South Beaver Creek Natural Area

Restoration Project Narrative

Submitted by METRO

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oregonmetro.gov

Metro
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Exhibits

Section I: Application Summary

Proposal	Metro seeks to restore fish and wildlife habitat and protect water quality on its South Beaver Creek Natural Area.
Site Location	South Beaver Creek Natural Area South of SE Stark Street; North of Cochran Road, Troutdale, OR
Subject Parcel	1S3E01 – 300 & 700 (63 +/- acres) 1S3E01 – 400 & 1S3E01CA – 1900 (construction staging and access only)
Permit Approval	Site Development Permit; Floodplain Development Permit
Application Type	Type II
Base Zone	Open Space (OS) – area of restoration work Industrial Park (IP) – construction staging and access only
Overlay Zones	Vegetative Corridor Overlay District; Special Flood Hazard Area
Property Owner and Applicant	Metro Gary Shepherd, Senior Attorney (primary contact) gary.shepherd@oregonmetro.gov Office of Metro Attorney 600 NE Grand Avenue Portland, OR 97232 (503) 797-1600
Design and Engineering:	Cascade Environmental Group 2800 N Lombard St #803 Portland, OR 97217
Biologist/ Resource Scientist	Metro Brian Vaughn, Principal Natural Resource Scientist brian.vaughn@oregonmetro.gov 600 NE Grand Avenue Portland, OR 97232 (503) 797-1919

Section II: Application and Project Description

Metro's South Beaver Creek Natural Area is in the City of Troutdale, Oregon. The property is bordered by Mt. Hood Community College (MHCC) on the west and southeast, SE Cochran Road to the south, SE Stark Street to the north, and S Troutdale Road to the east. *See* Exhibits 1 and 2. The project location is zoned Open Space (OS). Metro acquired the property with regional bond funds for the purpose of protecting and restoring water quality and wildlife habitat.

Through this application, Metro proposes fish and wildlife habitat restoration work within the riparian corridor. Specifically, Metro proposes to construct habitat and restoration improvements including removal of a weir and cistern, stormwater outfall improvements, installation of large wood log structures, and restoration of riparian vegetation. The restoration work will take place within the stream channel located on Metro owned tax map/lots 1S3E01 – 300 and 700. MHCC owned property, 1S3E01 – 400 & 1S3E01CA – 1900, will be used for access and construction staging.

A. Site Development Permit Application

A Site Development Review and Permit is required for the proposed project. Applicant submits the following narrative and exhibits demonstrating compliance with the general Open Space (OS) and site development standards.

B. Floodplain Development Permit Application

A Flood Plain Development permit is required when disturbances are proposed within the FEMA regulatory 100-year floodplain/Special Flood Hazard Area Overlay. Proposed activities are within the FSHA Overlay. Applicant submits the following narrative and exhibits demonstrating compliance with all applicable standards.

C. Vegetation Corridor Overlay District

South Beaver Creek Restoration project is almost entirely within the City of Troutdale's Vegetation Corridor Overlay District. Pursuant to TDC Section 4.312(C)(1) and (3), the project activities are exempt and allowed outright in the Vegetative Overlay District. A significant percentage of the project activities are within the jurisdiction of federal and state agencies. The project is the subject of a Joint State and Federal Permit. *See* Exhibit 6.

D. Project Description

1. General Background/Existing Conditions

Beaver Creek is a low elevation watershed that drains a total area of about 13.5 square miles within the Gresham and Troutdale, in Multnomah County, Oregon. The creek is over 23 miles long and is the lowermost tributary to the Sandy River.

The section of Beaver Creek located within the South Beaver Creek Natural Area provides some of the best potential salmon spawning and rearing habitat in the watershed due its low

gradient, seasonal flows, in-stream habitat conditions, intact riparian corridor, and accessible off-channel refuge habitat. Despite this, the area has been affected by surrounding urban land uses, including increased impervious areas associated with the steady growth of Troutdale and water withdrawals upstream for agricultural uses. These affects have altered stream flows, water temperatures, and aquatic habitat, including reduced wood recruitment and increased turbidity and sedimentation.

An existing concrete weir and instream cistern are in the proposed project area. The weir forms a constriction in the creek and poses a hydraulic and fish passage constraint. The cistern is an artificial feature that can affect stream geomorphic processes. An existing stormwater outfall drains the MHCC parking areas and discharges water to Beaver Creek. The stormwater outfall needs stabilization.

2. Overall Project Goals

The project is intended to increase the quantity and quality of the site's stream, floodplain, and upland habitat to benefit fish, wildlife, and water quality. The proposed work will enhance stream complexity and cover using large wood in the stream channels, improve fish passage to tributary areas and floodplain (in high water events), revegetate exposed areas, and restore hydrologic function to the floodplain. The project will also increase habitat for wildlife and provide suitable in-stream and off-channel habitat for adult and juvenile fishes, in an area where physical habitat quality, including off-channel habitat, has been identified as degraded.

3. Specific Project Activities

The proposed South Beaver Creek Restoration project involves the removal of existing anthropogenic structures and debris, the restoration of in-stream complexity and habitat through placement of large woody debris and vegetation, and bank stabilization of the stormwater outfall.

