these conditions.

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7. A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, minimizing departures from a natural hydrograph
8. Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited
9. Few or no nonnative predatory (e.g., Lake Trout *[Salvelinus namaycush]*, Walleye *[Sander vitreus]*, Northern Pike *[Esox lucius]*, Smallmouth Bass *[Micropterus dolomieu]*; inbreeding (e.g., Brook Trout *[Salvelinus fontinalis]*); or competitive (e.g., Brown Trout *[Salmo trutta]*) species present.

Bull Trout Critical Habitat

Bull Trout critical habitat was designated in September 2005 (USFWS citation: 70 FR 56211); however, critical habitat is not designated in the Action Area.

4.3 Washington State Priority Habitats

Washington State Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs). There are 20 habitat types currently in the PHS List (WDFW, 2008). Three of these habitat types are found in the Action Area, and are listed below.

4.3.1 Herbaceous Balds

Herbaceous balds are a priority habitat that typically consist of low-growing vegetation adapted for survival on shallow soils amid seasonally dry conditions, and is often on steep slopes. Dominant flora includes herbaceous vegetation, dwarf shrubs, mosses, and lichens. Rock outcrops, boulders, and scattered trees are often present, especially Douglas fir (*Pseudotsuga menziesii*), Pacific madrone (*Arbutus menziesii*), and Garry oak (*Quercus garryana*). Balds occur within mid-montane to lowland forest zones (WDFW 2008).

According to the DNR (2006), "Balds occur on sloping dry sites. They are typically the driest sites short of rock outcrops within the climate of lowland to mid-montane western Washington. Factors that contribute to creating such dry sites include depth to bedrock (shallower tends to be drier), slope position (upper slopes and ridgetops are drier), aspect (southern to western aspects are sunnier and therefore drier), slope steepness (steeper is drier), and soil texture and percentage of coarse fragments (coarse texture with more coarse fragments is drier). Rock outcrops are usually mixed in with balds vegetation, often at such a small scale that they are considered part of the same ecological system, and cliffs can also concur but are considered a different ecological system. Unlike cliffs or rock outcrops, balds have major portions with soil covering rock surfaces."

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4.3.2 Talus

Talus is a priority habitat that typically consists of homogenous areas of rock rubble ranging in average size 0.5-6.5 feet, composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. These areas are commonly associated with cliffs (WDFW, 2008) and may be inhabited by a range of ground-dwelling mammals, bats, reptiles and other animals.

4.3.3 Snags and Logs

Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation or use by wildlife. Priority snags have a DBH greater than 20 inches in western Washington and greater than 12 inches in eastern Washington, and are greater than 6.5 feet in height. Priority logs are greater than 12 inches in diameter at the largest end, and greater than 20 feet long. Abundant snags and logs can be found in old growth and mature forests or unmanaged forests of any age; in damaged, burned, or diseased forests, and in riparian areas. Priority snag and log habitat includes individual snags and/or logs, or groups of snags and/or logs of exceptional value to wildlife due to their scarcity or location in a particular landscape. Areas with abundant, well-distributed snags and logs are also considered priority snag and log habitat. Examples include large, sturdy snags adjacent to open water, remnant snags in developed or urbanized settings, and areas with a relatively high density of snags (WDFW, 2008).

4.4 Skagit County Critical Areas Evaluation

The following desktop evaluation integrates the best available science to characterize the existing conditions within the Action Area utilizing spatial data. Element compiled previously-collected public data and interpreted their relevance, using professional judgment and experience.

4.4.1 Spatial Data

The desktop assessment includes a review of available spatial data as inventoried below in Table 2. These data were evaluated on December 12, 2018 by professionals using scientific methods based upon industry best practices.

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Table 2. Data Used for Desktop Analysis conducted on December 12, 2018.

Data	Format	Date	Source
Aerial photography (NAIP Orthophoto)	SID	2011/2013	USDA
LiDAR	Bare earth grid	2006	PSLC
Topographic Contour Map	Shapefile	2016	Generated from LiDAR
Floodplain Elevation	Web map	2007	FEMA FIRM
Wetlands of High Conservation Value	Web map	2017	DNR
National Wetlands Inventory	Web map	Current	USFWS
ECOS IPaC ESA-listed Species	Accessed online	Current	USFWS
Priority Habitat and Species	Shapefile	Current	WDFW
Salmon distribution (SalmonScape)	Web map	Current	WDFW
Stream type	Web map	Current	DNR FPARS
Water Quality/303(d) list	Web map	2016	Ecology
Web Soil Survey	Accessed online	Current	USDA/NRCS
Hydric Soils List for Skagit County	Accessed online	2017	USDA/NRCS

Table Notes:
DNR = Washington Department of Natural Resources, ECOS = Environmental Conservation Online System, Ecology = Washington Department of Ecology, FEMA = Federal Emergency Management Agency, FIRM = Flood Insurance Rate Map, FPARS = Forest Practices Application Review System, IPaC = Information for Planning and Consultation, NAIP = National Agriculture Imagery Program, PSLC = Puget Sound LiDAR Consortium, USDA = U.S. Department of Agriculture, USFWS = U.S. Fish and Wildlife Service, WCAMP = Skagit County Amphibian Monitoring Program, WDFW = Washington Department of Fish and Wildlife

4.4.2 Summary of Findings

Information obtained during the document and data review of the Action Area support the following interpretations:

Federal Emergency Management Agency

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the Action Area designates the proposed project in Zone X (aka Zone C), "area of minimal flood hazard" (FEMA 1985). The adjacent historic floodplain of the Skagit River is identified as either Zone A9, "an area inundated by 1% annual chance flooding, for which a base flood elevation (BFE) has been determined" or Zone B, "an area of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood." Although there are adjacent FEMA Flood Hazard Areas, the proposed project would not likely affect flood storage of the Skagit River because it is located outside of these areas.

Washington Department of Natural Resources Natural Heritage Program

The DNR Natural Heritage Program (NHP) online mapper indicates a Wetlands of High Conservation Value (Subgroup: North Pacific Conifer Seepage Swamp) 1.2 miles south of the Action Area in the O'Brien Creek basin (DNR, 2018a). Given the observed site conditions, the

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historic images (1950) and current uses of the Action Area and neighboring parcels, Wetlands of High Conservation Value likely have not existed in the Action Area.

National Wetlands Inventory

The USFWS National Wetlands Inventory (NWI) online map indicates a number of riverine wetlands in the vicinity of the Action Area. These appear to be consistent with other Washington State data (see below); however, these data also appear to be incorrect based on field observations of watercourses in the Action Area. West and north of the Action Area, the Skagit River floodplain also contains numerous riverine and palustrine wetlands. To the east and south of the Action Area, there appear to be several other riverine wetlands, which apparently are mapped as streams. NWI-mapped wetlands are shown in Figure 3.

USFWS ESA-Listed Species Information

The USFWS Environmental Conservation Online System (ECOS) Information for Planning and Conservation (IPaC) produced a list of ESA-listed or proposed species and critical habitat under the jurisdiction of USFWS that could be affected by the proposed project. These species and habitats are listed in Table 1. Appendix B contains the Official list (USFWS, 2018b) of Endangered and Threatened species that are potentially present in the vicinity of the Action Area. Moreover, Appendix A contains an unofficial list of the migratory birds of concern that may be present, per the Migratory Birds Treaty Act (1918) and the Bald and Golden Eagle Protection Act (1940).

Washington Department of Fish and Wildlife Priority Habitats and Species

The publicly-available WDFW PHS maps indicate that Skagit River and its tributaries are contiguous with riverine and palustrine wetland habitats, as shown in Figure 3. Additionally, Salmonid use in the Skagit River is well documented and Chinook Salmon (*Oncorhynchus tshawytscha*), Coho Salmon (*O. kisutch*), Chum Salmon (*O. keta*), Steelhead (*O. mykiss*), resident Coastal Cutthroat Trout (*O. clarkii*), and Dolly Varden/Bull Trout utilize the river as a migratory and spawning corridor. PHS maps also indicate gray wolf and Northern Spotted Owl could be present in the Action Area (WDFW, 2018a). Appendix C contains a report of PHS species that are potentially present in the vicinity of the Action Area (WDFW, 2018b).

Washington Department of Fish and Wildlife SalmonScape

The WDFW SalmonScape web mapper indicates that the salmonids listed above are present in the Skagit River basin (WDFW, 2018b).

Forest Practices Application Review System

DNR Forest Practices Application Review System (FPARS) online mapping tool indicates the Skagit River as a Type S (State Shoreline) watercourse (DNR, 2018). Additionally, the FPARS map indicates Type F (fish bearing), Type N, and Type U (unknown fish presence) unnamed tributaries to Skagit River within the Action Area. These watercourses were evaluated in the field and it was determined that they did not meet the criteria for a State-regulated stream under WAC 222-16-030. Below in Section 5, we describe the observed site conditions including presence of streams.

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303(d) List

According to Ecology's online Water Quality Atlas, the lower Skagit River is on the 303(d) for various parameters; however, these listings appear to occur more than 35 miles downriver of the Action Area (Ecology, 2018). Total Maximum Daily Load (TMDL) criteria have been established for the Lower Skagit Basin approximately 30 miles west of the study area.

Natural Resources Conservation Service Soils

The U.S. Department of Agriculture (USDA) Web Soils Survey (WSS) online mapper shows Andic Xerochrepts, warm-Rock outcrop complex (65 to 90 percent slopes) throughout most of the Action Area. The online mapper also indicates the presence of Barneston very cobbly sandy loam (0 to 8 percent slopes soils) at the eastern edge of the Action Area, which appears to be a common soil type in the Skagit River floodplain (USDA, 2018).

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5 ENVIRONMENTAL BASELINE

5.1 Habitat Conditions in Action Area

Onsite watercourses (Watercourse A and Watercourse B), the Skagit River, and NWI-mapped wetlands were assessed during our initial desktop evaluation, via LiDAR digital elevation modeling (DEM) in ArcGIS, and during the field visit. The site topography indicated several channels and ditches within or adjacent to the Action Area, and each was field-verified to determine the connectivity to site watercourses and applicability to this assessment. Moreover, PHS habitat areas, including aquatic habitats and standing snags, were evaluated for evidence of use by Priority Species.

5.1.1 Federally-Listed Species

Birds

During the field investigations on November 29, 2018, Element staff was accompanied by scientists at Hamer Environmental who conducted habitat assessments for Marbled Murrelet and Northern Spotted Owl, two federally-listed species indicated in Table 1. The Action Area was visually assessed and does not contain enough live mature coniferous trees to meet the minimum standards to be considered suitable Marbled Murrelet or Spotted Owl habitat (Hamer Environmental, 2018). The habitat assessment results are included in Appendix D.

Mammals

No priority mammal species were observed during the field investigations; however, the USFWS IPaC mapper indicates that North American wolverine and gray wolf could inhabit the area (Appendix B). Traffic noise from Rockport Cascade Road, as well as human inhabitance of surrounding properties, would likely deter use by the (very rare) priority carnivore species listed above; however, marten and PHS bat species could inhabit the Action Area.

Fishes

Although the Skagit River is a known migratory corridor for listed salmonids, fish species do not likely exist in Watercourse A or Watercourse B. The unique geology within the study area, appears to consist of very well-drained soils in which onsite surface waters infiltrate into the ground before reaching nearby mapped streams; therefore Watercourses A and B do not appear to support fish species (see Section 5.2.2 below). Although onsite watercourses do not meet the State definition of a regulated stream, they appear to meet Skagit County HCA designations for aquatic habitat defined in SCC 14.24.500. Moreover, Priority Habitat features such as cut banks, overhanging roots and vegetation, and LWD were observed in Watercourse B, although these habitat features were not observed in Watercourse A.

Amphibians

No amphibian species (or egg masses) were observed during the site visit. According to the Whatcom County Amphibian Monitoring Program (WCAMP), however, populations of Oregon spotted frog have been found in the Skagit River basin near Lyman, Washington (WCAMP 2017). Based on this knowledge, it is conceivable that Oregon spotted frog could traverse the Action

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Area to access vicinity streams and wetlands; however, the species is very rare. Nearby freshwater emergent wetlands associated with the Skagit River (as mapped by WDFW, and USFWS) may provide aquatic breeding and egg-laying habitat for amphibian species (Figure 3).

5.1.2 Washington State Priority Habitats and Species

Herbaceous Balds

During the site visit, staff identified two areas that meet the State Priority Habitat definition for herbaceous balds (Figure 2). These herbaceous balds were predominantly composed of mosses with bracken fern (*Pteridium aquilinum*) and an unidentified grass species surrounded by Douglas fir.

Talus

During the site visit, staff identified a talus area at the base of cliff and proposed quarry area that met the State Priority Habitat definition (Figure 2, Appendix B). This area could potentially provide burrowing areas for mammals and reptiles.

Snags and Logs

During the site visit, staff identified a previously burned area with a high density of snags in the proposed quarry area, a result of the Joran Creek Fire in the 1990s. This area spans from the top of the cliffs down to the toe of the slope (Figure 2). Two hundred snags meeting the definition in Section 2.3.8 were approximated from an evaluation of site photographs. These snags could provide roosting and breeding areas for cavity nesting bird species.

Birds

One Osprey (*Pandion haliaetus*) nest was observed a few hundred feet beyond the northern boundary line of the project area and is in a broken top of a large coniferous tree snag, however no Osprey were observed during the field assessment (Appendix D). Osprey are not currently listed as a Priority Species, however, other large raptors, such as Bald Eagle (*Haliaeetus leucocephalus*) or Golden Eagle (*Aquila chrysaetoscould*) roost in large trees in the vicinity of the Action Area

Pileated Woodpecker is a state priority species that is monitored by WDFW. Breeding and roosting areas for Pileated Woodpecker are also listed as Washington State Priority Habitat and this habitat may include mature, old-growth, and second-growth forests with large snags and fallen trees (Lewis and Azerrad, 2004). Element staff observed several dozen snags within the Action Area, most of which resulted from the Jordan Creek Fire in the 1990s (Appendix D). These snags are a WDFW critical habitat that may support breeding and roosting of PHS species, including Pileated Woodpecker.

Great Blue Heron may also forage for aquatic prey in onsite watercourses within the Action Area. Forested riparian areas may also support Great Blue Heron nesting sites, although to our knowledge, these nesting sites have not been mapped. Numerous other PHS bird species, including PHS waterfowl species, may also utilize the Action Area for foraging; however, use is likely sporadic and breeding/nesting do not appear likely.

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Mammals

The WDFW PHS List (WDFW, 2008) indicates other State Priority carnivores that occur in the forested areas of Skagit County, including Grizzly Bear, Fisher, Canada lynx, Cascade red fox, and marten. Priority bat species, such as Keen's Myotis and Townsend's big-eared bat, may also utilize the area for hunting and roosting.

Fishes

The federally-listed salmonid species of concern, primarily Bull Trout, are also state-listed. As described in Section 5.1.2 above, presence of fish in the Action Area is unlikely.

5.2 Habitat Conservation Area Assessment

5.2.1 Habitat Conservation Area Determination Methods

The following assessment integrates the best available science to characterize the existing habitat conditions at the subject site and utilizes both desktop and field assessment methods. These assessments included previous studies and WDFW spatial PHS data and a thorough field investigation of PHS and locally-important habitat features. Evaluation of potential impacts to Critical Areas assumes industry and jurisdictional regulatory standards.

Ordinary High Water Mark Delineation

The ordinary high water mark (OHWM) is used to establish the jurisdictional line for waterbodies (watercourses and shorelines). In Washington State, the OHWM is evaluated and delineated using methods established by Ecology (2008). The OHWM is used to establish the jurisdictional line for County Shoreline Management Plan and CAO jurisdictional areas including HCAs.

USFWS and State Priority Habitats and Species Assessment

A desktop review of USFWS and WDFW PHS data was conducted in order to inform and provide focus to our field assessment to include relevant species (Section 4.4.1). Moreover, relevant Priority Habitats including Herbaceous Balds, Talus, and Snags and Logs were a focus of the assessment (WDFW, 2008).

5.2.2 OHWM Assessment

Two seasonal watercourses were identified in the Action Area (Figure 2). The OHWM of each watercourse was evaluated and delineated during the site visit on October 19, 2018, using methods established by Ecology. The left and right bank OHWM of Watercourse A and Watercourse B were flagged where each was accessible from the existing logging road; site conditions limited access to all areas, however relevant segments were field verified for mapping purposes. Blue flags were placed on each bank for each watercourse where accessible. Each flag was logged in the field with an AshTech handheld GPS with ± 2 to 3-meter accuracy. In some areas, the OHWM was approximated using LiDAR DEMs.

A variety of physical indicators were reviewed and utilized to establish the OHWM. The assessed area is characterized as a "flashy" and ephemeral aquatic environment, where flows drastically

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increase during the wet season and flows are significantly reduced (or are non-existent) during the summer.

The watercourses begin upgradient of the Action Area within the steep foothill terrain and terminate via infiltration within the talus or at the base of the steep topography on the alluvial terrace. There were no field indicators supporting connectivity between Watercourses A and B and the Skagit River or any other regulated streams or waterbodies. The flow from these two watercourses fully infiltrates into the alluvial terrace and no geomorphic channel networks were identified to suggest that surface flow, historic or modern, continues north of Rockport Cascade Road. While the DNR stream data indicate that the watercourses are connected and that Watercourse A is a tributary of Watercourse B (Figure 3), the observed site conditions demonstrate the DNR mapping is inaccurate. Actual field locations are shown in Figure 2.

Watercourses A and B do not meet the stream criteria described in WAC 222-16-030. As defined in WAC 222-16-030(4), non-fish-bearing seasonal or "intermittent" waters (Type Ns) "must be physically connected by an above-ground channel system to Type S, F, or Np waters." Because there was no evidence of surface water connectivity between the subject watercourses and other typed waters the watercourses do not meet the definition of a Type Ns stream or other typed stream. While Watercourses A and B are not regulated streams, they can have similar functions as Type N regulated waters with respect to water quality and would still be considered an Aquatic Priority Habitat and Habitat Conservation Area. As a result, we recommend protective measures that would reduce the potential for water quality or habitat loss in the watercourses (see Section 8.3.4).

Watercourse A

Watercourse A was first observed where it crosses under the existing logging road via a six-inch culvert. East of the road, the average bank-full width (BFW) was measured as 6.3 feet and average bank-full height (BFH) was measured as 0.5 feet in an area with defined channel banks; however, after passing through the culvert, the channel widens and the banks become less defined. West of the culvert, the slope becomes very steep and flows appear to dissipate and infiltrate as waters travel down gradient. Defined channel banks and evidence of hydrologic erosion were observed at the downstream end of Watercourse A; however, surface waters were not observed during a time when hydrology should have been present, leading to the conclusion that surface waters infiltrate into well-drained soils during most flows (Figure 2). Watercourse A has been mapped by DNR, although its location was not consistent with the observed site conditions. Moreover, the lower section of Watercourse A is mapped as a Type F stream, however, because it is intermittent and not connected to any other surface water, it is an unregulated watercourse.