The project focuses on strategic instream restoration actions described below:

Wier and Cistern Removal: The concrete weir was part of a flash board dam used to create an artificial pond within the creek. It is comprised of ~6" thick concrete walls and a concrete apron that extends out to the edge of the wingwalls. During low-flow periods, the concrete apron creates a fish passage barrier due to low-flow depths. There is also a containment berm along the eastern side of the creek that leads to the weir; both the weir and berm confine the creek in this reach of the Project. The flash boards are no longer used, but the weir and berm both are flow constrictions during high-flow events.

To improve conditions, the concrete weir, apron, and wingwalls will be demolished and all rubble, including some existing concrete rubble currently in the channel, will be removed from Beaver Creek and hauled offsite. After the concrete weir is removed, the creek banks will be graded to match the topography of the surrounding areas and a small notch will be excavated in the earthen berm to allow for high flow events to engage with the surrounding high quality riparian floodplain. The instream concrete cistern is immediately upstream of

the weir. The cistern structure will be demolished and removed. *See* Exhibit 5, Sheet D01 for details on the weir, earthen berm notch and cistern removal.

Helicopter Placed Large Wood Structures: Five different configurations of large wood structures are proposed to be placed in Beaver Creek and its floodplain. The large wood pieces are designed to be self-stabilizing, due to their length relative to bank full width, and will be placed by helicopter using bracing with existing trees where possible. Five configurations are proposed, based on location and conditions of the creek.

The logs will be placed by helicopter. Helicopter placement has been used recently by Metro, in collaboration with the Portland Water Bureau, to install large wood structures near Oxbow Regional Park – successful methods applied at Oxbow Park will be applied for the Project. Helicopter placement allows for rapid project completion, minimal habitat disturbance, a small construction crew, and accurate material placement. It is expected that this means of wood structure placement will provide cost-efficient stream habitat benefits for salmon. The proposed large wood structures are shown in Exhibit 5, detailed on Sheet D04.

Stormwater Outfall Stabilization: The Project stormwater outfall is just upslope, and west of the SE Stark Street Beaver Creek culvert crossing. It drains stormwater runoff to the creek through a steep, incised, and erosive channelized gully. To reduce erosion and sedimentation delivery into Beaver Creek, energy dissipation features will be placed in the channel. The gully side slopes will be laid back and the bottom of the channel graded with benching to provide a stable surface for the placement of angular rock armoring. *See* Exhibit 5, detailed on Sheet D02.

These restoration activities increase habitat and complexity and vary stream velocity, thereby decreasing erosive forces.

Section III: Applicable Review Criteria

Troutdale Development Code

Zoning Districts: Open Space	Section 3.520
Zoning District Overlay: Vegetative Corridor and Slope District (VECO)	Section 4.300
Erosion Control and Water Quality Standards	Section 5.600
Stormwater Management	Section 5.700
Site Development Review	Section 6.900
Development and Design Standards	Section 8.000
Flood Management	Section 14.000

Section IV: Compliance with Applicable Review Criteria

Below, applicant provides the applicable standards in *italics* followed by **findings** of compliance.

3.520 OS | Open Space

A. Purpose. The district is intended to provide and preserve open space areas. In addition to other areas which may be so zoned by the City, this district shall apply to publicly owned parklands.

Findings: The subject property is zoned Open Space (OS). Although not an applicable approval criterion, the purpose of the proposed restoration activities is aligned with and promotes the above OS purpose statement.

The proposed restoration activities are intended to conserve water quality and provide for wildlife and fisheries resources. The overall goals of the project are to restore and enhance aquatic, riparian, and wetland habitats along Beaver Creek; improve stream, wetland, and floodplain functions with the natural area; and protect vegetative and wildlife corridors.

B. Permitted uses. The following uses and their accessory uses are permitted in the OS district.

1. Nature and wildlife preserves.
…
4. Utility facilities (minor).

Findings: The application proposes conservation work to protect water quality and provide for wildlife and fisheries resources. The proposed project seeks to increase the quantity and quality of the site's stream, floodplain, and upland habitat to benefit fish, wildlife, and water quality. The proposed work will enhance stream complexity and cover using large wood in the stream channels, improve fish passage to the tributary areas and floodplain (in high water events), revegetate exposed areas, and restore the hydrologic function to the floodplain. The proposed improvements will also increase habitat for wildlife and provide suitable in-stream and off-channel habitat for adult and juvenile fishes, in an area where physical habitat quality, including off-channel habitat, has been identified as a limiting factor. The application also proposes to repair and improve an existing stormwater outfall to improve water quality. This project represents an allowed use in the OS zone. This standard is met.

C. Development criteria. The development of amenities, features, or facilities shall include, but not be limited to the following criteria:

1. Uses within the OS-designated lot shall be compatible with adjacent land uses.
….

Finding: Metro's property is managed as natural area for fish and wildlife habitat and water quality. The proposed restoration activities are intended to increase the quantity and quality of the site's stream, floodplain, and upland habitat to benefit fish, wildlife, and water quality. The restoration project is not proposing development of amenities, features, facilities, or any increased recreational use. Under Metro's ownership, the property is public lands and maintained as open space. This standard is met.

4.300 VEGETATION CORRIDOR AND SLOPE DISTRICT (VECO)

4.310 Purpose

The purpose of these standards is to promote the public health, safety, and general welfare. Provisions under this Chapter are designed to:

A. Restrict or prohibit uses, activities, or development which is damage-prone or damage-inducing to the land or water quality.

B. Require uses vulnerable to landslides, including public facilities which serve such uses, to be protected at the time of initial construction.

C. Maintain land and water quality by minimizing erosion and sedimentation, and by restricting or prohibiting development, excavation, and vegetation removal on vegetation corridors and slopes associated with primary and secondary protected water features, and on slopes of twenty-five percent (25%) or greater not directly associated with a protected water feature.

D. To comply with the provisions of Title 3 of the Metro Urban Growth Management Functional Plan and Statewide Planning Goal 6, Air, Water, and Land Resources Quality, and Statewide Planning Goal 7, Areas Subject to Natural Disasters and Hazards.

E. Substantially comply with the provisions of Title 13 of the Metro Urban Growth Management Functional Plan to protect regionally significant fish and wildlife habitat in compliance with Statewide Planning Goal 5, Open Spaces, Scenic and Historic Areas, and Natural Resources, as it pertains to natural resources.

Findings: Although not an applicable approval criterion, the purpose of the proposed restoration activities is aligned with and promotes the above VECO purpose statement. The proposed restoration activities are intended to conserve water quality and provide for wildlife and fisheries resources. The subject application seeks to increase the quantity and quality of the site's stream, floodplain, and upland habitat to benefit fish, wildlife, and water quality. The proposed work will enhance stream complexity and cover using large wood in the stream channels, improve fish passage to the tributary areas and floodplain (in high water events), revegetate exposed areas, and restore hydrologic function to the floodplain and historic wetland areas. The proposed improvements will also increase habitat for wildlife and provide suitable in-stream and off-channel habitat for adult and juvenile fish.

4.311 Applicability

These standards apply to all development in the Vegetation Corridor and Slope District as defined in Section 1.040, Vegetation Corridor and Slope District, and Water Quality and Flood Management Definitions, of this Code and to the Metro Title 13 Habitat Conservation Areas of all City-owned and Metro-owned parks and greenspaces as shown on the Metro Title 13 Habitat Conservation Area map. The vegetation corridor, inclusive of the wetland areas identified on the U.S. Department of the Interior, Fish and Wildlife Service National Wetland Inventory 1988 (NWI), are generally mapped on the Metro Title 3 map. Metro's Title 3 and Title 13 maps are

used as reference only. Not all wetlands recognized by the Oregon Division of State Lands are mapped on either the NWI or Title 3 map.

Findings: The VECO standards generally apply to the subject Metro property. However, the proposed restoration activities are exempt from requirements under Section 4.312(C)(1) and (3). As such, a VECO permit is not needed.

C. Exempt Development. The following uses and activities are exempt from the requirements of this Chapter:

1. Water dependent development.

…

3. Operation, maintenance, and repair of manmade water control facilities such as irrigation and drainage ditches, constructed ponds or lakes, wastewater facilities, and stormwater pretreatment facilities.

Findings: The proposed project is a restoration project with the purpose of restoring and enhancing stream and floodplain functions of the project area. Although the proposed restoration activities are wholly within the Vegetation Corridor Overlay District, the activities are "exempt development." The proposed project is an in-stream, water dependent restoration project and is an exempt activity under Section 4.312(C)(1). The restoration project also includes the stabilization and repair of the stormwater outfall located on, and flowing into, Beaver Creek and is an exempt activity under Section 4.312(C)(3). This standard is met.

4.314 Submission Requirements

An application for a development approval shall include the following information:

A. Site Development Application. A site development application, for the purpose of implementing this Chapter, shall consist of a grading and erosion control plan and a water quality plan. The applicant shall be responsible for submitting such information with a land use application.

1. Grading and erosion control plan. The grading and erosion control plan for the Development shall comply with the City's Construction Standards for Public Works Facilities, appropriate standards of the Sandy Drainage Improvement Company, this Chapter, and Chapter 5.600, Erosion Control and Water Quality Standards, of this Code. The grading plan shall include information on terrain (two foot contours), drainage, direction of drainage flow, location of surface and subsurface devices, retaining walls, water wells, dams, sediment basins, storage reservoirs, gas pipeline easements, or other in-ground utilities, either public or private, which may be affected by the proposed grading operations.

a. A current topographical survey shall be prepared for the entire site. The contours shall be at two (2) foot intervals.

b. At least three (3) slope measurements along the affected water feature shall be made, at no more than one hundred (100) foot increments.
c. The contour maps identifying slope percentages shall be prepared and certified by a licensed professional. The mapping shall depict the width of the vegetation corridor as established in Sections 4.316, Width of Vegetation Corridor, and 4.317, Method for Determining Vegetation Corridors Next to Primary Protected Water Features, of this Chapter. The vegetation corridor width will vary from site to site.
d. The grading plan shall also include a construction phase erosion control plan and a schedule of operations and shall be prepared by a professional engineer registered in Oregon.

Findings: Although the proposed activities are exempt development, this application submission includes all the above required information. In addition to supporting a VECO permit if needed, the above information is submitted to support applicant's floodplain development permit request. The above required information is provided in this narrative and attached exhibits.