Watercourse B

Watercourse B was observed south of the switchback of the existing logging road . The average BFW was measured as 6.5 feet and average BFH was measured as 1.0 feet in an area with defined channel banks where Watercourse B flows down a steep gradient. Based on observed conditions, such as channel substrate and flow volume, Watercourse B appears to also be seasonal and there is no surface flow connectivity to other surfaces waters, even with typical winter hydrology. Disconnection to other surface waters, intermittent flow, and steep topography likely precludes

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fish use. The DNR has mapped the upstream segment of Watercourse B as Type N. The lower segment of Watercourse B was mapped as Type F, however, this mapped location of Watercourse B and the potential for fish use is believed to be erroneous as no channel across the alluvial terrace exists. Watercourse B fully infiltrates into the alluvial terrace prior to reaching the Rockport Cascade Road. During our field investigation, staff also identified a tributary to Watercourse B outside the Action Area, which likely corresponds to a watercourse that is DNR Type U (unknown fish presence) (Figure 3).

Despite thorough field investigation of Rockport Cascade Road, a culvert could not be located that indicated there was connectivity between Watercourse B to mapped wetlands and streams on the west side of Rockport Cascade Road. Moreover, based on these observed site conditions, it is surmised that Watercourse B is incorrectly identified as a Type F and Type N stream. Given its highly ephemeral nature and the apparent barriers to fish migration and lack of connectivity, it fails to meet the criteria of Type Ns stream defined in WAC 222-16-030(4).

Although onsite watercourses do not meet state criteria of Type Ns stream defined in WAC 222-16-030(4), they do appear to have characteristics of WDFW Aquatic Priority Habitat and would be a regulated Critical Area per WAC 365-190-080 and SCC 14.24.500.

5.3 HCA Buffer Determination and Functional Assessment

Management buffers were recommended for watercourses in the action area using the guidelines for Type N streams as defined in SCC 14.24.530 as a proxy. These determinations are shown in Table 3 and Figure 2.

Table 3. Critical Area Buffer and Setback Widths within the Action Area.

Habitat Area	Washington State Designation	Recommended Protective Buffer Width (ft)	Additional Setback (ft)
Watercourse A	WDFW Priority Habitat [1]	50	10
Watercourse B	WDFW Priority Habitat[1]	50	10
Herbaceous Balds	WDFW Priority Habitat	unknown[2]	unknown[2]
Talus	WDFW Priority Habitat	unknown[2]	unknown[2]
Snags and Logs	WDFW Priority Habitat	unknown[2]	unknown[2]

Notes: ft = foot

[1]The lower segments of Watercourses A and B are mapped as DNR Type F, and upper segments are mapped as DNR Type N; however these watercourses fail to meet the criteria of Type Ns stream defined in WAC 222-16-030(4) as determined by observed site conditions. These watercourses do, however, meet state criteria for "Instream Aquatic Habitat.

[2]To our knowledge, buffers for WDFW Priority Habitats have not been established.

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5.3.1 Protective Buffer Functions

Per SCC, all streams which meet the criteria for Type S, F, and N waters as set forth in WAC 222-27 16-030 of the DNR Water Typing System, implement the following standard buffer width requirements for rivers and streams:

- Shoreline streams (Type S) - 150 feet
- Fish-bearing streams (Type F) - 100 feet
- Non-fish-bearing streams (Type N) - 50 feet

Although Watercourse A and Watercourse B do not meet the definition of a typed water per WAC 222-27 16-030, these watercourses do appear to have characteristics of WDFW "Instream Aquatic Habitat" and would be a regulated Critical Area per WAC 365-190-080 and SCC 14.24.500. These watercourses likely provide a similar level of habitat and water quality functions when compared to regulated Type N streams. Therefore, we recommend that each waterbody receives a 50-foot buffer, the same level of protection for Skagit County Type N streams.

The functions provided by the buffers to protect the watercourses in the Action Area are:

- Protect wildlife habitat.
- Maintain water quality.
- Maintain cool water temperatures.
- Maintain aquatic habitat conditions.

5.3.2 Functions of Washington State Priority Habitats

Balds are relatively rare land forms in Western Washington and may provide conditions for rare herbaceous plant species. Talus may provide denning areas for mammals and reptiles, and Snags and Logs often provide roosting and breeding areas for priority birds, bats, and many other species. The specific conditions that these habitats include:

- Providing unique habitat features for Washington native species (balds, talus, snags, and logs).
- Providing conditions for rare herbaceous plant species and plant communities (balds).
- Maintaining some level of water quality to surrounding areas (balds).
- Protecting wildlife species (talus, snags, and logs).
- Providing roosting, nesting, and denning areas for critical species (talus, snags, and logs).
- Providing LWD habitat to the landscape (snags and logs).

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6 FEDERAL ENDANGERED SPECIES ACT EFFECTS DETERMINATIONS

6.1 Regulatory Basis for Determinations

The ESA requires that federal agencies consider several types of effects on habitats and species. Previous and potential future activities on the site are evaluated for their direct, indirect, interdependent and/or interrelated, and cumulative effects on species and their associated habitats.

- ***Direct effects*** are effects from actions that would immediately remove or destroy habitat, harm (injure or kill) species, adversely modify designated critical habitat, or displace or otherwise influence the species, either positively (beneficial effects) or negatively (adverse effects).
- ***Indirect effects*** are effects that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Indirect effects may include impacts to food resources or foraging areas and impacts from increased long-term human access.
- ***Effects from interdependent and/or interrelated actions*** include effects from actions that (1) have no independent utility apart from the primary action, (2) are part of a larger action and depend on the larger action for their justification, and/or (3) are required as part of the action, including maintenance and/or use of the project, as well as other actions that would be carried out to implement, maintain, and/or operate the project.
- ***Cumulative effects*** are those effects of future state or private activities, not involving federal activities that are reasonably certain to occur within the Project area.
- ***Conservation measures*** are measures proposed to minimize or compensate for project effects on the species under review. Unless stated otherwise, the effects determinations, as defined in Section 8.3.5, are based on the assumption that conservation measures would be incorporated into the project.

The proposed action(s) are evaluated along with other activities that are interrelated or interdependent with the proposed action when added to the environmental baseline. The environmental baseline, as described in 50 CFR Part 402.02, includes the following:

- The past and present effects of all federal, state, or private actions and other human activities in the Action Area.
- The anticipated impact of all proposed federal projects in the Action Area that have already undergone formal or early Section 7 consultation.
- The impact of state or private actions, which are contemporaneous with the consultation in process.

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6.2 Potential Effects on ESA Species

The proposed project would be expected to incur habitat alteration impacts (primarily the removal of Herbaceous Balds, Talus, and Snag Priority Habitat), noise impacts, and temporary impacts to water quality (primarily turbidity) in onsite watercourses. The project is designed to avoid sensitive species and habitats to the greatest extent possible. Where avoidance is not feasible, methods to minimize the impacts would be employed. After project reclamation, the proposed project would result in an increase in habitat diversity in the mining areas and increased buffer functions in the riparian areas of Watercourses A and B. The riparian buffer and water quality impacts to the watercourses would occur during culvert and road placement and would be temporary in nature. Noise and vibration impacts would be ongoing throughout quarry operation. The Priority Habitat alteration would occur during the mining operations; however, the Reclamation Plan (pending submittal, PSE) proposes mitigation following mining and would ultimately be an improvement upon existing conditions and accounts for temporal loss.

6.2.1 Direct Effects

There are no proposed or anticipated direct effects on federally-listed species or critical habitats. The proposed mining activities would occur within a previously-logged and burned area that has been partially impacted by existing resource extraction activities. Impacts from the proposed Project Action would include temporary turbidity in non-fish bearing watercourses and noise impacts as well as permanent habitat alteration. Bull Trout and Dolly Varden do not likely inhabit Watercourses A and B, which are not connected to larger streams (as described in Section 5.2.2), and the temporary turbidity impacts are not likely to affect other aquatic species.

It is conceivable that the increase in sustained noise due to blasting and equipment operation may discourage use by the listed mammal species, although it is unlikely that these species inhabit vicinity forests. Tree and snag removal may directly affect food resources such as small mammal prey species for federally-listed carnivores and Northern Spotted Owl. Given that these animals do not likely hunt within the Action Area; however, the proposed Action is unlikely to directly impact food sources of these species.

A noise analysis conducted by BRC (2019) for the Project concluded the following. Further information is provided in BRC (2019):

- Existing measured sound levels are at or below Skagit County noise limits at all measurement locations in the vicinity of the proposed project.
- Calculated sound levels from proposed operations at the Marblemount Quarry with noise mitigation meet applicable Skagit County noise limits at all Analysis Location.
- The recommended noise-mitigation measure is to construct a sound barrier on the north shoulder of the proposed haul route near the northwest corner of the project site. The height of the barrier would be 24 feet at its west terminus and would taper off towards the east, as the underlying road profile rises.

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Potential impacts to species addressed in the BA from blasting and operational vibrations were also a concern. Potential impacts from Project blasting were addressed in RAI (2019). This report contained specific recommendations to reduce or eliminate impacts to species addressed in this BA, especially water and air quality as well as impacts on animals and the environment. Since there is no open water located near the defined rock blasting areas, it is reasonable to conclude that the proposed blasting at the quarry will have no impacts on the Skagit River or other area water resources. Based upon referenced studies and observations of the author at other projects, rock blasting at the Project would have little or no impact on domestic or wild animals near the site or on neighboring properties. Further details are provided in RAI (2019).

6.2.2 Indirect Effects

Permanent indirect effects from the proposed quarry would include alterations of habitat for potential prey sources and a general increase of ambient sound levels during operation of the quarry.

The project actions described above, may result in indirect effects to prey sources of federally-listed Northern Spotted Owl, particularly rodent species which may den in talus areas and forage in herbaceous balds. Although no Northern Spotted Owl habitat was observed in the Action Area, many forested areas are proposed to be retained, and these areas contain large trees that could one day provide nesting platforms for the species. There also appears to be adequate habitat for prey source denning in the future.

Habitat impacts to prey sources of federally-listed carnivores and Northern Spotted Owl would consist of permanent alteration of the existing herbaceous balds and talus areas (Figure 2). The Reclamation Plan to the proposed bedrock benches to be capped with shallow topsoil (to simulate balds) and for the talus piles to be recreated at the mine floor. Standing snags would also be installed for nesting of prey species and live trees would be planted as part of the reclamation. The impacted protective buffer areas of Watercourses A and B would be mitigated for via the removal of riparian blackberry and replanting of trees and shrubs to ensure a “no net loss” of habitat and water quality functions per WAC 365-196-830(8)(a). At the time of the November 29, 2018 field visit, species use in these Priority Habitat areas was limited to common song birds and squirrels; however, given the scale of these areas the likelihood of use by native species (that could be prey sources) is high. Certain talus areas and riparian areas would be left intact, and the Action Area has been modified to the extent feasible to avoid the protective buffer areas.

Approximately 1.66 acres (72,310 square feet) of riparian habitat within protective buffers would be impacted by vegetation removal and road construction (Figure 4). The total area of displacement for the herbaceous balds would be 0.39 acres (16,962 square feet) in two herbaceous balds areas; the total area of displacement for the talus area would be 1.10 acres (47,916 square feet) (Figure 5). Approximately 200 standing snags would be displaced by the mining activities. Work within the recommended 50-foot protective buffer would be conducted using appropriate erosion control measures and BMPs and the project would utilize appropriately-sized culverts to lessen impacts on surface flow. Watercourse A would be impacted by filling for road construction; however an 18-foot-wide and 2-foot-deep stormwater pipe would be installed (Appendix A) below the infiltration area (Figure 4) to prevent excess runoff in extreme

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flood events and preserve hydrologic functions in the Action Area. In Watercourse B, buffer impacts would be proposed due to road construction (Figure 4); however, the removal of an existing hydromodification (Element, 2018) would increase the flow volume, and therefore aquatic habitat availability in Watercourse B. These impacts to Watercourses A and B would not likely effect ESA species.

6.2.3 Interrelated and Independent Effects

The proposed project would create interrelated and independent effects by increasing traffic and large equipment operation throughout the lifespan on the mine (an anticipated 100 years). This would in turn increase vehicle use on Rockport Cascade Road and various routes as trucks travel to their destinations. Increased use by trucks and large equipment would also increase noise and vibrations along truck routes during mine operation, which could potentially disturb area species. These impacts, however, would occur on permitted roadways and resources extraction in the Skagit County MRO would be an intended land use, meeting the purpose and need of the project.

The intended use of the jetty stone would be for rebuilding existing jetties in the Columbia River and the subsequent uses of the jetty stone would be fully permitted and lawful occurring to Washington State and Federal laws and regulations. While impacts to ESA species may be a concern in these areas, the appropriate biological studies, assessments, and evaluations would be conducted after selection of subsequent Action Area/s.

6.2.4 Cumulative Effects

The primary cumulative effect would be a change in landform of the current bedrock slope and the temporal loss of Washington State Priority habitats that could be used by ESA species prey sources for denning and foraging. The habitat enhancement and reclamation plans propose that several benches are established and that these Priority Habitat areas are completely mitigated for to ensure no net loss of habitat functions. During the mine reclamation phase, a 3 to 6-inch layer of mineral and humic soil would be applied to the benches to allow for natural recruitment of native herbs and reestablishment of the herbaceous balds. Moreover, talus piles would be established at the mine floor such that the impacted areas are mitigated (Reclamation Plan pending submittal, PSE). Addition recommendations for that loss of Snags and Logs habitat are provided in the Habitat enhancement Plan is Section 8.3.

Industry standard BMPs for stormwater management and dust abatement would ensure that cumulative impacts from mining activities are reduced to the extent practicable and that area habitat value would be increased after reclamation is complete.

6.3 Effects to Listed Species and Critical Habitat

The effects determination is the conclusion of the analysis of potential direct or indirect effects of the proposed action, together with the potential effects of other activities that are interrelated or interdependent with the proposed action, on listed or proposed species or designated or proposed critical habitat. Regulatory guidance from the Final Section 7 Consultation Handbook (USFWS and NMFS, 1998) was used to make the effects determination for the proposed action, as described below.

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For listed species and designated critical habitat, the range of conclusions that could result from the effects analysis for the effect determination includes the following:

- **No Effect** (NE)—the appropriate conclusion when the action agency determines its proposed action and any interrelated or interdependent actions will have no direct or indirect effect on listed species or destroy/adversely modify designated critical habitat.
- **May Affect, Is Not Likely to Adversely Affect** (NLTAA)—the appropriate conclusion when effects of the proposed action on listed species or critical habitat are expected to be beneficial, insignificant, or discountable. Beneficial effects are contemporaneous positive effects without any adverse effects to the species. Insignificant effects relate to the size or duration of the impact and would never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not 1) be able to meaningfully measure, detect, or evaluate insignificant effects, or 2) expect discountable effects to occur.
- **May Affect, Is Likely to Adversely Affect** (LTAA)—the appropriate conclusion if any adverse effect to listed species or critical habitat may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or completely beneficial (see definitions of "is not likely to adversely affect"). If the overall effect of the proposed action is beneficial to listed species or critical habitat but may also cause some adverse effect on individuals of the listed species or critical habitat segments, then the determination would be "likely to adversely affect."

For proposed species and proposed critical habitat, possible effects are **No Jeopardy** or **Jeopardy**. For candidate species, possible effects are **No Impact** or **May Impact**.

6.3.1 Marbled Murrelet

Potentially suitable habitat has not been observed within the Action Area and no sightings have been documented in the Action Area, as determined by a Marbled Murrelet survey. This area does not contain enough live mature coniferous trees to meet the minimum standards to be considered suitable Marbled Murrelet habitat (i.e., must be at least 7 acres in size and contain a minimum of 7 platforms per acre; Hamer Environmental, 2018). In addition, Marbled Murrelet food sources, such as forage fishes, have been documented spawning in the eelgrass beds of Padilla Bay, approximately 46 miles from the Action Area. The proposed project would not affect Marbled Murrelet food sources. The Project area is not within a Marbled Murrelet Detection Zone (Appendix D).

Due to the lack of forage fish habitat, nesting habitat, and the lack of documented sightings, it is expected that the proposed project **May Affect, Is Not Likely to Adversely Affect** Marbled Murrelet.

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Marbled Murrelet PCEs

Marbled Murrelet PCEs are listed in Section 4.2.1. As indicated by the Marbled Murrelet survey, PCEs 1 and 2 do exist within the Action Area; however, the Action Area lacks specific requirements for Marbled Murrelet habitat (Appendix D).

Marbled Murrelet Critical Habitat

There is no designated critical habitat in the Action Area; therefore, the proposed project will have **No Effect** on Marbled Murrelet critical habitat.

6.3.2 Northern Spotted Owl

Potentially suitable habitat has not been observed within the Action Area and no sightings have been documented in the Action Area, as determined by a Spotted Owl survey. The site did not meet the minimum guidelines set forth in the Washington State Forest Practice Rules (WAC 222-16-085) for private landowners to be considered suitable roosting, foraging, and/or dispersal habitat, nor does it meet the minimum standards to be considered suitable dispersal support habitat within the Finney SOSEA (Appendix D). Due to the lack of nesting habitat, and the lack of documented sightings, it is expected that the proposed project **May Affect**, **Is Not Likely to Adversely Affect** Northern Spotted Owl.

Northern Spotted Owl PCEs

Northern Spotted Owl PCEs are listed in Section 4.2.2. PCEs 1, 2, 3, and 4 do exist within the Action Area; however, the Action Area lacks specific requirements for Northern Spotted Owl habitat (Appendix D).

Northern Spotted Owl Critical Habitat

There is no designated Northern Spotted Owl critical habitat in the Action Area; however, habitat was assessed in the action for suitable habitat, and the proposed project would have **No Effect** on Northern Spotted Owl critical habitat (Appendix D).

6.3.3 Yellow-Billed Cuckoo (Western U.S. DPS)

Riparian habitat in the Action Area does not contain large areas of forested habitat typically associated with Western Yellow-Billed Cuckoo. The species typically feeds on large insect fauna, including cicadas, caterpillars, katydids, grasshoppers, large beetles, and dragonflies, and tree frogs. Because the Action Area does not contain potential breeding habitat, and suitable forested habitat or habitat associated with prey species preferred by the cuckoo is not located within the Action Area, Western Yellow-Billed Cuckoo are not expected to use the Action Area. The proposed project **May Affect**, **Is Not Likely to Adversely Affect** Western U.S. DPS Yellow-Billed Cuckoo.