This application includes a grading and erosion control plan and is designed for minimal impacts and the implementation of best management practices. Metro's proposed restoration project includes the removal of two anthropogenic features of the property, an existing weir and cistern, as necessary to stabilize the site and enhance ecological values. The proposed activities also include the placement of large wood structures and vegetation to create in-stream and off-channel habitat. As indicated by the plan sheets, applicant is implementing best management practices to limit disturbances to areas adjacent to the restoration work. Equipment will be staged in designated areas and equipment access areas will be flagged to prevent equipment from encroaching into the resource areas other than what is necessary for the restoration work. Applicant is proposing restoration work that is intended to minimize erosion by increasing connectivity of floodwater to the floodplain and redirecting flows in a manner that should disburse energy. In addition, applicant is implementing several project design features related to erosion control and timing of restoration activities to the Oregon Department of Fish and Wildlife established in-water work timeline. Disturbed areas will be revegetated immediately following construction and a comprehensive native revegetation is planned for the planting window following construction. Work will be isolated with sandbags, and silt and turbidity curtains, among other measures, will be implemented as best management practices. The project is being reviewed by the U.S. Army Corps of Engineers , Oregon Department of State Lands, and Oregon Department of Environmental Quality to confirm proposed erosion control is sufficient and effective. This standard is met.

2. Water quality plan. The applicant's engineer shall provide a water quality plan, consistent with the provisions of Chapter 5.600, Erosion Control and Water Quality Standards, of this Code and with the State of Oregon Department of Environmental Quality's National Pollutant Discharge Elimination System (NPDES) program.

Findings: The proposed restoration project has been designed to avoid and minimize any impacts to water quality. The proposed project falls under U.S. Army Corps of Engineers SLOPES V – Restoration programmatic opinion and project engineering, best management practices, design criteria, and general construction comply with the criteria identified in the SLOPES V programmatic opinion. All staging and mobilization activities will take place above

the ordinary high-water mark (OHWM). In-stream restoration activities necessitates work below OHWM; however, the project has been designed to minimize construction time below OHWM reducing impacts to the site. Project design measures include sequencing work to minimize activity below OHWM, stream dewatering in coordination with Oregon Department of Fish and Wildlife, fish exclusion and work area isolation, and upland staging areas. Work in and around flowing water involving heavy equipment and earth movement will take place during the July 15th to August 31st in-water work period.

The project does not involve any dredging and no permanent ground disturbance or impervious surface is proposed. No stockpiling or staging material will occur waterward of the OHWM. Temporary construction impacts are turbidity. No changes to the hydrology or the hydrolytic conditions of the site are anticipated as a result of this work.

All upland fill surfaces will be regraded and all disturbed areas, including staging areas, will be seeded with native erosion control mix and straw mulched. Comprehensive native revegetation of the site is planned following construction.

Metro currently has permits associated with this project pending with the U.S. Army Corps of Engineers and the Oregon Department of State Lands, and Oregon Department of Environmental Quality.

This standard is met.

B. A hydrology, geology, and soils report of the site in accordance with the following:

1. Prepared by a qualified, licensed professional such as a geotechnical engineer, and certified by the same.
2. Includes information on the hydrological activities of the site, the effect of hydrologic conditions on the proposed development, and any hydrological or erosion hazards.
3. Quantifies the current stormwater volume and rate that leaves the site and shows direction of flow within the site and toward adjoining properties.
4. Includes recommendations for the engineering and location of onsite detention facilities to meet the standards of Chapter 5.700, Stormwater Management, of this Code.
5. Depicts all stormwater facilities (swales, detention or retention ponds) existing or proposed, and shows the finished contours and elevations, including all cut and fill slopes and proposed drainage channels.
6. Describes how the site is suitable for the proposed use, and why there is no practicable alternative to the site.
7. Includes geological characteristics of the site and identifies any geological hazard that might present a hazard to life and property, or adversely affect the use or stability of a public facility or utility.
8. Includes information on the nature, distribution, and strength of existing soils and an assessment of grading procedures required to impose the minimum disturbance to the existing topography and native vegetation.

Findings: All of the above required information is provided in this narrative and attached exhibits. Maps, reports, and plan sheets depict and provide all the above required information. This standard is met.

C. Vegetation Report. This report shall consist of a survey of existing vegetative cover, whether it is native or introduced. Measures for enhancement or revegetation with approved plant species will be clearly stated, as well as methods for immediate and long-term stabilization of slopes and control of soil erosion. The revegetation plan shall be prepared by a licensed landscape architect, landscape designer, botanist, or arborist with specific knowledge of native plant species, planting and maintenance methods, survival rates, and their ability to control erosion and sedimentation, in compliance with Chapter 5.600, Erosion Control and Water Quality Standards, of this Code.

Findings: Although the proposed activities are exempt development, the above required information is provided in this narrative and attached exhibits. Maps, reports, and plan sheets depict and provide all the above required information. This standard is met.

4.315 Development Standards

Permitted uses in the vegetation corridor and slope district are to be developed in compliance with the following development standards unless there is an approved District Plan in accordance with Metro Code Section 3.07.1330.b.4(a) for the site. A District Plan shall be prepared and approved prior to, or in conjunction with, the preparation and approval of a master plan for the eventual development of the specific site. The approval criteria for the District Plan are those of Metro Code Section 3.07.1330.b.3.

Findings: These standards discuss development in the Vegetation Corridor Overlay District. The South Beaver Creek Restoration project is not the type of development contemplated by these standards. The requirements of this section pertain to constructing or improving buildings, similar structures, installing utilities associated with buildings or structures, and subdivisions. As demonstrated above, the proposed in-water, water dependent activities and stormwater improvement constitute "exempt development."

A. New Development

1. The applicant shall demonstrate that no reasonably practicable alternative design or method of development exists that would have a lesser impact on the vegetation corridor and slope than the one proposed.

Findings: The proposed project is a fish and wildlife habitat restoration project in and along South Beaver Creek– a water-dependent activity. Work within the water resource area is necessary and cannot be avoided. There is no alternative to the location of the proposed project. This standard is not applicable or otherwise met.

2. If no such reasonably practicable alternative design or method of development exists, new structures and development shall be limited in scale, as specified in this Section, so that the impacts on the vegetation corridor and slope district are the least necessary and the plans shall include restoration, replacement, or rehabilitation of the vegetation corridor and/or slope associated with the site …

Findings: The restoration project is a water-dependent use and work in the water resource area is necessary for the water resource's restoration and enhancement. Restoration and enhancement are an allowed use in the zone. The project's purpose is to restore and enhance habitat, and the development is limited to only those areas that need fish and wildlife habitat improvement. As demonstrated by the plans, development impacts will be controlled and limited to the area necessary to allow for the restoration work. Applicant is implementing best management practices to limit disturbances to areas adjacent to the restoration work. Equipment access areas will be flagged to prevent equipment encroaching into the water resource area other than what is necessary for the restoration work.

For the last 100 years, the geomorphology of South Beaver Creek has been heavily impacted by land use modifications through the watershed, which in turn has had major impacts to salmon populations. The cumulative impacts of forced channelization, bank hardening, encroachment into riparian areas and floodplains, and infilling of wetlands are readily apparent. Increases in the magnitude of and frequency of flood events exacerbate channel incision, extensive bank erosion, and loss of in-channel habitat including the number of stable, deep pools and large wood structures.

Beaver Creek provides critical habitat for Coho and Chinook Salmon, Steelhead, and Rainbow and Cutthroat trout. Salmon rely on the interconnection of the stream and its floodplain. Annual floods that have access to floodplains allow for the creation of off-channel habitats and refugia. Off-channel habitats allow juvenile salmonids the opportunity to escape adverse conditions in the main channel resulting from high flows, high temperatures, and high pollutant loads, as well as provides feeding and other rearing opportunities. Flooding also allows for the formation of large wood jams. Stable and persistent large wood structures create important hydraulic controls that provide a variety of functions for fish and in-channel processes including deep pool formation, channel bed stability, and erosion control. This standard is not applicable, or otherwise met.

> *3. The applicant shall provide mitigation to ensure that impacts to the functions and values of the vegetation corridor and integrity of the slope will be mitigated or restored to the extent practicable.*

Findings: The proposed work will enhance stream complexity and cover using large wood in the stream channels, improve fish passage to the tributary areas and floodplain (in high water events), revegetate exposed areas, and restore the hydrologic function to the floodplain. The proposed improvements will also increase habitat for wildlife and provide suitable in-stream and off-channel habitat for salmon and steelhead, in an area where physical habitat quality, including off-channel habitat, has been identified as a limiting factor. As indicated by the plan sheets, disturbed areas will be revegetated as part of the project. Revegetation work will be initiated immediately following the construction activities. Any nuisance plants in the action areas will be removed and replaced with additional plantings to improve habitat areas. Aquatic resources will be enhanced. *See* attached Exhibit 5.

The subject application seeks to increase the quantity and quality of the site's stream, floodplain, and upland habitat to benefit fish, wildlife, and water quality. The proposed work will enhance stream complexity and cover using large wood in the stream channels, improve fish passage to the tributary areas and floodplain (in high water events), revegetate exposed

areas, and restore the hydrologic function to the floodplain. The proposed improvements will also increase habitat for wildlife and provide suitable in-stream and off-channel habitat for salmon and steelhead, in an area where physical habitat quality, including off-channel habitat, has been identified as a limiting factor.

Upon completion, the Vegetation Corridor and water resource area will be restored to a better condition. The resource area, function, and value will be enhanced. No mitigation is required to off-set the project because the project will not result in the loss or degradation of a regulated natural resource. This standard is not applicable, or otherwise met.

> *4. The use satisfies all applicable standards of Chapters 4.500, Flood Management Area; 5.600, Erosion Control and Water Quality Standards; and 5.700, Stormwater Management, of this Code.*

Findings: The standards set forth in Chapters 4.500, 5.600, and 5.700(where applicable) are adhered to in the proposed preliminary construction plans. Exhibit 5. Applicant and its team of professional biologists and engineers have designed stabilization and restoration activities to have minimal impact on the natural resource. The design construction elements will generally follow a sequence of mobilization, fish exclusion and work area isolation at the weir and cistern removal site, bank layback at the weir and cistern removal site, weir and cistern removal, berm notching, placement of large wood habitat structures throughout the project area, stormwater outfall stabilization, and site restoration and stabilization. The project has been designed to have minimal impact on erosion and water quality and is intended to restore the stream, wetland, and floodplain functions on the site. This standard is not applicable, or otherwise met.

> *5. All excavation over three feet in depth shall require submission of an engineering report addressing the hydrology, geology, and soils of the site as specified in this Chapter. The siting, engineering, erosion control, water quality, and enhancement or revegetation of the site shall comply with the standards of this Chapter. The applicant's engineering plans shall certify that runoff from the site will not increase above pre-development quantity and rate, and that visible and measurable erosion is prevented.*

Findings: The proposed restoration activities are supported by professional engineering reports, including the required hydrological and soils analyses, and needed certifications. This standard is not applicable, or otherwise met.