Yellow-Billed Cuckoo (Western U.S. DPS) PCEs

Yellow-Billed Cuckoo PCEs are listed in Section 2.3.3. Although there are likely riparian forests that would contain Yellow-Billed Cuckoo PCEs throughout the Skagit River Basin and project vicinity, PCEs 1, 2, and 3 do not exist within the Action Area.

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Yellow-Billed Cuckoo (Western U.S. DPS) Critical Habitat

There is no critical habitat designated in the state of Washington; therefore, the proposed project will have **No Effect** on Western U.S. DPS Yellow-Billed Cuckoo critical habitat.

6.3.4 North American Wolverine

The proposed project would occur in an area that has been significantly impacted by the existing gravel quarry, logging operations, and the Jordan Creek Fire. Moreover, the Action Area receives very little snow. The Skagit Valley floodplain is also partially developed with roads, rural residences, logging areas, and mineral extraction which would discourage wolverine use. The Action Area lacks the altitudinal and spatial requirements typically needed for wolverine habitat; therefore, it is highly unlikely that wolverine would be found within the Action Area or within the vicinity of the proposed project. The proposed Project will have **No Jeopardy** on the North American wolverine.

North American Wolverine PCEs

PCEs have not been designated for North American Wolverine.

North American Wolverine Critical Habitat

No critical habitat has been designated for North American Wolverine; therefore, the proposed Project will have **No Effect** on North American Wolverine.

6.3.5 Gray Wolf

Although wolves inhabit a wide range of habitats including temperate forests which are found in the Action Area, the proposed Project would occur in an area that has been significantly impacted by the existing gravel quarry, logging operations, and the Jordan Creek Fire. The Skagit Valley floodplain is also partially developed with roads, rural residences, logging areas, and mineral extraction which would discourage gray wolf use. A significant prey source for wolves, black-tailed deer (*Odocoileus hemionus*), are present and likely forage in the area; therefore hunting could potentially occur in the vicinity of the Action Area. Wolf packs, however, in Washington State are closely monitored by WDFW officials. Of the three wolf packs in the North Cascades, only two (the Lookout and Loup Loup Packs), containing a total of nine wolves, could potentially hunt in the Action Area. These packs appear to be predominantly using the eastern slopes of the Cascade Mountains; to our knowledge, there have not been reports of wolf use in the vicinity of the Action Area. It is unlikely that wolves would be found within the Action Area or within the vicinity of the Proposed Project; therefore, the proposed Project **May Affect, Is Not Likely to Adversely Affect** North American wolverine.

Gray Wolf Critical Habitat

There is no critical habitat designated in the state of Washington, therefore, the proposed project will have **No Effect** on gray wolf critical habitat.

6.3.6 Grizzly Bear

Although grizzly bear restoration plans are currently being proposed, there have been only four confirmed sightings of grizzly bear in the North Cascades in the previous 10 years. All of these

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sightings occurred north of the Canadian border (USFWS and NPS, 2017). In addition, the proposed project would occur in an area that has been significantly impacted by the existing gravel quarry, logging operations, and the Jordan Creek Fire; therefore, it is not likely that grizzly bear would have adequate hunting habitat in the Action Area or vicinity. The Skagit Valley floodplain is also partially developed with roads, rural residences, logging areas, and mineral extraction, which would discourage grizzly bear use in the future.

Grizzly bears are large animals with great metabolic demands requiring extensive home ranges and large sources for energy-rich foods, such as salmon which inhabit the Skagit River; therefore it is possible that grizzly bear could one day hunt in the Skagit River Valley in the project vicinity. Because the Action Area lacks salmon-bearing streams and the spatial requirements typically needed for grizzly bear habitat, it is highly unlikely that they would be found within the Action Area or within the vicinity of the proposed Project. Therefore, the proposed Project **May Affect, Is Not Likely to Adversely Affect** grizzly bear.

Grizzly Bear Critical Habitat

Grizzly bear critical habitat areas have not been designated but has been proposed; therefore, the proposed project will have **No Jeopardy** on grizzly bear proposed critical habitat.

6.3.7 Bull Trout and Dolly Varden (Puget Sound-Coastal)

Although there is no designated Bull Trout critical habitat in the Action Area, Element biologists assessed potential habitat in the Action Area, Watercourses A and B, for suitable habitat and PCEs. As described in Section 4.2.7, Bull Trout require cold-water, streams with less than 2% gradient (Fraley and Shepard, 1989), water depths ranging from 4 to 23 inches (Fraley et al., 1981), and low-velocity streams with large substrate and submerged LWD (Shepard et al., 1984). Waters in Watercourses A and B are likely cold enough to support Bull Trout, however both watercourses lack gradients less than 2%, adequate perennial depth, low-velocity flow regimes, large substrate, and submerged LWD. Moreover, based on observed site conditions, these watercourses are not connected to other DNR-typed waters as described in Section 5.2.2.

The Skagit River, a known Bull Trout rearing and spawning river, is more than 0.4 miles east of the Action Area, with no apparent connectivity to Watercourses A and B in the Action Area. In addition, the ephemeral Watercourse A appears to outlet into a man-made pond (during extreme, 10-year flood events); Watercourse B outlets into the existing gravel pit at Rockport Cascade Road. The lower segments of each watercourse contain well-drained soils such that, under normal conditions, surface waters appear to infiltrate completely into the ground in flat infiltration areas (Figure 4). Since Watercourse B may have once been connected to tributaries of the Skagit River west of the Rockport Cascade Road, Bull Trout may have historically had access to the watercourse from the Skagit River.

No culverts exist under the Rockport Cascade Road suggesting that surface flows in Watercourse B do not regularly reach or pass the roadway. However, it is possible that during extreme high flows, surface water could possibly flow over Rockport Cascade Road (personal communication K. Ashenfelter). These flood waters could potentially (though would not likely) affect aquatic habitats, including wetlands and streams, west of Rockport Cascade Road, although fish presence

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in these areas appears highly unlikely. We could not definitively determine fish absence within offsite areas; and therefore, the federal determination for Bull Trout would be **May Effect, Not Likely to Adversely Affect**.

Bull Trout (Puget Sound-Coastal) PCEs

Salmonid PCEs are listed in Section 4.2.7. Although there are likely stream and river conditions that support Bull Trout in the vicinity, only PCEs 1, 3, 5, 8, and 9 may exist within Stream B in the Action Area. PCEs 1, 5, and 9 may exist in Stream A; however, PCEs 2, 4, 6, and 7 were not observed in either stream in the Action Area.

Bull Trout (Puget Sound-Coastal) Critical Habitat

There is no critical habitat designated in the project area; therefore, the proposed project will have **No Effect** on Bull Trout critical habitat.

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7 PROPOSED IMPACTS TO AQUATIC AREAS AND WASHINGTON STATE PRIORITY HABITATS

7.1 Skagit County Critical Area Buffer Impacts

As indicated below in Table 4, approximately 1.66 acres of the recommended protective buffer area would be impacted by the road construction and mining activities. Impacts would include tree, shrub, and herb removal in the riparian areas indicated in Figure 2. These protective buffer impacts would occur in two separate locations where the proposed access road crosses Watercourses A and B (utilizing culverts) traversing the recommended buffer areas, and creating fill impacts that could affect habitat and water quality functions within the watercourses. As part of the Reclamation Plan (pending submittal, PSE), the proposed road would be decommissioned, and watercourses would be returned to pre-existing conditions, however, a habitat enhancement plan that addresses buffer impacts is provided below in Section 8.3.

Table 4. Proposed Impacts[1] to Aquatic Areas and PHS Habitats.

Habitat Area	Total Area in Action Area (acres)	Proposed Impacts (acres)		
		Proposed Access Road	Proposed Mining Activities	Total Impacts
Watercourse A Recommended 50-foot Buffer	2.32	1.02	N/A	1.02
Watercourse B Recommended 50-foot Buffer	8.05	0.65	N/A	0.65
Herbaceous Balds	0.39	N/A	0.39	0.39
Talus	4.44	0.73	0.37	1.10
Cumulative Total Impacts[1]		**2.40**	**0.76**	**3.16**

[1]Approximately 200 snags would also be removed but mitigated for see Section 7.4, Section 8.3, and Table 6.

7.2 Impacts to Herbaceous Balds

The total area of displacement for the herbaceous balds would be 0.39 acres (16,962 square feet) in two herbaceous balds areas near the peak of the proposed mining area (Figure 5). The proposed project would permanently impact these areas which have been identified as a Priority Habitat by WDFW; however, the Reclamation Plan (pending submittal, PSE) would propose simulated herbaceous bald areas that in time would provide similar habitat functions as impacted

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areas. A habitat enhancement plan that addresses habitat impacts to herbaceous balds is provided below in Section 8.3.

7.3 Impacts to Talus

The total area of displacement for Talus would be 1.10 acres (47,786 square feet) with is approximately 25% of the existing talus area (Figure 5). The proposed project would permanently impact this area which has been identified as a Priority Habitat by WDFW; however, the Reclamation Plan (pending submittal, PSE) would propose creation of talus areas that in time would provide similar habitat functions as impacted areas. A habitat enhancement plan that addresses habitat Talus impacts is provided below in Section 8.3.

7.4 Impacts to Snags and Logs

Approximately 200 standing snags, a result of the Jordan Creek Fire, were found in the proposed mining area (Figure 5), and all would be displaced by the mining activities. The proposed project would permanently remove Snags and Logs, which have been identified as a Priority Habitat by WDFW; however, the habitat enhancement plan proposes salvaging Snags and Logs for woody debris placement throughout the Action Area and placement of snags or creation of snags via girdling of existing second-growth trees. The habitat enhancement plan that addresses habitat impacts to Snags and Logs is provided below in Section 8.3.

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8 CONCLUSIONS AND RECOMMENDATIONS

8.1 State and Federally-listed Species Assessment Conclusions

Due to the potential presence of state and federally-listed species in the vicinity of the Action Area, the proposed Project has the potential to affect listed species and their associated habitats. Following the appropriate BMPs would control and minimize impacts from material placement activities; therefore, our determination is that the overall proposed project **May Affect, Is Not Likely to Adversely Affect** the biological environment of the area.

Determinations of effect have been made for federally-listed endangered, threatened, or candidate species for the purposes of consultation under Section 7 of the ESA, as well as migratory birds (also listed in the ECOs IPaC search) and State-listed species (Table 5).

Table 5. Summary of Species and Effects Determinations.

Species	State Status	Federal Status	Federal Effect Determination	Justification
Fish				
Bull Trout	Candidate	Threatened	NLTAA	All work would adhere to BMPs, and would not impact fish-bearing streams or their buffers.
Dolly Varden	Candidate	Threatened	NLTAA	
Birds				
Marbled Murrelet	Endangered	Threatened	NLTAA	Proposed activity would take place outside of areas with nesting and roosting habitat.
Northern Spotted Owl	Endangered	Threatened	NLTAA	
Yellow-Billed Cuckoo	Candidate	Threatened	NLTAA	
Mammals				
North American Wolverine	Candidate	Proposed Threatened	No Jeopardy	Proposed activity would take place outside of areas with known habitat.
Gray Wolf	Endangered (Western WA)	Endangered	NLTAA	
Grizzly Bear	Endangered	Threatened	NLTAA	
Critical Habitat				
Bull Trout Critical Habitat	N/A	Listed, Not in Action Area	NE	All work would adhere to BMPs, and would not impact fish-

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Species	State Status	Federal Status	Federal Effect Determination	Justification
Dolly Varden	N/A	Listed, Not in Action Area	N/A	bearing streams or their buffers.
Marbled Murrelet	N/A	Listed, Not in Action Area	N/A	N/A
Northern Spotted Owl	N/A	Listed, Not in Action Area	N/A	N/A
Yellow-Billed Cuckoo	N/A	Listed, Not in Action Area	N/A	N/A
North American Wolverine	N/A	Proposed	No Jeopardy	N/A
Gray Wolf	N/A	Listed, Not in Action Area	NE	N/A
Grizzly Bear	N/A	Proposed	No Jeopardy	N/A
Migratory Birds				
Bald Eagle	Sensitive	Species of Concern	No Jeopardy	Proposed activity would take place outside of areas with nesting and roosting habitat.
Black Swift	None	None (Migratory)	No Jeopardy	
Brewer's Sparrow	None	None (Migratory)	No Jeopardy	
Golden Eagle	Candidate	None (Migratory)	No Jeopardy	
Lewis's Woodpecker	Sensitive	None (Migratory)	No Jeopardy	
Olive-sided Flycatcher	None	None (Migratory)	No Jeopardy	
Sage Thrasher	None	None (Migratory)	No Jeopardy	
Willow Flycatcher	None	None (Migratory)	No Jeopardy	

8.2 Critical Areas and State Priority Habitat Conclusions

The proposed Project would directly impact Skagit County Critical Area buffers and Washington State Priority habitats in the Action Area. The Project proposes habitat enhancement and reclamation plans to account for these impacts in a "no net loss" scenario per WAC 365-196-830(8)(a). By adhering to minimization strategies, employing appropriate BMPs and stormwater

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treatment, the proposed Project Action would not be expected to result in a net loss of habitat functions.

Table 6 summarizes the results of the assessment and presents the regulated Critical Areas and their associated buffers in addition to Washington State Priority Habitats. We also provide recommended enhancement ratios as described in below in Section 8.3.3.

Table 6. Assessment Summary for Action Area

Habitat Conservation Areas	Recommended Buffer Width (feet)	Impacts	Recommended Enhancement Ratio	Recommended Habitat Enhancement
Watercourse A	50	1.02 acres	1:1	N/A
Watercourse B	50	0.64 acres	1:1	1.66 acres
Herbaceous Balds	N/A	0.39 acres	1.5:1[1]	0.58 acres
Talus	N/A	1.10 acres	1.5:1[1]	1.65 acres
Snags and Logs	N/A	200 snags[2]	1:1	200 snags and logs[2]

[1]The 1.5:1 habitat enhancement ratio is based on Ecology guidance to account for temporal habitat loss due to project impacts.

[2]Impacts to snags were based on point count estimates of approximately 200 snags and the habitat enhancement proposes compensation as Snags and Logs, each providing similar habitat functions (Ecology 2008).

8.3 Recommendations for Project Habitat Enhancement and Reclamation

The recommendations presented were developed to restore and enhance Habitat Conservation Areas and State Priority Habitats within the Action Area. General and specific restoration measures for the enhancement areas are outlined below.

8.3.1 Sequencing Requirements

The proposed project adheres to Skagit County's sequencing requirements typically apply for required habitat enhancement purposes. We recommend that these standards are upheld for the proposed habitat enhancement. The following sequencing strategy is outlined in conformance to SCC 14.24.080(5)(b):

1. **Avoiding:** The proposed quarry project would avoid impacting the majority of the talus area and also establishes clearing limits where native vegetation would remain. Moreover, the southern extent of the project has been modified in such a way that the majority of the buffer to Watercourse B is avoided.

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2. **Minimizing:** Appropriate and quarry-specific BMPs would be utilized throughout the Project until completion. Moreover, an appropriate stormwater plan would be used such that the stormwater inputs into critical areas are non-existent or minimal.

3. **Rectifying:** All temporarily impacted areas (due to equipment staging, etc.) would be treated with topsoil and access to these areas would be restricted to allow for the regrowth of native vegetation where appropriate.

4. **Reducing:** Foot traffic and large equipment use would be restricted in and around Watercourses A and B, so as not to disturb wildlife use. Placement of conservation signage would reduce the potential impacts to the watercourses and habitat buffers in the future. The proposed road construction would allow for safe and sufficient access to the proposed quarry and would ensure no vehicles would travel off-road or into Critical Area buffers.

5. **Compensating:** Habitat enhancement and reclamation are proposed such that project impacts account for habitat loss in habitat buffers and temporal loss of Priority Habitats. The Habitat enhancement and reclamation plans would ensure a "no net loss" of habitat functions scenario per WAC 365-196-830(8)(a). We also recommend a phased approach, in which buffer habitat would not need to account for temporal loss of habitat functions.

8.3.2 Phased Approach

In order to avoid temporal loss of buffer habitat functions, we recommend that the habitat enhancement Plan be carried out in two phases such that **Phase I** includes the aquatic habitat buffer enhancement and would occur in advance or congruent with the proposed impacts. **Phase II** would involve habitat restoration of Herbaceous Balds and Talus Priority Habitats and would occur during mine reclamation.

8.3.3 Recommended Habitat Enhancement Ratios

To meet a "no net loss" of habitat function scenario per WAC 365-196-830(8)(a), a habitat enhancement ratio of 1:1 is recommended for the protective buffer areas. Although the watercourses do not appear to meet the definition of a stream under WAC 222-16-030, they appear to provide some level of habitat and water quality functions. The impacts to watercourses would be mitigated for such that the square-footage of impacts in the buffer areas equals the square-footage of the buffer enhancement area. The buffer enhancement will be conducted in advance or congruent with the proposed impacts, therefore habitat buffer enhancement would not need to account for temporal loss of functions.

To our knowledge, guiding regulations and habitat enhancement ratios for impacts to Washington State Priority Habitats have not been established. Ecology, however, does provide guidance in calculating habitat enhancement ratios based on habitat functional values in wetland systems and wetland buffers (Hruby, 2012), which provide similar habitat functions as stream buffers. In particular, Ecology provides important guidance on the temporal loss of habitat functions. As described in Hruby (2012), "Scientific studies have shown that it will take decades if not centuries to fully replace the functions lost at an impact site even if the [habitat enhancement] is started

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concurrently with the impacts. If functions are replaced only to the level present at the impact site, there will be a net loss of functions for the project." Therefore to account for the temporal loss of habitat, Ecology recommends a mitigation ratio of 1.5:1. Given that these habitat areas will not be completely re-established (or mitigated for) until after project completion and reclamation, we recommend an enhancement ratio of 1.5:1 for the impacted Priority Habitats as indicated in Table 6.

8.3.4 Specific Habitat Enhancement Measures

We recommend the following habitat enhancement measures in order to meet the requirements of the Skagit County code 14.24.540(3) and Washington Administrative Code WAC 365-196-830(8)(a):

Phase I (Congruent)

1. Impacts to the riparian habitat buffers of Watercourse A and Watercourse B should be compensated for at a 1:1 ratio such that a total of 1.66 acres of the recommended protective buffer is mitigated for via removal of existing invasive species and installation of native species in the Watercourse B buffer enhancement area (Figure 4). Enhancing the buffer of Watercourse A would be logistically challenging due to steep topography. See Table 7 below for recommended riparian plant species.

Phase II (Reclamation)

2. Impacts to Herbaceous Balds should be compensated for at a 1.5:1 ratio to account for temporal loss in habitat functions such that a minimum of 0.58 acres. Habitat enhancement for this Priority Habitat would occur during the Reclamation Phase of the proposed Project Action (Reclamation Plan pending submittal, PSE). Herbaceous Bald habitat is generally lacking in trees and shrubs and the habitat conditions described in Section 4.3.1 should be simulated as follows:
    - A 3 to 6-inch layer of coarse (2-4mm grain size) mineral and humic soil should be applied to a minimum of 0.58 acres of moderately-sloped (20-30% slope) areas of exposed bedrock. These areas should have southern to western aspects to promote dry conditions associated with Herbaceous Balds.
    - Erosion control measures should be added to the grading or mineral and humic soil application in order to prevent erosion.
    - Plant several herbaceous species and a few scared herbs and trees as indicated in Table 8 below.