> *B. Addition or alteration of development in the vegetation corridor and on slopes of twenty-five percent (25%) and greater may be allowed provided that it meets the standards of Subsections (A)(1) – (3) of this Section, as applicable, and the following…*

Findings: Applicant is not proposing an addition or alteration of existing development in the vegetation corridor. This standard is not applicable or otherwise met.

> *C. Construction of public utilities and public streets not included in the review of the tentative plat shall be processed as a Type II site and design review land use application*

and shall be subject to the following approval criteria, provided that it meets the standards of Subsections (A)(1) – (3) of this Section, as applicable, and the following…

Findings: Applicant is not proposing construction of public utilities or public streets. This standard is not applicable or otherwise met.

D. Approval Standards for Walkways and Bike Paths and other Low-Impact Outdoor Recreation Facilities.

Findings: Applicant is not proposing development of walkways, trails, bike paths, or any other low-impact outdoor recreation facilities. The site is managed as a natural area and the proposed restoration activities are intended to stabilize, restore, and enhance the natural resource and fish and wildlife habitat within the resource area. This standard is not applicable or is otherwise met.

E. Prescribed Conditions for the Rehabilitation or Replacement of Pre-Existing Structures.

Findings: Applicant is not proposing rehabilitating or replacing pre-existing structures. This standard is not applicable or is otherwise met.

5.600 EROSION CONTROL AND WATER QUALITY STANDARDS

5.620 Applicability

This Section is applicable to ground disturbing activities associated with development, subject to the limitations and thresholds set forth in the reference standards specified in Section 5.630.

5.630 Reference Standards

The erosion control standards and requirements set forth in the most current edition of Chapter 12.09 of the Troutdale Municipal Code and the most current edition of the Construction Standards for Public Works Facilities are hereby incorporated by reference.

Findings: The standards set forth in Troutdale Municipal Code Chapter 12.09 and the Construction Standards for Public Works Facilities (where applicable) are adhered to in the proposed preliminary construction plans. Exhibit 5. Applicant and its team of professional biologists and engineers have designed stabilization and restoration activities to have minimal impact on the natural resource. The design construction elements will generally follow a sequence of mobilization, fish exclusion and work area isolation at the weir and cistern removal site, bank layback at the weir and cistern removal site, weir and cistern removal, berm notching, placement of large wood habitat structures throughout the project area, stormwater outfall stabilization, and site restoration and stabilization. The summer construction schedule with anticipated low water levels and the use of helicopter wood placement were selected to minimize potential impacts to fish and water quality. Access route, clearing, and construction limits will be flagged prior to construction.

The following construction ESC measures will be taken to further limit impacts to aquatic resources:

- The access route to the weir removal area and berm will be cleared only as necessary. Portions of the access route follow what appears to be an old road.
- Access route, clearing, and construction limits will be flagged prior to construction.
- Wattles will be installed around the wood staging area and downslope of the access route to the weir removal area. Wattles will be installed perpendicular to direction of potential flow, as shown on Sheet EC-01 of Exhibit 5.
- Construction equipment will be staged and refueled in the designated staging areas, within uplands.
- Log storage will occur within the designated log staging area; this area will remain vegetated, and clearing is not required (the grass covered area may be mowed).
- No clearing or work is proposed for the helicopter operations staging area, this is an existing gravel parking and equipment storage yard.
- Helicopter staging and refueling will occur in the designated upland helicopter staging area.
- The contractor will prevent generation and transport of rotor wash (blowing caused by the rotors); water trucks or other approved dust abatement measures will be onsite if conditions warrant dust management.
- Equipment refueling will occur within staging areas or in uplands via a pickup truck outfitted with appropriate containment devices. A spill kit will be available, and contractor is responsible for placing disposable absorbent mat "diapers" on the ground beneath fueling operations.
- Contractor will be required to clean (pressure washed or pressurized air) all equipment to be used in the Natural Area to limit the spread of noxious weed seeds.
- Contractor will inspect machinery daily for fuel or lubricant leaks.
- Vegetated buffers will remain intact adjacent to Beaver Creek.
- Wattles will be maintained to prevent the discharge of sediment to Beaver Creek.
- Work will be competed in the in-water work window for Sandy River tributaries (July 15-August 31) or as required by ODFW.
- Monitor and inspection of erosion control measures and site water management features will occur daily, and observation will be recorded in a log.
- Exposed soils will be protected from erosion during rain events.
- BMPs and protective devices will be installed at the end of each workday when rain is forecast within 24-hrs.

The majority of the project work areas are below the OHW of Beaver Creek, however very little excavation or grading is proposed as part of the restoration activities. Demolition of the weir and cistern will likely occur with a jackhammer, or similar equipment. No saw cutting that generates slurry will be used. Excavation is limited to laying the banks back to conform with site topography at the weir removal site and will occur with an excavator and haul truck. Material removed from the weir and for the bank layback will be disposed of offsite at an approved disposal facility. Streambed fines, gravels and cobbles will be placed to fill

streambed void left by concrete apron removal and cistern structure removal. This streambed substrate will be imported to the site.

The berm notching will occur last, as equipment leaves the site, and will be done with a small excavator. Concrete and berm spoils will be hauled offsite via the access route identified on Sheet C05 of Exhibit 5.

A helicopter will be used for all wood placements. Metro and the project engineer will identify and flag locations of the wood prior to helicopter flight. Adjustments will be made at the approval of the project engineer. Structure stability will rely on self-stabilization or bracing against existing trees where possible. Logs with rootwads will be sized appropriately for the bankfull width of the creek and appropriate for self-stabilization to occur. Slash will be obtained from logs (branch trimmings) and will be placed in conjunction with and around the logs to provide extra debris and habitat complexity. Contractor will supply local, conifer logs with rootwads for the project.

The stormwater outfall stabilization will be completed on Metro property limits with access from the MHCC campus. *See* Sheet D02, Exhibit 5. The erosional channel (gully) side slopes will be graded back, and these spoils placed in the bottom of the channel and compacted. The channel profile will be graded with benching to provide a stable base for the rock. A small basin will be excavated at the base, and below OHW of Beaver Creek, that will also be lined with rock to provide a basin for energy dissipation during high flows. The stormwater outfall channel will be lined with filter fabric above OHW before lining the entire length with quarry spalls; no filter fabric will be placed below the Beaver Creek OHW. *See* Sheet D02 of Exhibit 5. The stormwater outfall gully lacks bed and bank or other OHW indicators.

All Additional BMPs to minimize impacts to wetlands and waters include:

- Two site access routes will be used: from SE Cochran Road for weir and cistern removal and from SE Stark Street for stormwater outfall stabilization. (Sheets EC01 and C02 of Exhibit 5)
- The contractor will take measures to minimize rutting or other damage by construction vehicles on the primary access route shown to the east of Beaver Creek at the southern end of the Project.
- No excavation in the wetted area of the channel is planned for wood structure placement. Structures are intended to be placed with as little disturbance to the channel and aquatic habitat as practicable.
- Biodegradable, non-toxic hydraulic fluids will be used in construction equipment specifically working below OHW.

Revegetation will occur on all disturbed areas in the access corridor and log staging areas, if needed. Site revegetation is shown on Sheet D05 of Exhibit 5. Comprehensive native revegetation of the site is planned for the site to reach Metro's goals of restoring long-term processes via riparian vegetation enhancements. Finish grade surfaces of the weir grading bank layback areas and the berm notch side slopes will be seeded, mulched, and covered with erosion control blanket.

The subject application is intended to increase the quantity and quality of the site's stream, floodplain, and upland habitat to benefit fish, wildlife, and water quality. The proposed work will enhance stream complexity and cover using large wood in the stream channels, improve fish passage to the tributary areas and floodplain (in high water events), revegetate exposed areas, and restore the hydrologic function to the floodplain.

This standard is met and can be made a condition of approval to ensure compliance.

5.700 STORMWATER MANAGEMENT

5.730 Applicability

No land use action shall be approved which does not make adequate provisions for stormwater or floodwater runoff. The stormwater drainage system shall be separate and independent of any sanitary sewer system. Water quality treatment for stormwater is required as indicated in the City's Construction Standards for Public Works Facilities.

Findings: Stormwater will not be generated from this project. No impervious surface is being added. Applicant is implementing best management practices for the project consistent with the work proposed. The proposed restoration activities are intended to conserve water quality and enhance wildlife and fisheries resources and is aligned with the purpose statement of Section 5.710. The proposed work will create instream habitat for juvenile anadromous fish and resident fish through reconnection of the floodplain for high flow refuge and feeding, and the addition of large wood and beaver dam analogs to provide pools for rearing. Placement of native woody vegetation will provide food and dam building materials for beaver, food and structure for birds and other wildlife, and carbon production to support the food chain. Reconnection of the floodplain will create breeding and rearing habitat for reptiles and amphibians. The project will enhance stream complexity and cover using large wood in the stream channels, improve fish passage to the tributary areas and floodplain (in high water events), revegetate exposed areas, and restore the hydrologic function to the floodplain. The project also proposes to repair an existing Stormwater facility to improve water quality. This standard is met or otherwise not applicable.

6.900 SITE DEVELOPMENT REVIEW

6.910 Applicability and Exemptions

Site development review approval is required for new development, change of use resulting in increased vehicle traffic or requiring an increase in minimum parking pursuant to Chapter 9, Building Expansions and to expand a nonconforming use or development.

Findings: The proposed restoration project is considered "development' as defined by City code. As such, applicant is seeking site development review approval.

6.915 Review Procedures

Site development review shall be conducted using a Type I or Type II procedure to be determined as follows:

B. A Type II application shall be used to review all of the following:

1. All new development not exempted or made subject to a Type I procedure above. …

Findings: Applicant is seeking a Type II application site development review. This standard is met.

6.920 Approval Criteria

In order to approve a site development review application, the decision-making authority shall make findings of fact based on evidence provided by the applicant demonstrating that the proposal is consistent with the applicable approval criteria.

B. An application for a Type II site development review shall be approved if the proposal meets all of the following criteria. The City decision-making body may, in approving the application, impose reasonable conditions of approval, consistent with the applicable criteria.

1. The proposal complies with the approval criteria specified in Section 6.920.A.

Findings: As demonstrated through this narrative and exhibits, this project represents an allowed use in the OS zone and complies with Vegetation Corridor Overlay District and the Floodplain Overlay District standards. This standard is met.

2. If applicable design standards are proposed to be adjusted, the proposed adjustment: a. Is justified due to unique site conditions. b. Conforms to the extent practicable with these design standards. c. Mitigates potential impacts from the adjustment to the extent practical.

Findings: The applicant is not proposing applicable design standards be adjusted. This standard is not applicable or otherwise met.