3. Impacts to Talus should be compensated for at a 1.5:1 ratio to account for temporal loss in habitat functions such that a minimum of 1.10 acres. Habitat enhancement for this Priority Habitat would occur during the Reclamation Phase of the proposed Project Action (Reclamation Plan pending submittal, PSE). This Priority Habitat area would be composed of homogenous areas of rock rubble ranging in average size 0.5-6.5 feet (WDFW 2008).

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4. Snag removal in the Action Area would be avoided if possible. When existing snags of live trees must be removed for mining activities they may be salvaged and stockpiled to be used for onsite habitat enhancement projects. Snags may be used for habitat enhancement projects in the following ways:

    - 100 snags would be installed or created in one of the remaining forested areas, preferably in the proposed large soil berm areas that would be generally lacking habitat. Salvaged trees may be installed in a hole approximately one-third the height of the snag and back-filling and tamping with soil, gravel, or concrete footings. Snags may also be created from second-growth living trees by girdling or other techniques described in Appendix E.
    - 50 snags would be repurposed as logs and placed as LWD in either Watercourse A or Watercourse B (preference to Watercourse B) such that the snags are spread out evenly throughout the channel.
    - 50 snags would be repurposed as logs in the quarry area during project reclamation to account for Snag and Log habitat loss by the mining activities.

Applies to both Phases

5. Addition of language to the property deed stating that the habitat enhancement areas would be set aside as a permanent conservation area, regardless of ownership.
6. Implementation of a conservation sign along the edge of the buffer enhancement area near the proposed access road (see Appendix F for sign requirements).
7. Installation of protective planting covers ("blue tubes") around woody-stemmed plants.
8. Establishment of a 125% Assignment of Savings to ensure that habitat enhancement goals are met and maintained throughout the duration of the monitoring period per SCC 14.24.080(6).
9. Requirements that maintenance and monitoring would be performed for 5 years after plant installation, or as long as directed by the county administrator. As-built reports and monitoring reports should be submitted to the county on an annual basis.

8.3.5 Best Management Practices Specific to Habitat Enhancement

The following BMPs are recommended prior to and during plant installation:

- Appropriate erosion control measures, including but not limited to coir logs, rock check dams and hydro-mulch, would be utilized during construction to reduce turbidity, sediment, and/or pollutants from entering Critical Areas (Appendix A).
- The job site would be marked, the work area would be flagged, and equipment would be operated in such a way as to minimize disturbance to riparian habitat.
- All wastewater would be directed away from waterbodies and conform to Ecology Stormwater Standards.

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- All areas previously disturbed (clearing and/or fill) would be replanted with grass, or as authorized by Skagit County via the permit process.
- Direct exterior lights away from the protective buffers.
- Limit the use of pesticides within 150 feet of habitat areas, except as needed to remove invasive vegetative species and establish native plantings.
- Infiltrate, disperse and/or treat runoff into buffers as far from the Critical Area as feasible.
- During the summer (July through September), no soils would remain exposed and unworked for more than seven days.
- During the winter (October through June), no soils would remain exposed and unworked for more than two days.
- The construction contractor would be required to have a spill kit on site at all times.
- Locate facilities that generate substantial noise (such as some manufacturing, industrial and recreational facilities) away from Critical Areas and buffers.
- Implement integrated pest management programs.
- Use low impact development techniques to the greatest extent possible.

8.3.6 Invasive Species Removal and Plant Installation

A common invasive species, Himalayan blackberry (*Rubus armeniacus*), was observed on the channel banks of Watercourse B, and therefore invasive species removal is recommended. In addition, the banks are generally lacking species diversity and the buffer function and habitat quality would be improved by establishing a more diverse set of shrubs and trees. Habitat improvements would include enhancement of 1.66 acres of the Watercourse B protective buffer by planting upland trees and shrubs species. Planting in this area would create a barrier between the aquatic habitat and noise, light, and human intrusion.

Invasive Species Removal

All non-native vegetation including Himalayan blackberry and any other identified invasive species, would be removed from the habitat enhancement site prior to planting, and thereafter strictly controlled. Plant cover for a particular invasive species may not exceed 20% throughout the five-year monitoring period. Himalayan blackberry would be removed by cutting the above-ground portions and digging up the remaining root ball. All invasive weeds would then be completely removed from the property to prevent re-growth. For more information on blackberry removal and maintenance see the attached *Control Options for Himalayan Blackberry* (Appendix G).

Native trees and shrubs that exist within the buffer enhancement areas would be left in place where feasible as they may provide cover for the maturing installed plantings.

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Mulching

Mulch would be applied in selected portions of the buffer enhancement areas to shade out weedy and invasive species and aid in planting success. Additional wood chips may need to be applied throughout the monitoring period as necessary.

Recommended Plant Species in Protective Buffer Enhancement areas (Phase I)

The protective buffer areas indicated in Figure 4 would be planted with the following recommended trees and shrub species. All of the species below were observed to be already growing within native-species-dominated portions of the buffers. Table 7 provides recommended species, quantities, and spacing to adequately vegetate the enhancement areas. Plant quantities were determined using the *Plant Quantities Calculator* from Sound Native Plants (2018).

Table 7. Recommended Species List for Habitat Enhancement Area of Watercourse B.

Common Name	Scientific Name	Planting Method	Recommended Spacing (ft O.C.)	Recommended Quantity in Enhancement Area
Trees				
Western red cedar	*Thuja Placata*	1-gal	18	75
Douglas fir	*Pseudotsuga menziesii*	1-gal	18	75
Red alder	*Alnus rubra*	1-gal	18	75
Shrubs				
Oceanspray	*Holodiscus discolor*	1-gal	10	200
Red-flowering currant	*Ribes sanguineum*	1-gal	10	200
Snowberry	*Symphoricarpos albus*	1-gal	10	200
Hooker's willow	*Salix hookeriana*	stakes	10	200
			Total	**1,025**

Notes: ft O.C. = feet on center, 1-gal = 1-gallon container

Recommended Plant Species in Herbaceous Balds Enhancement areas (Phase II)

As part of the Reclamation Plan (pending submittal, PSE), habitat associated with Herbaceous Balds would be simulated by planting a variety of herbaceous species indicated in DNR (2006) in an area/areas greater than or equal to 0.58 acres. Trees and shrubs would be planted at a *very* sparse spacing to simulate the natural sparseness of these strata in Herbaceous Bald environments. Some of the species below were observed onsite in the bald areas.

Erosion control measures and BMPs should also be applied to minimize risk of erosional hazards throughout the habitat enhancement monitoring period.

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Table 8. Recommended Species List for Herbaceous Balds.

Common Name	Scientific Name	Planting Method	Recommended Spacing (ft. O.C.)	Recommended Quantity
Shrubs				
Salal	*Gaultheria shallon*	1-gal	32	26
Nootka rosa	*Rosa nutkana*	1-gal	32	26
Snowberry	*Symphoricarpos albus*	1-gal	32	26
Herbs				
Colonial bentgrass	*Agrostis tenuis*	seed	Selectively broadcast	50 lbs
Tall oatgrass	*Arrhenatherum elatius*	seed	Selectively broadcast	50 lbs
Meadow brome	*Bromus commutatus*	seed	Selectively broadcast	50 lbs
Western fescue	*Festuca occidentalis*	seed	Selectively broadcast	50 lbs

Notes: ft O.C. = feet on center, 1-gal = 1-gallon container

8.3.7 Planting Plan

Plant installation would consist of installing plant protective devices and applying mulch if deemed necessary. Installation would not be initiated until the habitat enhancement site is prepared in accordance with this habitat enhancement plan and the requirements made by the County or other jurisdictional authority.

Source of Plant Materials

All plant materials used at the habitat enhancement site would be acquired from local or near local sources, grown in the Puget Sound lowlands, and obtained from a reputable native plant nursery. Note that the quantities of individual species (Listed above in Tables 7 and 8) may change depending on nursery availability.

Planting Locations

Using Tables 7 and 8, plants would be installed in areas best suited to promote growth and function of a native habitat area. Plants would be laid out in clusters or "islands" that mimic natural plant distribution. Specific attention would be paid to hydrologic, soil, and shade conditions that can contribute to the survival and proliferation of the plantings. Planting plan locations may vary based on actual site conditions, however the total number of plants installed and the area enhanced would not fall below the quantities suggested in Tables 7 and 8.

Installation of Container and Bare Root Plants

Bare root plants would only be installed during the months of December and January. Planting outside of this window can substantially reduce survival rates. We recommend these general guidelines:

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- Water all container stock and bare root plants the day before planting.
- Transplant according to the location recommendations provided in this report.
- Follow the appropriate spacing guidelines in Tables 7 and 8.
- Dig holes deep enough and wide enough to allow room for roots to spread.
- Soil augmentation may be necessary to property establish the installed plants in the heavy clay rich soils.
- Install plantings with downward facing root mass and avoid "J-planting" or horizontal root arrangements.
- Apply water to the hole prior to installing the plant.
- Water plant after installation and tamp down the soil to close any air holes.
- Create soil basin around plantings to allow for water collection.

Markers

Numbered flags and/or posts to mark photo points would be established and photos would be taken during the initial phase of habitat enhancement. These photo points would remain constant over the 5-year monitoring period and serve as a point of comparison to show annual progress. These photo points would be indicated on map figures when submitted with the annual monitoring report. The number of photo points and their locations would be determined based on site conditions and would be representative of the enhancement areas.

Proposed Plant Installation Schedule

Native vegetation planting would begin in the spring or fall following approval of this habitat enhancement plan by the County. Plant installation would take place between February 15th and April 15th, between September 15th and October 31st, or according to the specific recommendations of a representative of the nursery that provides the plant materials.

8.3.8 Monitoring and Maintenance Reporting

Performance Standards

Habitat enhancement performance standards are used to determine the relative success of the project. Failure to meet these general minimum standards throughout the monitoring period would result in the implementation of contingency measures and maintenance activities provided in Section 8.3.11. Element recommends the following performance standards for the habitat enhancement sites (Figure 4):

1. In the event that invasive species are introduced to the area, they would be removed and maintained so that invasive species areal cover is below 10% for the duration of the monitoring period.
2. Planted tree, shrub, and herb species would have a survival rate of at least 80% for the duration of the five-year monitoring period.

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3. If native colonizers result in the total native tree and shrub cover exceeding 80%, the habitat enhancement would be considered successful and the suggested survival rate for installed plants would be decreased to 50%. A percent cover calculation would be conducted prior to plant installation to create a baseline for determining total plant cover success.
4. The ground layer would have an average areal cover of 50% throughout the enhancement area by the completion of the 5-year monitoring period.

Monitoring Schedule

The enhancement area would be maintained and monitored for five years following installation. Monitoring reports should be submitted to the County during years 1, 2, 3, 4, and 5, beginning the year after the County accepts the As-Built specifications. The monitoring reports would be submitted by October 1 of each monitoring year. The general timeline and activities that would be conducted during the monitoring period are specified in Table 9 below.

Monitoring Reports

At the end of each monitoring year (Years 1 through 5) an annual report **w**ould be prepared and submitted to the County. The specific monitoring schedule would be determined by the date of implementation, the submittal of the As-Built Report, and the acquisition of the installation completion letter from the County. The As-built report should be submitted at the completion of each Phase of the project and will start the monitoring period for each respective Phase. The Year 1 monitoring report would be submitted by October 1 of the first monitoring year, contingent on County approval. Annual monitoring reports would provide an assessment of the habitat enhancement site as it relates to the performance standards and an evaluation of progress toward completion of the goals and objectives contained in this habitat enhancement plan. Each monitoring report would contain, at a minimum:

- The survival rate and/or replacement of planted tree and shrub species.
- Areal cover of planted herbaceous species.
- Percent cover of native vegetation, native plant recruitment, average shrub height.
- An inventory of plant species (both planted and volunteer).
- A list of names, titles, and companies of any and all persons who participated in the data collection, compilation, and preparation of the monitoring report.
- A habitat enhancement site map identifying enhancement area, data collection locations and/or transects, photo point locations, and any other pertinent information.
- Labeled photographs from each of the photo point locations.
- Copies of completed field data sheets.
- An analysis of all qualitative and quantitative monitoring data.

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Table 9. Schedule of Habitat Enhancement Monitoring and Maintenance Activities.

Year	Task	Date
0	Invasive Removal/Plant Installation	Between September and April
	Preparation of As-Built Report	Within 30 days of installation
	Installation Completion Letter	To be determined
1	Monitoring Activities	Spring and Fall
	Plant Maintenance (as described in habitat enhancement plan)	Summer/Fall
	Dry Season Watering	July through September
	Year 1 monitoring report	October 1
2	Monitoring Activities	Spring and Fall
	Plant Maintenance (as described in Year 1 Monitoring Report)	Summer/Fall
	Dry Season Watering	July through September
	Year 2 Monitoring Report	October 1
3	Monitoring Activities	Spring and Fall
	Plant Maintenance (as described in Year 2 Monitoring Report)	Summer/Fall
	Year 3 Monitoring Report	October 1
4	Monitoring Activities	Spring and Fall
	Plant Maintenance (as described in Year 3 Monitoring Report)	Summer/Fall
	Year 4 Monitoring Report	October 1
5	Monitoring Activities	Spring and Fall
	Plant Maintenance (as described in Year 4 Monitoring Report)	Summer/Fall
	Final Monitoring Report	October 1
	Agency Confirmation of Monitoring Completion	To be determined
	Contingency Measures (if required)	To be determined

8.3.9 Monitoring Methods

This section provides recommended methods for evaluating the success of the habitat enhancement efforts.

Plant Survival Sampling Technique

An inventory of all installed plants would be conducted at the end of each growing season of the corresponding monitoring year. The total number of dead, missing, or declining plant stocks would be recorded and subtracted from the total number of installed plants. The percentage of installed plants that have survived would be calculated to determine whether the performance standards are being met. If performance standards are not met for any monitoring year, the

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Applicant would be responsible for additional plantings to meet performance standard values, unless total percent cover (installed plants plus native recruits) meets or exceeds these criteria. Due to the relatively small size of the proposed enhancement area, it is recommended that the protective buffer and Herbaceous Balds habitat enhancement area be evaluated annually. This would include documenting all planted individuals during habitat enhancement installation, and subsequent annual counting of all individual plants within the planting area. It may be difficult to count individual ground cover species in later monitoring years. Ground cover would be evaluated based on areal cover.

Monitoring Inspection Checklist

The site would be inspected at least once a year to evaluate progress (mid-summer). However, we would also encourage a visit during the late spring to do an additional evaluation for progress and potential maintenance. We recommend the following inspection guidelines to document the re-vegetation progress:

Spring (April-May)

1. Evaluate plants and plant communities using monitoring methods listed above.
2. If plants are determined to be dead, dying, or missing, replace with the same species or another species that is demonstrating success in the habitat enhancement areas.
3. Replace flags and markers as needed.
4. Photograph site from predetermined photo points.

Fall (September-October)

1. Evaluate plants and plant communities using monitoring methods listed above.
2. If plants are determined to be dead, dying, or missing, replace with the same species or another species that is demonstrating success in the habitat enhancement areas.
3. Water plants during dry springs and summers.
4. Replace flags and markers as needed.
5. Photograph site from predetermined photo points.

8.3.10 Maintenance

Maintenance activities would be conducted throughout the habitat enhancement areas regularly throughout the five-year monitoring period to ensure the success of the habitat enhancement. Maintenance personnel, would be informed of the ultimate goals and objectives of the approved habitat enhancement plan. Persons conducting maintenance activities would also report existing or potential problems observed on-site.

Maintenance would be conducted using the following guidelines as the minimum amount of maintenance necessary to ensure habitat enhancement success. Additional maintenance may be necessary. A summary of the maintenance tasks is provided in Table 10.

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Table 10. Maintenance Task Schedule.

Activity	Schedule	Responsibility
Replace all dead and declining landscape plantings	One year following completion of the implementation, and then as specified in the annual Monitoring Reports	The Applicant would be responsible for replacing all dead or unhealthy plants; the Applicant may choose to hire a Landscape contractor to do this work
Noxious species control measures	No less than twice per year during the growing season	The Applicant would be responsible for conducting noxious species control measures; the Applicant may choose to hire a Landscape contractor to do this work
Recommended Watering during Dry Season	July to September	The Applicant would be responsible for conducting watering measures during the dry season of the first two years.
Watering installed plants (would only be necessary for the first two years following installation)	As needed, with a minimum of one inch of water for every two weeks during the dry season (generally July and August)	The Applicant would be responsible for implementing an appropriate watering schedule; the Applicant may choose to hire a Landscape contractor to do this work

8.3.11 Habitat Enhancement Project Completion

Notification of Completion

At the end of the five-year monitoring period, the Applicant would provide written notification to the County, provided the approved performance standards have been met. If habitat enhancement has not achieved the performance standards, then the County would be consulted for approval of a contingency plan. Only those portions of the site that fail to meet specific performance standards would require additional monitoring. This process would continue until all performance standards are met or until the County determines that the habitat enhancement project is sufficiently successful.

The Applicant would not be held responsible or accountable for any natural occurrences that significantly damage or destroy the habitat enhancement areas provided that the plantings were documented to have been proceeding towards meeting the performance standards prior to the naturally damaging disturbances. Natural occurrences that could cause significant damage include, but are not limited to, significant windstorm events, flooding, naturally caused fire, or other destructive natural forces. In the event that the site is damaged or destroyed by a natural occurrence, reconstruction and replanting would not be required; however, if the habitat enhancement areas fares significantly worse than the surrounding natural communities, the habitat enhancement site would be considered not to have sufficiently established itself, and reconstruction, replanting, and monitoring would continue.

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Agency Confirmation

Following submittal of the Year 5 monitoring report and notification of completion of the monitoring period, the County would provide written confirmation releasing the Applicant of any and all monitoring and maintenance responsibilities associated with this plan. While it is the responsibility of the Applicant to ensure that the habitat enhancement is successful, agency staff would review annual reports in a timely fashion and provide comments throughout the monitoring period so that any part of the habitat enhancement project that is deemed insufficient can be addressed prior to the anticipated end of the monitoring period.

Contingency Plan and Measures

Contingency measures would be implemented if one or more of the performance standards are not met for any monitoring year. If contingency measures are required, a qualified wetland scientist would prepare an analysis of the cause(s) of failure and, if deemed necessary by the County, develop a plan for remedial action. Maintenance and monitoring would continue beyond the original five-year monitoring period until the agencies give final approval releasing the Applicant of remaining responsibilities.

If it is determined that the performance standards cannot be achieved through routine maintenance, a qualified wetland scientist would develop a contingency plan. The contingency plan would replace the corresponding components of the approved habitat enhancement plan, and must be approved by the County prior to implementation.

Contingency Measures

If performance standards are not met within the maintenance and monitoring period, the following actions are recommended:

1. If survival of installed plants become less than 80% during the monitoring period for any particular species, then additional planting would occur to restore the number and species to As-Built specifications, unless it is determined that a different native species would have greater success.
2. If noxious species occupy more than 10% of the total areal cover, then additional weed control measures would be utilized.
3. If the average overall native herbaceous cover is below 50% then additional planting would occur to ensure adequate coverage

If additional restoration measures are needed to meet the performance standards in this report, an Element scientist or other qualified professional would monitor efforts to reestablish the restoration area. A specific contingency plan may be required if any or all performance standards are not met by the end of the five-year monitoring period

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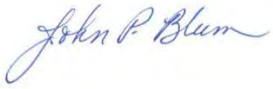
9 CLOSURE

This report was prepared and submitted by:

Adam Crispin
Biologist, Aquatic Ecologist



John P. Blum
Fisheries Biologist

Reviewed by:

Jeff Ninnemann, PWS, LHG
Wetland Scientist, Hydrogeologist

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References

Banci, V. 1994. Wolverine. pp99-137. In: Ruggiero, L.F. K.B. Aubry, S.W. Buskirk, L.J.Lyon, W.J. Zielinski. The Scientific Basis for Conserving Forest Carnivores: American Marten, Fisher, Lynx, and Wolverine in the Western United States. USDA Forest Service. Gen. Tech. Rep. RM-254.

BRC (BRC Acoustics& Audiovisual Design). 2019. Sound analysis for Marblemount Quarry Skagit County,, WA. Submitted to Element Solutions, Bellingham, WA.

Copeland, J. P.; McKelvey, K. S.; Aubry, K. B.; Landa, A.; Persson, J.; Inman, R. M.; Krebs, J.; Lofroth, E.; Golden, H.; Squires, J. R.; Magoun, A.; Schwartz, M. K.; Wilmot, J.; Copeland, C. L.; Yates, R. E.; Kojola, I.; May, R. 2010. The bioclimatic envelope of the wolverine (Gulo gulo): do climatic constraints limit its geographic distribution? Canadian Journal of Zoology. 88: 233-246DNR (Washington State Department of Natural Resources), 2018a. Wetlands of High Conservation Value Map Viewer. Available from: http://www.dnr.wa.gov/NHPwetlandviewer

DNR (Washington Department of Natural Resources), 2006. Plant Associations of Balds and Bluffs of Western Washington. Natural Heritage Report 2006-02. June 2006. Prepared by Christopher B. Chappell Washington Natural Heritage Program P.O. Box 47014, Olympia, WA 98504-7014

DNR, 2018. Forest Practices Application Review System (FPARS). Available online from: http://www.dnr.wa.gov/programs-and-services/forest-practices/forest-practices-application-review-system-fpars

Ecology, 2008. Determining the Ordinary High Water Mark on Streams in Washington State. Ecology Publication #08-06-001. April 2008. October 2016.

Ecology, 2016. Washington State Water Quality Atlas. Approved 07/22/2016. Available online from: http://www.ecy.wa.gov/programs/wq/303d/index.html

Element (Element Solutions), 2018. Marblemount Quarry Hydrogeologic Site Assessment, Rockport Cascade Road, Skagit County, WA.

Fişne, A., Kuzu, C. & Hüdaverdi, T., 2011. Prediction of environmental impacts of quarry blasting operation using fuzzy logic. Environmental Monitoring and Assessment, 174(1), pp.461–470.

Fraley, J., D. Read and P. Graham. 1981. Flathead River fisheries study. Montana Department of Fish, Wildlife and Parks.

Fraley, J.J., and B.B. Shepard, 1989. Life history, ecology and population status of migratory bull trout (*Salvelinus confluentus)* in the Flathead Lake and River system, Montana. Northwest Sci. 63: 133-143.

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Hamer Environmental, 2018. Marbled Murrelet and Northern Spotted Owl Habitat Assessment for the Marblemount Quarry Project. December 7, 2018. P.O. Box 2561, Mount Vernon, Washington.

Hornhocker, M. G. and H. S. Hash. 1981. Ecology of the Wolverine in Northwestern Montana. Can. J. Zool. 59:1286-1301.

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.

Kolden, K. and C. Aimone-Martin, 2013. Blasting Effects on Salmonids. Prepared for the Alaska Department of Fish and Game, Division of Habitat, Southeast Region 802 3rd Street, Douglas Alaska.

Lewis, J.C. and Azerrad, J.M . 2004. Pileated Woodpecker. Pages 29-1 – 29-9. In E.Larsen, J.M. Azerrad, N. Nordstrom, editors. Management Recommendations for Washington's priority species, Volume IV: Birds. Washington Department of Fish and Wildlife, Olympia, Washington, USA

Munsell, 2010. Munsell Soil Color Charts, Revised Edition. [2010 Production]. X-rite, Grand Rapids, MI.

RAI (REVEY Associates, Inc.). 2019. Marblemount Quarry, Skagit County, WA. Assessment of rock blasing impacts and recommended practices. Prepared for Kiewit Infrastructure West Company, Vancouver, WA. Prepared by Gordon R. Revey, P. Eng.

Shepard, B.B., K.L. Pratt, and P.J. Graham. 1984. Life histories of westslope cutthroat and bull trout in the upper Flathead River Basin, MT. Environmental Protection Agency. 85 pp.

Sound Native Plants, 2018. Calculating Plant Quantities calculator available at: https://soundnativeplants.com/nursery/plant-quantity-calculator/

Stokes, D.W. and L. Q. Stokes, 1996. Field guide to birds, western region. Little, Brown & Co. Boston, MA

USDA (US Department of Agriculture), 2018. Natural Resource Conservation Service (NRCS) Web Soil Survey. Available online from: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

USFS (US Forest Service), 2014. Addendum to the Biological Assessment for thePrescott National Forest Land and Resource Management Plan – Yellow-billed cuckoo Proposed Critical Habitat. Southwest USFS Region.

USFWS (U.S. Fish and Wildlife Service), 2018. National Wetlands Inventory online mapper. Available: https://www.fws.gov/wetlands/data/Mapper.html

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USFWS and National Parks Service (NPS), 2017. Newsletter: Draft Grizzly Bear Restoration Plan/ Environmental Impact Statement, North Cascades Ecosystem. Available: https://www.nps.gov/noca/upload/NCEG-draft-EIS-newsletter-electronic.pdf

WSDOT (Washington Department of Transportation), 2018. Best Management Practices Field Guide for ESA § 4 (d) Habitat Protection. Available: https://www.wsdot.wa.gov/NR/rdonlyres/177E1E03-C638-48B7-BFD6-AFE116721FE7/0/bestmanagementpracticesfieldguideregionalroadmaintenance.pdf

Whatcom County Amphibian Monitoring Program (WCAMP), 2017. 2017 Egg Mass Survey Results. Available online from: https://whatfrogs.wordpress.com/2017-egg-mass-survey-resuls/

WDFW (Washington Department of Fish and Wildlife). 2008. Priority Habitat and Species List. Olympia, Washington. 288pp.

WDFW, 2018a. WDFW PHS online. Available online from: http://apps.wdfw.wa.gov/phsontheweb/

WDFW, 2018b. SalmonScape web mapper. Available online from: http://apps.wdfw.wa.gov/salmonscape/

Wiles, G. J., and K. S. Kalasz. 2017. Status report for the Yellow-billed Cuckoo in Washington. Washington Department of Fish and Wildlife, Olympia, Washington. 32+ iv pp

WSDOT, 2004. Best Management Practices Field Guide for ESA 4(d) Habitat Protection. March 2004. Maintenance and Operations Division.

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Figures

2) Proposed Project within the Action Area showing Critical Areas and Priority Habitats.
3) Vicinity streams and wetlands, as mapped by WDFW, DNR, or USFWS.
4) Proposed Project showing Impacts to Skagit County Critical Areas and Enhancement area.
5) Proposed Project showing Impacts to Priority Habitats and Habitat enhancement Areas.

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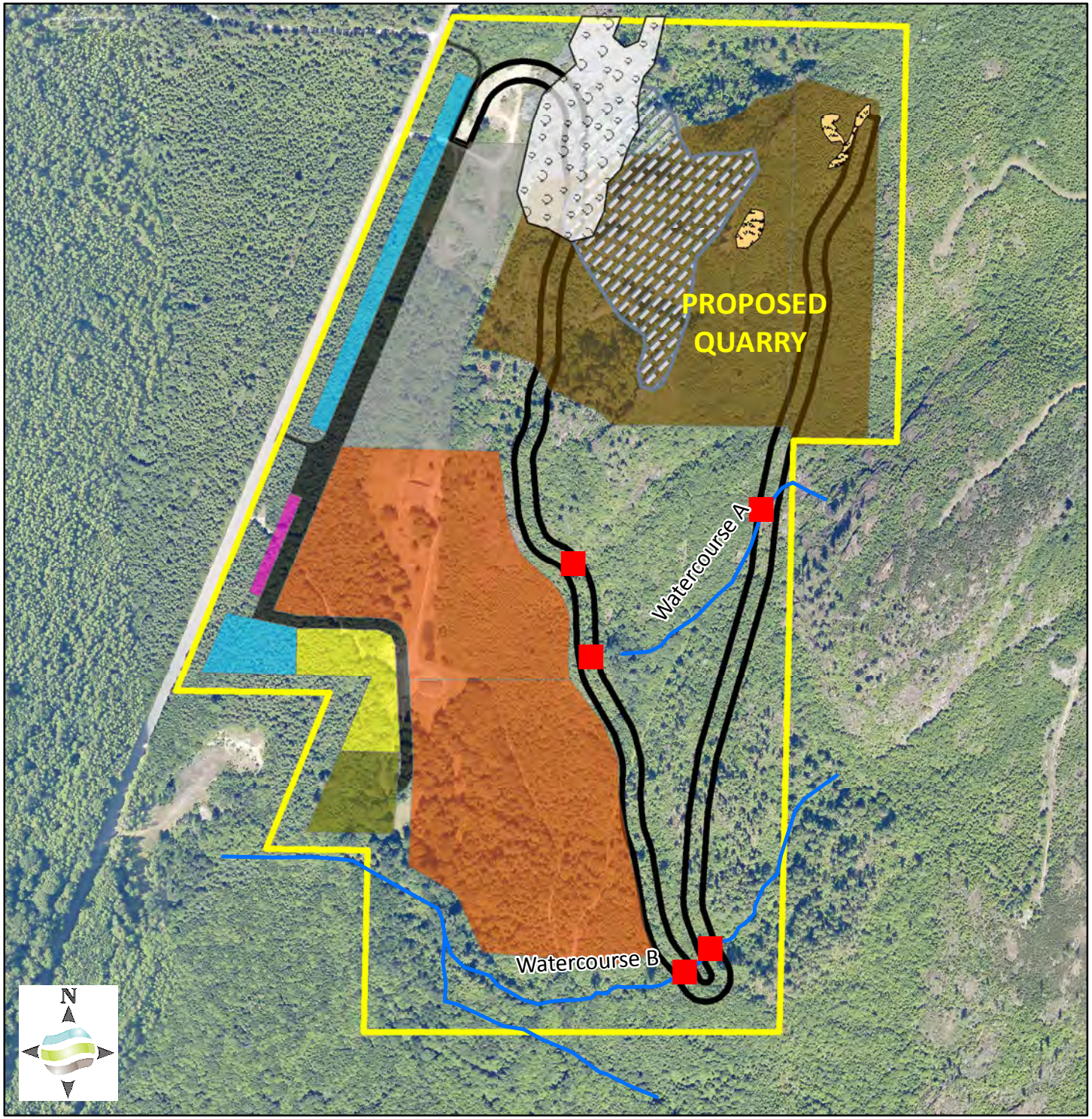

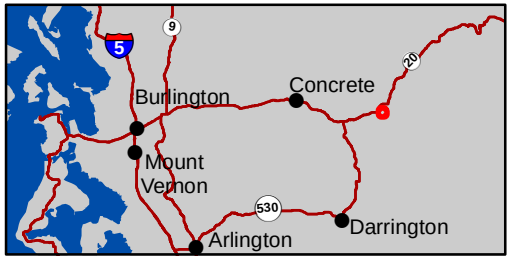

- Proposed Culvert
- Watercourses
- Talus
- Snags
- balds
- Project Boundary

Proposed Quarry Activies

- Armor Stone Stockpiling and Crushing
- Access/Scale Roads
- Explosives Storage Exclusion Area
- Undersized Stockpile Area
- Misc. Structures Footprint
- Quarry Footprint
- Soil Stockpile
- Stormwater Facilities
- Proposed Access Road

Miles
0 0.05 0.1 0.2

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FIGURE 2

Proposed Project within Action Area showing Critical Areas and Priority Habitats

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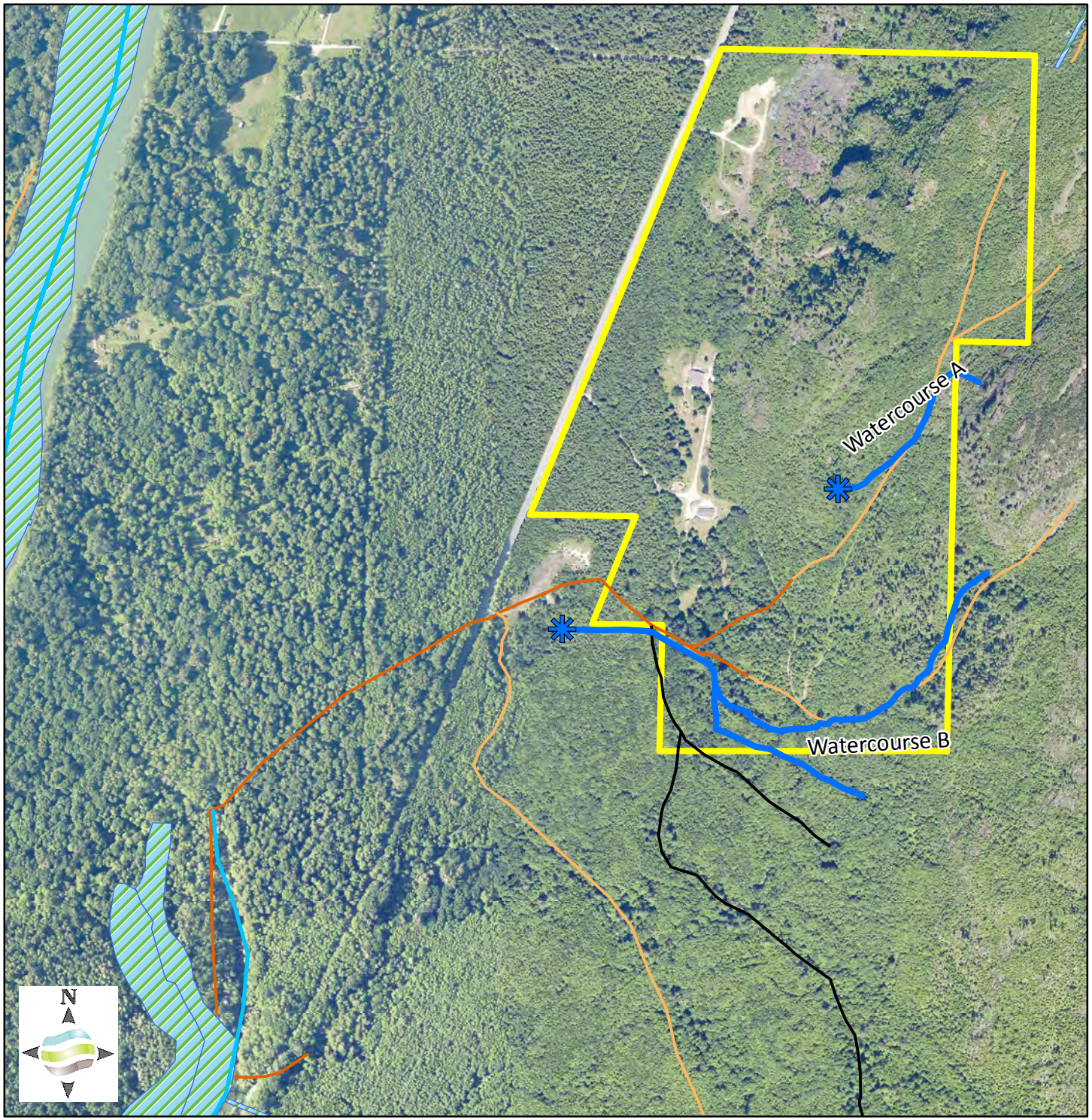

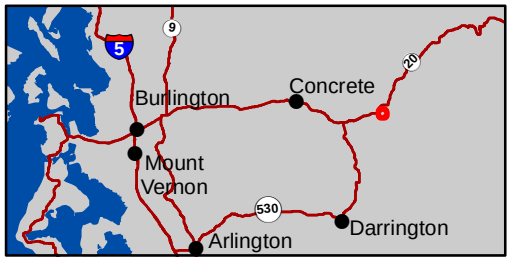

Project Boundary

Infiltration Ares

Feild-verified Watercourses

WDFW Fish Bearing Streams Data

USFWS NWI Wetland Data

DNR Stream Type Data

Fishbearing

Non-Fishbearing

Shoreline

Untyped

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FIGURE 3

Vicinity streams and wetlands
as mapped by WDFW, DNR, or USFWS

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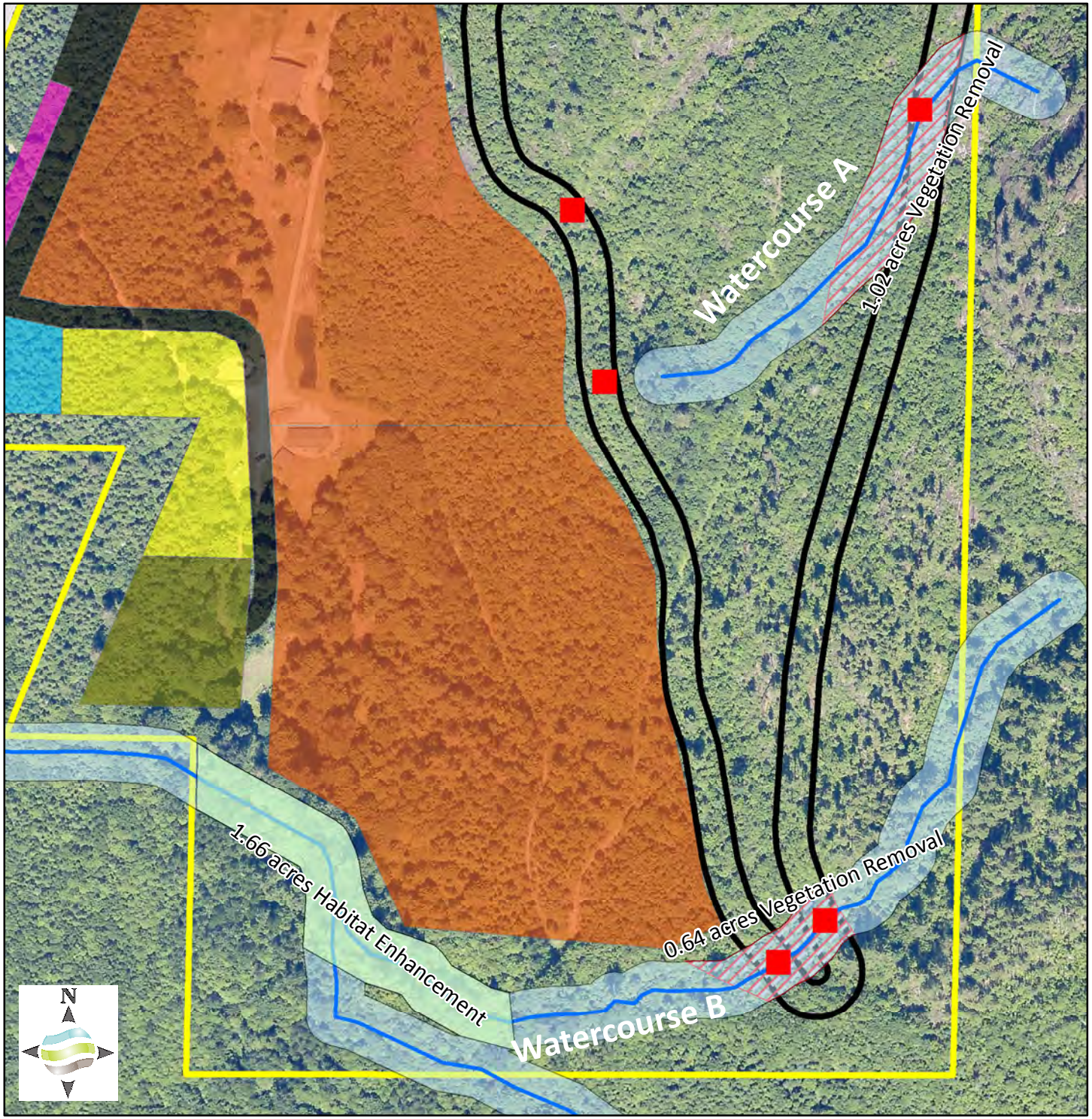

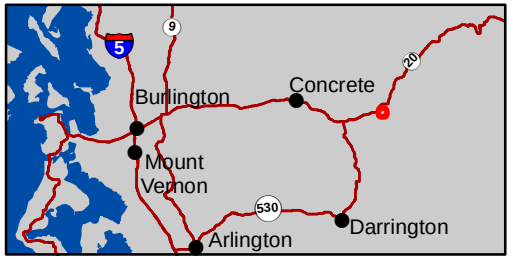

Project Boundary
Watercourses
Recommended 50-foot Protective Buffer
Impacts
Phase I Stream Mitigation Areas
Recommended 50-foot Protective Buffer

Proposed Quarry Activies

Armor Stone Stockpiling and Crushing
Access/Scale Roads
Explosives Storage Exclusion Area
Undersized Stockpile Area
Misc. Structures Footprint
Quarry Footprint
Soil Stockpile
Stormwater Facilities
Proposed Access Road
Proposed Culvert

Miles
0 0.025 0.05 0.1

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FIGURE 4

Proposed Project showing Impacts to Skagit County Critical Areas and Enhancement Areas

Date: 2/6/2019

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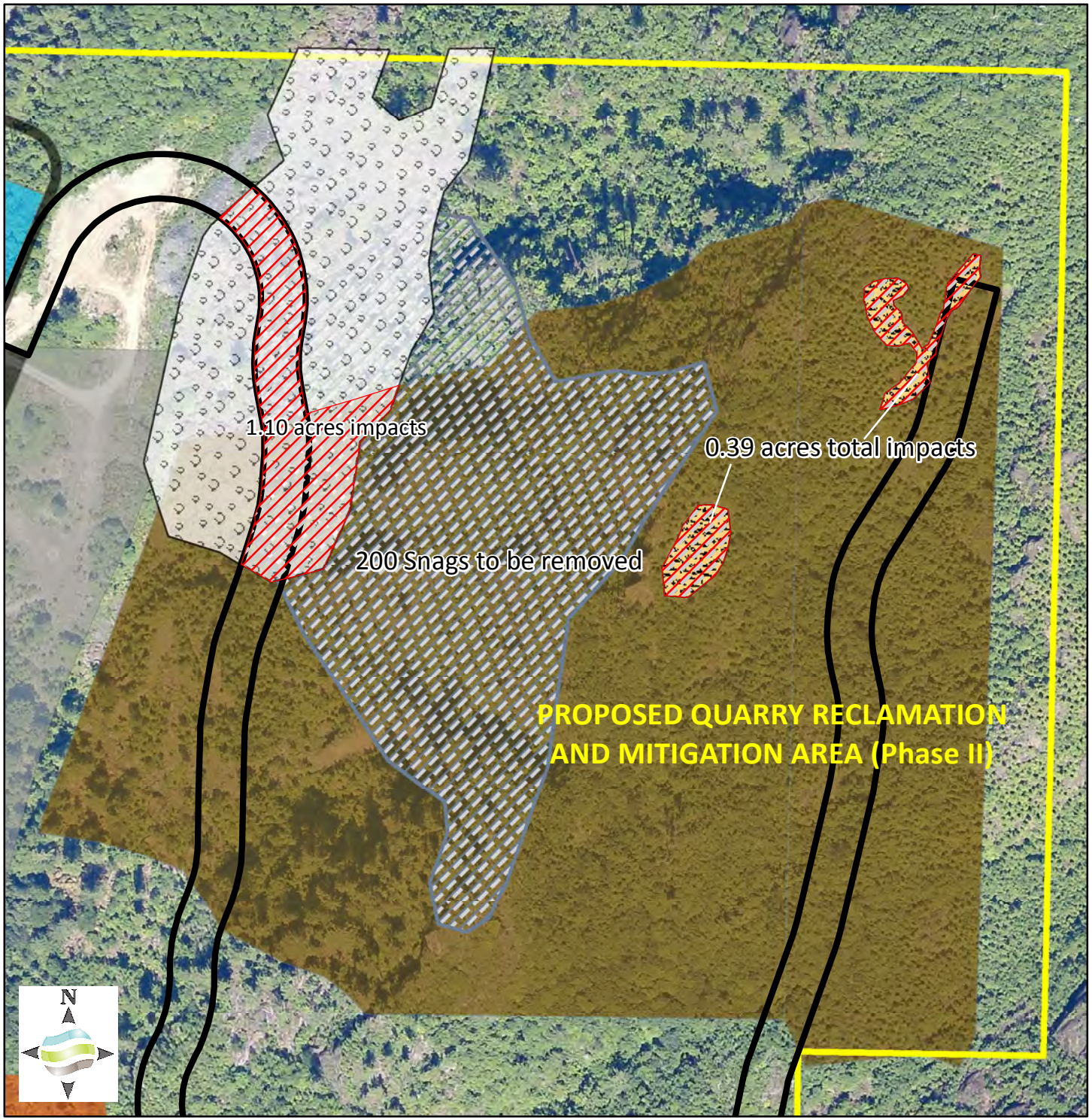

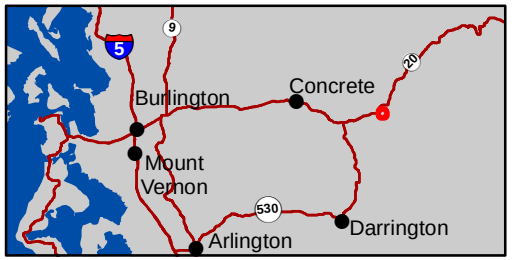

- Project Boundary
- Impacts
- Talus
- Snags Area
- balds

Proposed Quarry Activies

- Armor Stone Stockpiling and Crushing
- Access/Scale Roads
- Explosives Storage Exclusion Area
- Undersized Stockpile Area
- Misc. Structures Footprint
- Quarry Footprint
- Soil Stockpile
- Stormwater Facilities
- Proposed Access Road

Miles
0 0.02 0.04 0.08

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FIGURE 5

Proposed Project showing impacts to Priority Habitats and Enhancement Areas

Date: 2/6/2019

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Appendix A - Site Planning Documents

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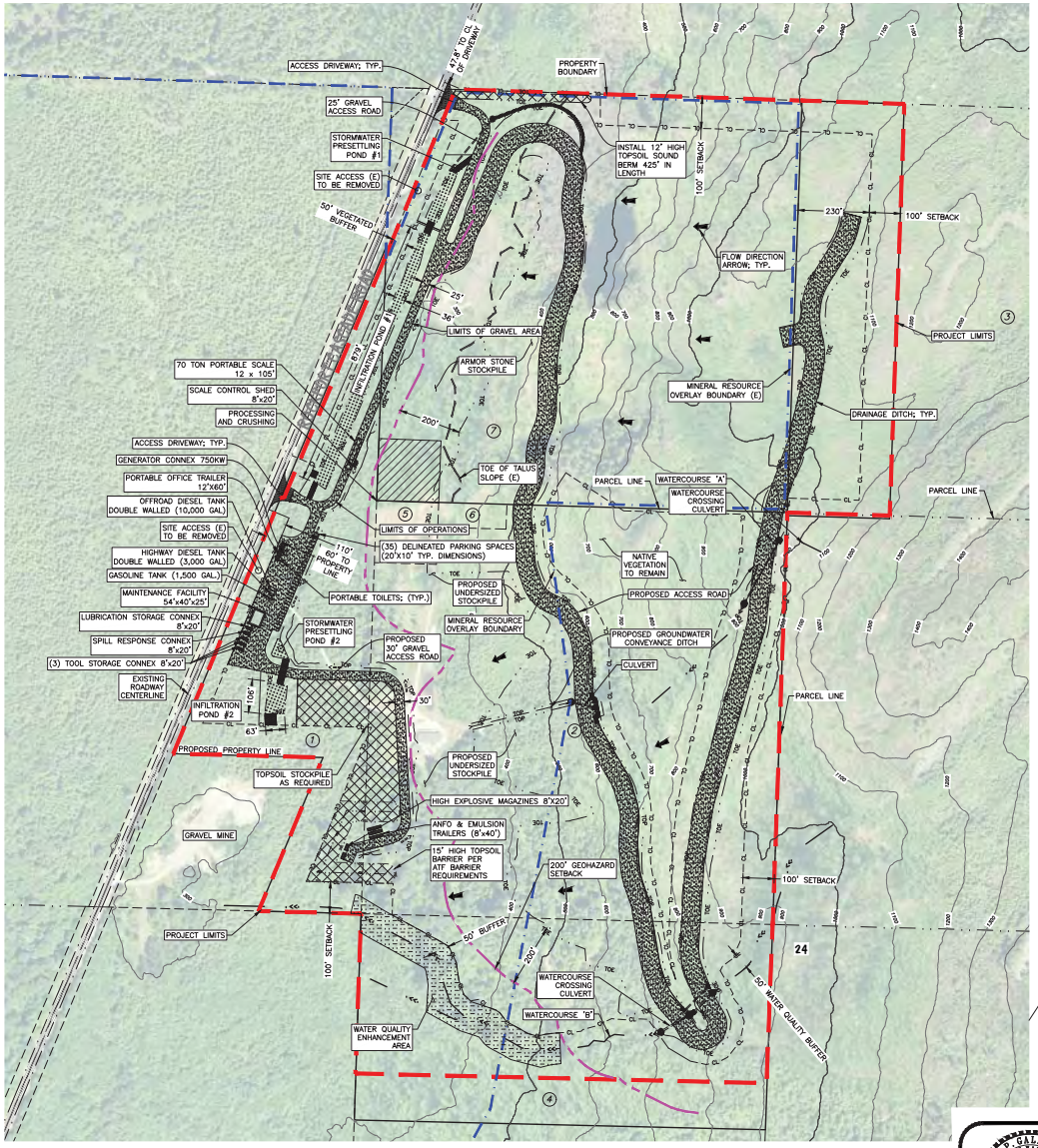
GRAPHIC SCALE
(as survey feet)
0 200
200 100 400
1 inch = 200 feet

SCALE SHEET ACCORDINGLY IF REPRODUCED AT SMALLER SCALE



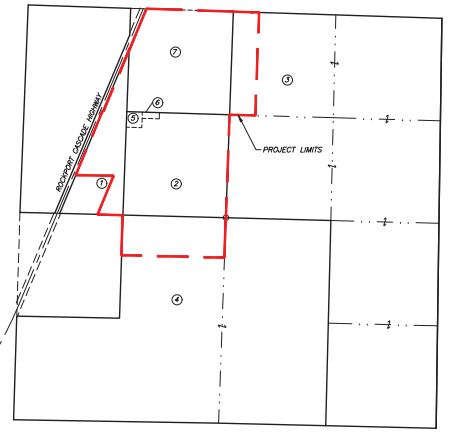
EXISTING LEGEND

- = EXISTING WATER WELL
- = SECTION BOUNDARY
- = SUBJECT PROPERTY BOUNDARY
- = OFFSITE PROPERTY BOUNDARY
- = OFFSITE RIGHT OF WAY MARGIN
- = EXISTING EASEMENT AREA
- = EXISTING EDGE OF ASPHALT
- = EXISTING EDGE OF DIRT ROAD
- = EXISTING GRADE INDEX CONTOUR
- = EXISTING GRADE INTERVAL CONTOUR
- = FLOWLINE

PROPOSED LEGEND

- = PROPOSED PROPERTY LINE
- = MINING PERMIT BOUNDARY
- = MINERAL RESOURCE OVERLAY
- = 200-FOOT GEOHAZARD SETBACK
- = QUARRY CLEARING LIMITS
- = PROPOSED FINISHED GRADE INDEX CONTOUR
- = PROPOSED FINISHED GRADE INTERVAL CONTOUR
- = PROPOSED DITCH LINE
- = PROPOSED TOP OF SLOPE LINE
- = PROPOSED TOE OF SLOPE LINE
- = PROPOSED ASPHALT APRON
- = PROPOSED GRAVEL AREA
- = PROPOSED TOPSOIL STOCKPILE
- = PROPOSED STORMWATER INFILTRATION POND
- = PROPOSED STREAM MITIGATION AREA

PARCEL MAP TABLE		
PARCEL IDENTIFIER	SKAGIT COUNTY PARCEL NUMBER	OWNERSHIP
1	P45548	KIEWIT INFRASTRUCTURE COMPANY
2	P128574	ASHENFELTER
3	P45541	KIEWIT INFRASTRUCTURE COMPANY
4	P45548	KIEWIT INFRASTRUCTURE COMPANY
5	P45550	ASHENFELTER
6	P120304	ASHENFELTER
7	P45543	CUNNINGHAM FAMILY TRUST



PARCEL MAP

FIELD BOOK	DATA	DRAWN BY	CHECKED BY	SCALE
DESIGN:	BASE			HORIZ:
STAKING:	DESIGN	PD	DC	VERT:
ASBUILT:	XREF:			
	DWG: P:\Pse Project\2017008\DWGs_SHEET\2017008_ecP_RP.dwg			

SURVEY REFERENCE | PLAN CHECK

REV	DATE	REVISION DESCRIPTION	BY

REVISIONS

No.	ISSUE DESCRIPTION	DATE
1	PROJECT MEETING	NOV. 14, 2018
2	PRE-APP SUBMITTAL	NOV. 21, 2018
3	GRADING PERMIT SUBMITTAL	JAN. 15, 2019

ISSUE

KIEWIT INFRASTRUCTURE CO.
2200 COLUMBIA HOUSE BLVD.
VANCOUVER, WASHINGTON 98661
360.693.1478

APPLICANT

DAVID GALBRAITH PACIFIC SURVEY & ENGINEERING 44679 REGISTERED PROFESSIONAL ENGINEER
1-15-2019

MARBLEMOUNT QUARRY
MARBLEMOUNT, WASHINGTON
GRADING PERMIT PLANS

OVERALL SITE PLAN

JOB No. 2017008
SHEET 03 OF 24

Appendix B – USFWS ESA-listed Species Report

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Washington Fish And Wildlife Office
510 Desmond Drive Se, Suite 102
Lacey, WA 98503-1263
Phone: (360) 753-9440 Fax: (360) 753-9405
http://www.fws.gov/wafwo/

In Reply Refer To:
Consultation Code: 01EWFW00-2019-SLI-0281
Event Code: 01EWFW00-2019-E-00605
Project Name: Marblemount Quarry

December 12, 2018

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, and proposed species, designated and proposed critical habitat, and candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. The species list is currently compiled at the county level. Additional information is available from the Washington Department of Fish and Wildlife, Priority Habitats and Species website: http://wdfw.wa.gov/mapping/phs/ or at our office website: http://www.fws.gov/wafwo/species_new.html. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether or not the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species, and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:
http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.). You may visit our website at http://www.fws.gov/pacific/eagle/for information on disturbance or take of the species and information on how to get a permit and what current guidelines and regulations are. Some projects affecting these species may require development of an eagle conservation plan: (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Also be aware that all marine mammals are protected under the Marine Mammal Protection Act (MMPA). The MMPA prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas. The importation of marine mammals and marine mammal products into the U.S. is also prohibited. More information can be found on the MMPA website: http://www.nmfs.noaa.gov/pr/laws/mmpa/.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Related website:
National Marine Fisheries Service: http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Washington Fish And Wildlife Office
510 Desmond Drive Se, Suite 102
Lacey, WA 98503-1263
(360) 753-9440

Project Summary

Consultation Code: 01EWFW00-2019-SLI-0281

Event Code: 01EWFW00-2019-E-00605

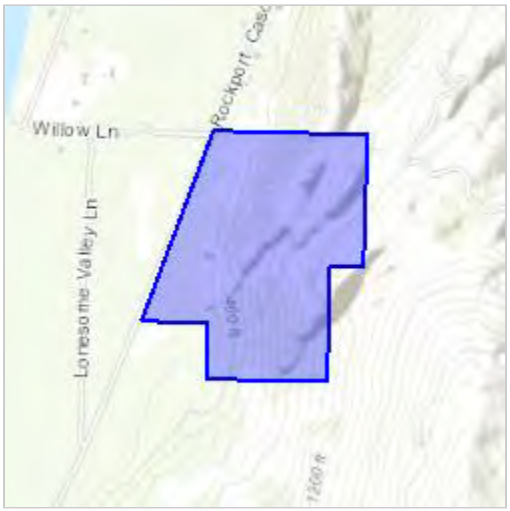
Project Name: Marblemount Quarry

Project Type: MINING

Project Description: 130-acre Rock Quarry to be operated by the Kiewit Corporation

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/48.508245877499725N121.45194462937823W



Counties: Skagit, WA

Endangered Species Act Species

There is a total of 8 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Gray Wolf *Canis lupus* Population: U.S.A.: All of AL, AR, CA, CO, CT, DE, FL, GA, IA, IN, IL, KS, KY, LA, MA, MD, ME, MI, MO, MS, NC, ND, NE, NH, NJ, NV, NY, OH, OK, PA, RI, SC, SD, TN, TX, VA, VT, WI, and WV; and portions of AZ, NM, OR, UT, and WA. Mexico. There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/4488	Endangered
Grizzly Bear *Ursus arctos horribilis* Population: U.S.A., conterminous (lower 48) States, except where listed as an experimental population There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/7642	Threatened
North American Wolverine *Gulo gulo luscus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5123	Proposed Threatened

Birds

NAME	STATUS
Marbled Murrelet *Brachyramphus marmoratus* Population: U.S.A. (CA, OR, WA) There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/4467	Threatened
Northern Spotted Owl *Strix occidentalis caurina* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1123	Threatened
Yellow-billed Cuckoo *Coccyzus americanus* Population: Western U.S. DPS There is **proposed** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3911	Threatened

Fishes

NAME	STATUS
Bull Trout *Salvelinus confluentus* Population: U.S.A., conterminous, lower 48 states There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8212	Threatened
Dolly Varden *Salvelinus malma* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1008	Proposed Similarity of Appearance (Threatened)

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

Appendix C - WDFW PHS Report

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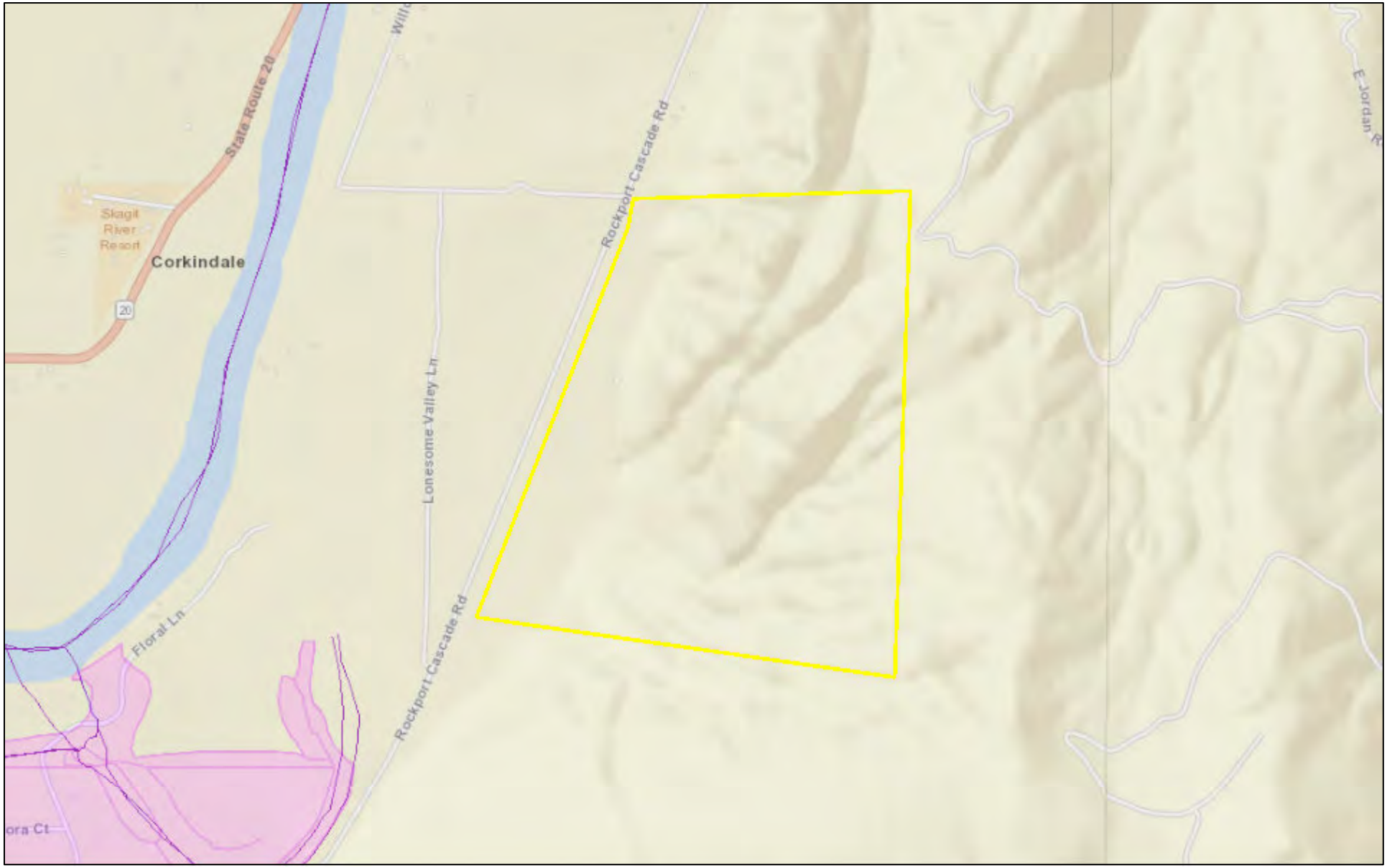
WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
PRIORITY HABITATS AND SPECIES REPORT

SOURCE DATASET: PHSPlusPublic Query ID: P181212162531
REPORT DATE: 12/12/2018 4.25

Common Name / Scientific Name / Notes	Site Name / Source Dataset / Source Record / Source Date	Priority Area / Occurrence Type / More Information (URL) / Mgmt Recommendations	Accuracy	Federal Status / State Status / PHS Listing Status	Sensitive Data / Resolution	Source Entity / Geometry Type
Gray wolf Canis lupus	WS_OccurPoint 57559 May 01, 1988	Occurrence Biotic detection N/A	1/4 mile (Quarter	Endangered Endangered PHS LISTED	Y TOWNSHIP	WA Dept. of Fish and Wildlife Points
Northern Spotted Owl Strix occidentalis	WS_OwlStatus_Buf	Management Buffer Management buffer http://wdfw.wa.gov/publications/pub.php?	NA	Threatened Endangered PHS Listed	Y TOWNSHIP	WA Dept. of Fish and Wildlife Polygons

WDFW Test Map



December 12, 2018

PHS Report Clip Area

PT

LN

POLY

AS MAPPED

SECTION

QTR-TWP

TOWNSHIP

1:19,842

0 0.15 0.3 0.6 mi

0 0.275 0.55 1.1 km

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand),

Appendix D – Marbled Murrelet and Northern Spotted Owl Habitat Assessment

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909 Squalicum Way, Suite 111, Bellingham WA 98225
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December 7, 2018

Paul Pittman
Element Solutions
Bellingham, WA 98225
360-671-9172

RE: Marbled Murrelet and Northern Spotted Owl Habitat Assessment for the Marblemount Quarry Project

On November 21st, 2018, Hamer Environmental was contracted by Element Solutions to conduct a Marbled Murrelet and Northern Spotted Owl Habitat Assessment for the Marblemount Quarry project that is on privately-owned land near the town of Marblemount in Skagit County, Washington. The project area is located along Rockport Cascade Road in Township 35N, Range 10E, Section 24 and is ~125 acres in size. A map of the survey area is provided in Figure 1. Much of the project area was burned in the Jordan Creek Fire in 1998.

Habitat Assessment Results

Marbled Murrelet

A complete Marbled Murrelet Habitat Assessment was conducted by Matt Reed and Erin Colclazier of Hamer Environmental on November 29th, 2018. The Habitat Assessment was conducted according to the guidelines set forth in the Washington State Forest Practice Rules (WAC 222-12-090(15)) for private landowners, which includes identifying and locating potential nesting platforms found in conifer trees that are at least 32 inches in diameter at breast-height (DBH). The project area is private and does not contain any state or federally-owned lands (Figure 1). The project area is not within a Marbled Murrelet Detection Zone.

In total, 4 coniferous trees were identified as containing potential Marbled Murrelet nesting platforms (Figure 2). The total potential platform count for these trees was 11 platforms, which were made up of a mixture of large branch, mossy branch, and split-top platforms. These trees were located in the southwest corner of the project area in a small area of Sub-Mature/Young Forest mixed timber. This area does not contain enough live mature coniferous trees to meet the minimum standards to be considered suitable Marbled Murrelet habitat. Washington State Forest Practice Rules, suitable Marbled Murrelet habitat must be at least 7 acres in size and contain a minimum of 7 platforms per acre.

A few older remnant coniferous trees are also found in an inaccessible area highlighted in Figure 2. This area is located in a large boulder field at the base of a cliff in the northcentral part of the project area, which was burned during the Jordan Creek Fire in 1998. This area mostly contains snags of mature trees that were burned in the fire, though a few of these mature trees appear to still be alive (Figures 3 and 4). This area was visually assessed from above and below and does not contain enough live mature coniferous trees to meet the

minimum standards to be considered suitable Marbled Murrelet habitat. According to the Washington State Forest Practice Rules, suitable Marbled Murrelet habitat must be at least 7 acres in size and contain a minimum of 7 platforms per acre.

Northern Spotted Owl

A complete Northern Spotted Owl Habitat Assessment was conducted by Matt Reed and Erin Colclazier of Hamer Environmental on November 29th, 2018. The Habitat Assessment for Northern Spotted Owls was conducted according to the guidelines set forth in the Washington State Forest Practice Rules (WAC 222-16-085) for private landowners. Suitable habitat for Northern Spotted Owls includes old-growth habitat, sub-mature habitat, and young forest marginal habitat whose characteristics meet the minimum characteristics needed for Northern Spotted Owl for roosting, foraging, and dispersal. The project area is private and does not contain any state or federally-owned lands (Figure 1). The project area falls within the Finney SOSEA for Northern Spotted Owls in a Section managed for Dispersal Support.

While certain aspects of Northern Spotted Owl habitat are present in the project area, the site did not meet the minimum guidelines set forth in the Washington State Forest Practice Rules (WAC 222-16-085) for private landowners to be considered suitable roosting, foraging, and/or dispersal habitat, nor does it meet the minimum standards to be considered suitable dispersal support habitat within a SOSEA. Most of the project area (103.07 acres or 82.3% of the project area) is comprised of some components of Young Forest Marginal habitat for Northern Spotted Owls (Figure 2), which includes a forest made up of greater than 30% coniferous trees and more than 115 trees per acre > 4 inches DBH. Tree heights in this varied from 40 feet to 90ft, depending on whether or not the timber burned during the wildfire of 1998. The habitat type lacked key components to be considered suitable Young Forest Marginal habitat for Northern Spotted Owls, as this area did not contain any snags > 20 inches DBH and 16 feet in height and canopy closure averaged less than 60%.

A small portion of the project area (7.37 acres or 5.9% of the project area) is comprised of some components of Sub-Mature habitat for Northern Spotted Owls (Figure 2), which includes a forest made up of greater than 30% coniferous trees and more than 115 trees per acre > 4 inches DBH with dominant trees > 85 feet in height and a canopy closure > 70%. The key component for this habitat type that was not present in this area was the snag/cavity trees, as no large snags > 20 inches DBH and 16 feet in height were present. A minimum of 3 snags/cavity trees > 20 inches DBH and 16 feet in height are required for this area to be considered suitable Sub-Mature habitat for Northern Spotted Owls.

The remaining forest habitat present in the project area (11.8 acres or 11.8% of the project area) was found in an area inaccessible to our biologists due to being in a large boulder field and at the base of a cliff (Figure 2).. This area was burned during the Jordan Creek Fire in 1998. This area mostly contains snags of mature trees that were burned in the fire, though a few of these mature coniferous trees appear to still be alive (Figures 3 and 4). This area was visually assessed from above and below and does not contain enough live mature coniferous

trees to meet the minimum standards to be considered suitable Old Forest habitat for Northern Spotted Owls.

Lastly, the project area did not meet the minimum guidelines to be considered suitable dispersal habitat for Northern Spotted Owls in western Washington. To be considered suitable dispersal habitat, the forest structure must offer dispersing owls cover and protection from the weather and predators, roosting opportunities, and clear space below the forest canopy for flying. Most of the project area is comprised of a Young Forest structure, which lacks clear flight space for dispersing owls. The small area of Sub-Mature forest lacked the minimum 130 trees per acres > 10 inches DBH or a basal area of 100 square feet of 10-inch DBH or larger trees and the required flight space for dispersing owls. The inaccessible forested area located in a large boulder field at the base of a cliff in the northcentral part of the project area containing mostly snags and a few remnant larger conifers does not contain enough live trees to provide 70% canopy cover or the minimum number of trees per acre to be considered suitable for dispersing owls.

Miscellaneous Wildlife Notes

A recently active Osprey nest was seen during the onsite habitat assessment (Figure 5). This nest was located a few hundred feet beyond the northern boundary line of the project area and is in a broken top of a large coniferous tree snag. No Ospreys were observed during the field assessment, but the nest structure and condition seemed to indicate the nest was used in 2018.

Please contact Hamer Environmental if you have any questions about this assessment at (360) 899-5156 and matt@hamerenvironmental.com.

Sincerely,

Matt Reed

Matt Reed

Appendix E – Creating Snags from Live Trees, WDFW

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Creating Snags from Live Trees

Any snag you provide for wildlife will likely be used. You can even create one from a live tree. Branches or trunk you remove can be added to a brush shelter. Remember, a tree can provide habitat even when just part of it dies. For instance, if a large conifer has a fork in it, you can girdle one of the forks creating an excellent perch. If the trunk of this tree is large enough in diameter, a future cavity may develop at the perch limb dies. In addition, if the tree is not dying after the side branches and top have been removed; some individual side branches can be girdled to create perches help the tree decline.

Always hire an expert tree service to remove branches and tops of large trees. Make sure that whoever does the work is licensed, bonded, and insured, and understands your intention to make a wildlife tree. Many certified arborists with the International Society of Arboriculture specialize in wildlife tree creation and maintenance. Check with your local chapter.

There are several methods for creating snags:

- Remove the top third of the tree and half the remaining side-branches.
- Leave the top the way it is and remove a majority of the tree's side-branches.
- Leave the top and sides as they are and girdle the trunk.
- Girdle the branches.

Creating a Cavity in a Live Tree

Gradual Technique

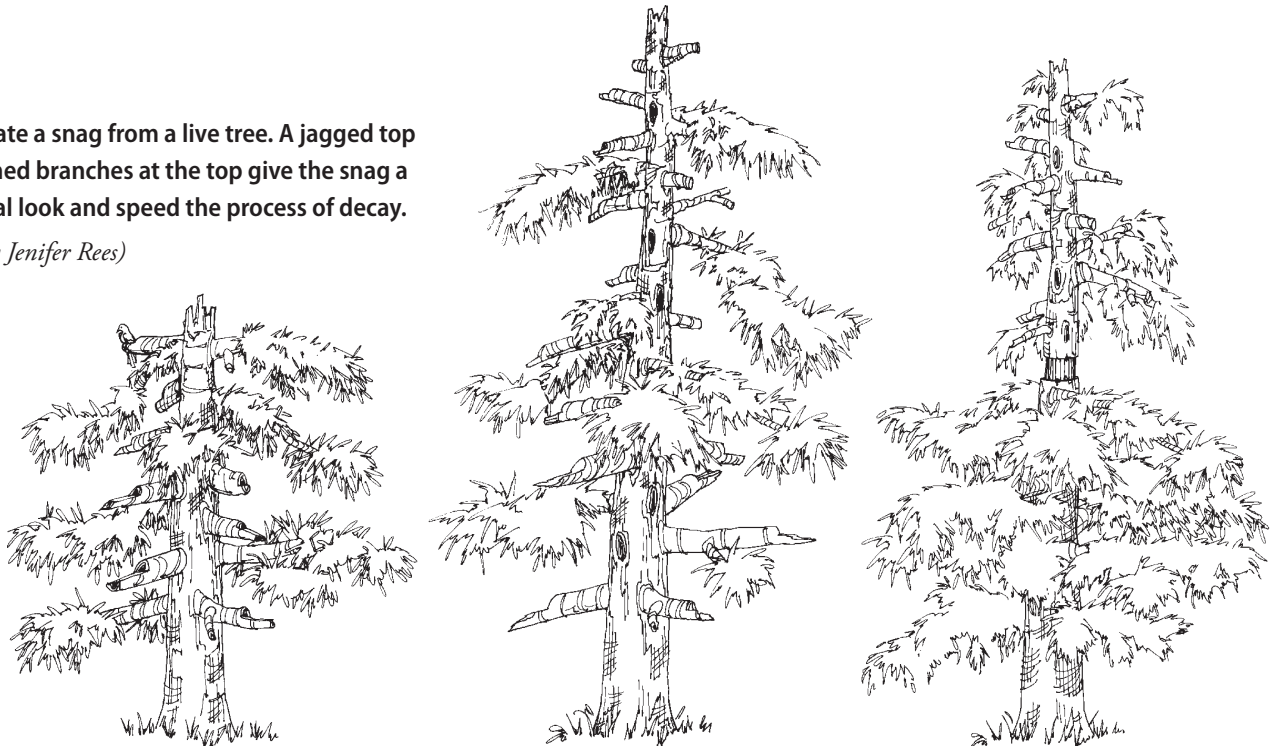
Drill a 1" diameter hole at a ten-degree angle downwards into the heartwood of the tree anywhere water might collect, such as below a crotch of a branch, starting the cavity making process. The illustration shows the drill going up

Remove a large (4" or larger) limb and leave the jagged, broken stub allowing for invasion by bacteria, fungi, and insects. Most diseases attack the dead heartwood and the outer layer can continues its growth around the rotten core; the rest of the tree can continue to grow for many years.

Rapid Technique

Cut a cavity in the trunk using a small chain saw, drill, or chisel. Next, cover the cutout with a piece of wood or sheet metal with the species-appropriate size entry hole drilled into it. Whether this kills a tree depends on the size of the cavity in relation to the size of the tree.

To prevent aggressive, non-native European starlings and house sparrows from nesting in a snag, create or reduce the size of an existing hole to 1 1/8 inches using leather, wood, or metal covers.



Ways to create a snag from a live tree. A jagged top and shortened branches at the top give the snag a more natural look and speed the process of decay.

(Drawing by Jenifer Rees)

Remove the top third of the tree and half the remaining side branches. This method ensures that the tree begins the preferred inside-out decay process, premium sites for cavity-nesting birds. Leave some shortened branches at the top for perches and make the snag look natural by creating a jagged top. A jagged top also provides an avenue for fungi infection and other rot-causing organisms. Water and bird feces will collect and speed decay. Sow bugs, earwigs, and other invertebrates will find their way in and assist in the decay process.

Leave the top intact and remove about 3/4 of the tree's side-branches. Douglas fir, hemlock, and pine respond well to this technique. Western red cedar is a tough conifer to kill in this way, but it makes an excellent snag because it is extremely wind-resistant and long-lasting. Keep branch ends jagged and more susceptible to microorganisms and fungi, and more natural looking.

Leave the top and sides as they are and girdle the trunk. Least preferred method. Girdling creates a dead but intact top, providing a taller snag, but leaves it more susceptible to breaking at the wound site. Girdling tends to cause a tree to rot from the outside in, instead of the preferred inside-out. As a result, by the time the rot has progressed far enough for woodpeckers to excavate a cavity, the tree has become fragile and may easily fall in a windstorm. Furthermore, a cavity in a girdled tree may not be safe because the hole is likely to be shallow, which exposes young to weather and predators.

To girdle a tree, remove a four-inch belt of inner and outer bark around the trunk which stops the movement of water and nutrients. If girdling is done at breast height and the tree falls, this leaves very little remaining snag habitat. Therefore, try to make the girdling cut as high up as possible. Big-leaf maple, aspen, and poplar may send up sprouts, which can be removed or left to grow around the tree as temporary cover. Some tree species, alder for example, are difficult to kill even when properly girdled. A tree girdled in winter may not show signs of decline until well into spring, after it has used its stored energy.

Roosting Slits

Roosting slits for bats and some songbirds, including brown creepers, may be added to created snags that are tall enough and wide enough in diameter to accommodate the cuts. The slits should be at least eight inches deep, one or more inches wide, and angled sharply upward. Bats need to fly up into the slits so the slits should be located in an area free of branches. The higher up the snag they are, the more likely these roosting slits will be used. Some sun exposure warms these roosts and makes them more attractive in winter.

Brown creeper on a snag with visible roosting slits.

Relocating Snags

It is possible to install a small snag on your property obtained from somewhere else, such as those salvaged from a construction or logging site. Be sure to get permission from the landowner. Snag relocation is difficult, dangerous and usually requires professional help and special equipment. A dead tree is generally much heavier and more fragile than it looks weighing several hundred or even thousands of pounds. Remember, if you double the diameter of a cylinder, you quadruple the weight. An old snag, too rotten to support its own weight, is best used as a log.

Relocate the snag to a place where it will remain upright and secure. If you are moving it within your property, try to install it as close as possible to its original location minimizing disturbance to wildlife that have been using it. Locate the snag in a wind-protected area near live trees and shrubs.

"Planting" a large snag.

Before setting the snag, cut its base flat so the snag will stand straight. Then do any of the following:

- Place it in a hole approximately one-third the height of the snag and firmly tamp soil, gravel, or pour a concrete footing around it.
- Lower a firm, hollow snag over a metal or wooden post that's been securely placed in the ground.
- Wire the snag to a sturdy post.

Hazard Tree and Snag Management

If not managed properly, snags can pose a risk to people and structures. If a dead or dying tree threatens something that can be moved, such as a swing set or patio furniture, consider moving those items before cutting the tree down. An alternative to eliminating the entire tree is to remove only the dangerous section(s). Consulting with a certified arborist with experience in wildlife snags is recommended. These professionals can determine what part of a tree is a hazard and provide management options to reduce or eliminate any risk. Remaining parts can be removed over time. Often, once the unsafe limbs or portions of the trunk have been removed, the tree is safe.

When a tree must be cut down, maximize its habitat value by placing as much of the debris as possible near the area where the tree was removed. In hot, dry areas, move the material into the shade of nearby trees or large shrubs. Bringing branches in contact with the ground will cause them to rot faster. Place a nest box on your site as replacement for cavities lost through tree or limb removal.

Wood duck ducklings plunging from their nest cavity in a tree. This is normal behavior for wood ducks when leaving the nest cavity which can be anywhere between 6 to 15 feet above ground and almost always above water into which they fall.

Photo Credit: Mike Lentz Images

References

Bull, E.L., C.G. Parks, T. R. Torgersen. 1998. *Trees and Logs Important to Wildlife in the Interior Columbia River Basin.* Diane Pub. 55 pgs.

Gilles, B.K. 2004. *Tree cutting and pruning to benefit urban wildlife.* Proceedings 4th International Urban Wildlife Symposium, Shaw et al., Eds. Pgs 325-329. http://ag.arizona.edu/pubs/adjunct/snr0704/snr07043l.pdf.

Link, R.E. 1999. *Landscaping for Wildlife in the Pacific Northwest.* Washington Department of Fish and Wildlife, University of Washington Press. 320 pp.

MacKenzie, Martin, T.T. Dunlap, B.J. Spears, and J.G O'Brien. 2003. Ch 5. *Correction of Hazardous Defects in Trees.* See Pp 143-159. *In Urban Tree Risk Management: A Community Guide to Program Design and Immplementation.* J.D Pokorny, Ed. USDA Forest Service, Northeastern Section. St. Paul MN. See: http://www.na.fs.fed.us/urban/index.shtm.

Rohila, C.M. 2002. *Landscape and Local Effects on Snags and Cavity-Nesting Birds in an Urbanizing Landscape.* Thesis, University of Washington College of Forest Resources, Seattle, WA.

Web Sites and Documents

Bottorff, J. *Snags, coarse woody debris, and wildlife.* Snohomish Co. Extension Service, Washington State University. http://snohomish.wsu.edu/forestry/documents/SNAGS.pdf

Fletcher Wildlife Gardens. *Wildlife Trees.* http://www.ofnc.ca/fletcher/howto/htsnags.php

Lewis, J.C. and J.M. Azerrad. 2003. *Priority Species Management Recommendations: Pileated Woodpecker; Black-backed woodpecker; Lewis' woodpecker; Flammulated owl; Cavity nesting ducks.* Washington Department of Fish and Wildlife;. http://wdfw.wa.gov/conservation/phs/mgmt_recommendations/ Click Volume IV: Birds; See Pileated Woodpecker.

Maser, Chris, Andrew Claridge, and James M. Trappe. 2007. *Trees, Truffles, and Beasts: How Forests Function.* Rutgers University Press

National Wildlife Federation. *Attracting Wildlife with Dead Trees*. http://www.nwf.org/Get-Outside/Outdoor-Activities/Garden-for-Wildlife/Gardening-Tips/Attracting-Wildlife-With-Dead-Trees.aspx

Pederson, Richard J. 1991. *Managing Small Woodlands for Cavity Nesting Birds.* USDA Forest Service, Pacific NW Region. 6 pages. http://www.woodlandfishandwildlife.org/.

Shay, Ron. 1997, revised 2007. *Cavity Nesting Ducks.* U.S. Fish and Wildlife Service. 8 pages. http://www.woodlandfishandwildlife.org/publications.htm/.

Snags, Cavity Trees, and Downed Logs. Oklahoma Cooperative Extension Service. http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-5202/Snags%20L-270.pdf.

US Forest Service. 1988. *From the Forest to the Sea: The Story of Fallen Trees.* PNWGTR229, Pacific Northwest Research Station, US Dept. of Agriculture, Portland, OR. http://www.fs.fed.us/pnw/pubs/gtr229.

Washington Department of Fish and Wildlife. Backyard Wildlife Sanctuary Program. http://wdfw.wa.gov/wlm/backyard/. Note – in particular, see the link for "Nest Boxes for Birds" section for cavity diameter and related habitat specifics.

Organizations

International Society of Arboriculture, Pacific Northwest Chapter. (503) 874-8263. http://www.pnwisa.org/

Plant Amnesty. (206) 783-9813. http://www.plantamnesty.org/home/index.aspx

Published by the Washington Department of Fish and Wildlife, 2011. 600 Capitol Way North, Olympia, WA 98501. Website: http://www.wa.gov/

Phil Anderson, Director, Washington Department of Fish and Wildlife. Miranda Wecker, Chair, Washington Fish and Wildlife Commission.

Appendix F – Conservation Signage Recommendations (Whatcom County)

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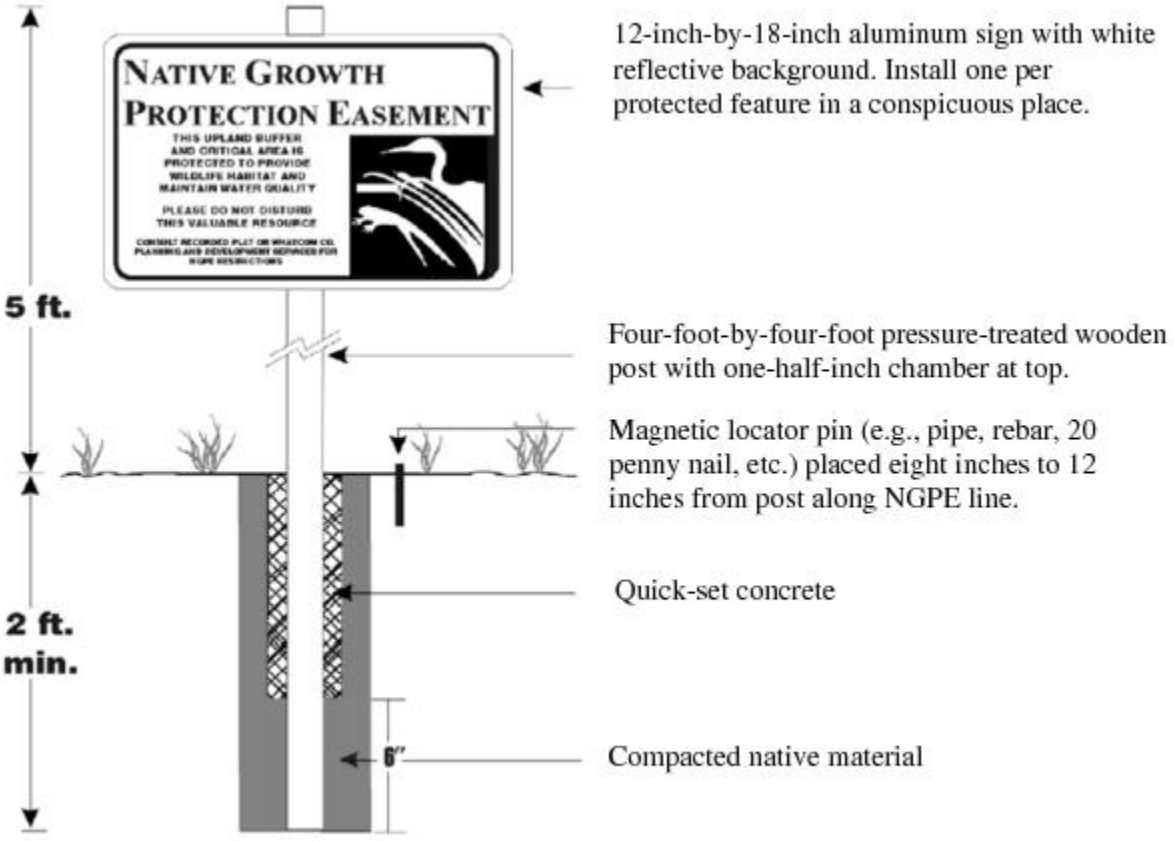
16.16. Appendix C

NATIVE GROWTH PROTECTION EASEMENT SIGN INSTALLATION GUIDELINES

TYPE 1 SIGN



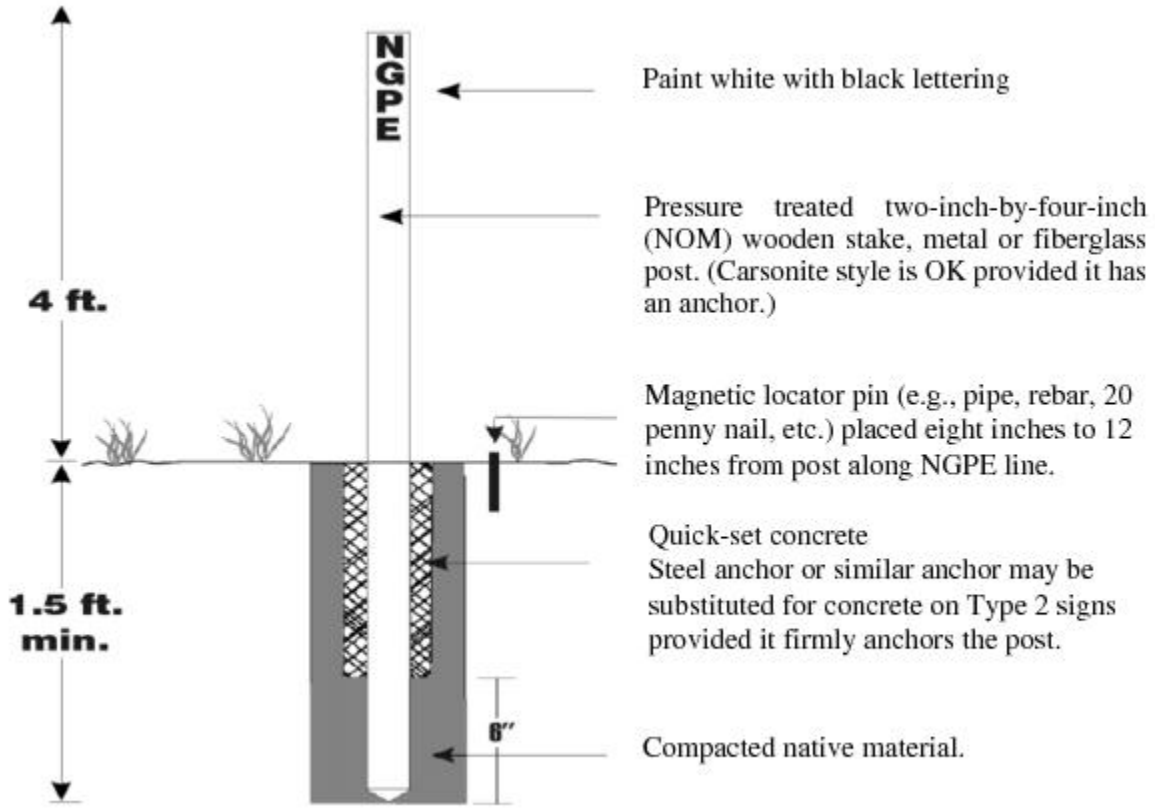
NOTES:

1) NGPE signs shall be placed no greater than 200 feet apart around the perimeter of the NGPE. Minimum placement shall include one Type 1 sign per wetland, and at least one Type 1 sign shall be placed in any lot that borders the NGPE unless otherwise approved by the technical administrator.

2) Sign placement shall be subject to the approval of Whatcom County. Alternative sign designs may be submitted to Whatcom County for approval.

3) All signs must be secure and permanent. Type 2 signs may be used in conjunction with Type 1 signs at the discretion of the Whatcom County technical administrator.

TYPE 2 SIGN



NOTES:

1) NGPE signs shall be placed no greater than 200 feet apart around the perimeter of the native growth protection easement. Minimum placement shall include one Type 1 sign per wetland, and at least one Type 1 sign shall be placed in any lot that borders the native growth protection easement unless otherwise approved by the county critical areas specialist.

2) Sign placement shall be subject to the approval of Whatcom County. Alternative sign designs may be submitted to Whatcom County for approval.

(Ord. 2009-013 § 2 (Exh. 2); Ord. 2005-068 § 1).

Appendix G – Control Options for Himalayan Blackberry (Whatcom County)

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Control Options for Himalayan Blackberry

General Information

Himalayan blackberry is a robust, sprawling, weak-stemmed shrub. The stems, called canes, can grow 20-40 feet long. The canes can take root at the tip, when they hit the ground, further expanding the infestation. Canes start producing berries in their second year. Individual canes may live only 2 to 3 years, with new stalks sprouting from the root crown. Himalayan blackberry has white to light pink flowers, which produce a large, juicy, blackberry. Himalayan blackberry can be evergreen, depending on the site.

Manual/Mechanical Techniques

Seedlings or first year plants can be hand pulled, especially in loose, moist soil. Larger plants can also be hand dug. Care should be taken to remove as much of the root as possible, to prevent resprouting. Mowing can be used to control blackberries, but must be repeated throughout the growing season. Cutting and removing canes is a very short-term solution, as more canes will sprout from the root crown. However, these new sprouts could subsequently be treated with herbicide. If canes can only be removed once in a season, the best time is when the plant starts to flower, since much of the root reserves have gone into flowering.

Chemical Recommendations

Himalayan blackberry can be managed using specific herbicides. If herbicides are used during berry production, care should be taken to prevent people from using berries. When using herbicides, always read and follow label directions for rates, spraying conditions, personal protective equipment and grazing intervals. If spraying is the chosen option, spray late in the evening to reduce the direct impact on pollinating insects. Do not spray when it is windy or raining, or when rain is forecast. Do not cut sprayed plants for at least 2 weeks after herbicide application. Herbicides should not be sprayed within 60 feet of water bodies and creeks, without further consultation with the Noxious Weed Board. Remember, it is the herbicide applicators responsibility to apply the product in accordance to the instructions on the label.

Glyphosate (RoundUp®, many other brands) solution at a rate of 1-1.5 % (of a 41% active ingredient product) should be used and applied during fall months to just wet the foliage will get very good control. ***Metsulfuron*** (Escort®, others) can be used effectively in early fall before fall leaf color begins, but may or may not be an appropriate herbicide for your site. Good coverage is critical. This herbicide can affect shrub species also. ***Triclopyr*** (Garlon®, others) is effective and rates vary for foliar treatment from 4 to 8 quarts per acre, depending on application equipment. Spray to wet on actively growing plants in early fall. ***Triclopyr*** can be used in solution mix with ***2,4-D***, or as already prepared in combination (e.g. Crossbow®).

NEVER apply RoundUp® or other herbicides to standing water unless they are distinctly labeled for aquatic use. Ingredients in non-aquatic products may be toxic to fish and other aquatic organisms. Aquatic formulations of herbicides are generally only available to licensed pesticide applicators in Washington State. If the target plants are immediately adjacent to or are in standing water, a state permit may be required in order to treat those plants with an aquatically approved herbicide.

- **Always read and understand the label of the herbicides you choose to use.**
- **More is NOT better when using herbicides, and may actually hinder the ability of the herbicide to injure the target plant if the solution is too strong. This wastes money and effort and puts more product into the environment than is necessary. ALWAYS follow the recommended rates on the label.**
- **With all herbicides, when you apply them is as important as how you apply them.**

The mention of a specific product brand name in this document is not, and should not be construed as an endorsement or as a recommendation for the use of that product. Herbicide information is taken from the WSU Pacific Northwest Weed Management Handbook and King County Noxious Weed Program (Seattle WA).