CHAPTER 8 – DEVELOPMENT STANDARDS

8.020 Applicability and Exemptions

A. General Standards. Unless otherwise stated, standards in Sections 8.030 to 8.099 of this Division shall apply to all existing uses and development, and to new or expanded uses or development, regardless of zoning district, land use designation, or site development review requirements as described below.

Findings: These standards are not applicable. These standards discuss development that involves buildings and structures. The proposed restoration project is not the type of development contemplated by these standards. The project proposes to return a developed area to its natural conditions. No buildings or structures are proposed.

…

C. Site Development Review. Site development review approval in accordance with Section 6.900 of this Code is required for new development, building expansions, expansion of a nonconforming use or development, and changing of use resulting in increased vehicle traffic or requiring an increase in minimum parking pursuant to Chapter 9 of this Code.

Findings: Applicant is seeking Site Development Review in accordance with Section 6.900. Applicant demonstrates compliance with section 6.900 above. This standard is met.

D. Exemptions.

Findings: Applicant is not seeking an exemption. This standard is not applicable or otherwise met.

CHAPTER 14 – FLOOD MANAGEMENT

14.005 Purpose

Without establishing any priority, the purpose of this Chapter is to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions or degradation of water quality in specific areas by provisions designed to…

Findings: The proposed restoration activities are intended to conserve water quality and provide for wildlife and fisheries resources. The overall goals of the project are to restore and enhance aquatic, riparian, and wetland habitats along Beaver Creek; improve stream, wetland, and floodplain functions with the natural area; and protect vegetative and wildlife corridors. The subject application seeks to increase the quantity and quality of the site's stream, floodplain, and upland habitat to benefit fish, wildlife, and water quality. The proposed work will enhance stream complexity and cover using large wood in the stream channels, improve fish passage to the tributary areas and floodplain (in high water events), revegetate exposed areas, and restore hydrologic function to the floodplain and historic wetland areas. Although not an applicable approval criterion, the purpose of the proposed restoration activities is aligned with and promotes the above flood management purpose statement.

14.010 Applicability

A. These provisions shall apply to public and private properties in the one percent (1%) annual chance of flood floodplain (100-year floodplain or Special Flood Hazard Area) as mapped by the Federal Insurance Administrator of rivers and local streams within the planning jurisdiction of the City of Troutdale, which includes land in unincorporated Multnomah County within the City's Urban Planning Area.

Findings: The proposed restoration project includes in-stream, water dependent work and activities within the Special Flood Hazard Area. Applicant demonstrates compliance with applicable provisions below.

14.030 Uses within the Floodway or within Wetlands

A. Prohibited Uses within the Floodway or within Wetlands. Unless specifically permitted under this Section, the following uses are prohibited within floodways and wetlands:

1. Manmade structures.
2. Vegetation removal, fill, or excavation. Vegetation removal in the floodway in concert with an approved wildfire mitigation project may be permitted subject to review under the standards for development of Section 14.040 of this Chapter.
3. Private road construction.
4. Alterations and relocations of the watercourses of Arata, Salmon, or Beaver Creeks, the Sandy and Columbia Rivers, or the watercourse of any unnamed perennial or intermittent stream except as provided for in Subsection B(11) of this Section and Section 14.040.O of this Chapter.
5. Fill of wetlands without both an approved land use application and an approved Joint Fill Permit issued by the Oregon Department of State Lands and the U.S. Army Corps of Engineers.
6. Uncontained, outside storage areas of hazardous materials for hazardous materials as defined by the State of Oregon Department of Environmental Quality.
7. Expansion of nonconforming uses.
8. New installation of manufactured dwellings.

Finding: Applicant is not proposing a prohibited use. This standard is met.

B. Permitted Uses within the Floodway or within Wetlands. The following uses are permitted subject to review under the standards for development of Section 14.040 of this Chapter:

1. Open space, trails, walkways, and bike paths, as designated by the Troutdale Parks Plan, or as approved with a land use application.
2. Removal of unauthorized fill.
…
4. Routine repair and maintenance of existing structures (conforming and nonconforming uses), streets, driveways, utilities, culverts, drainageways and levees constructed for flood control by the Sandy Drainage Improvement Company or its successor, accessory uses, and other existing development on the site (including landscaped yards, decks, patios, boat ramps, and the operation, maintenance, and repair of manmade water control facilities such as irrigation and drainage ditches, constructed ponds or lakes, wastewater facilities, and stormwater quality facilities, and similar development.
…
6. Balanced excavation and fill required for the construction of detention facilities or structures and other facilities such as levees specifically designed to reduce or mitigate flood impacts. Levees shall not be used to create vacant buildable lands.
…
8. Permanent bank stabilization necessary to preserve an existing structure provided

the balanced cut and fill standard is met if the work is in the floodplain or a "NoRise" certification if the work is within the floodway. Exception: Bank stabilization is not permitted for development on a vacant lot of record.

Findings: The proposed restoration activities are a permitted use within the floodway under Section 14.030(B). The project area is a natural area, owned and managed by Metro as open space and identified in the Troutdale Parks Master Plan 2023 as South Beaver Creek Greenway, an existing open space. The restoration activities will remove existing debris and anthropogenic features, a weir and cistern, that are in the floodway restoring the natural stream, wetlands, and floodplain functions. The project is designed to balance materials cut and fill. Materials for the restoration project are primarily large logs, woody debris, and vegetation. Bank stabilization is required for an existing stormwater outfall discharging into the creek. These restorative actions are designed to maintain and increase slope stability and decrease erosive velocities of Beaver Creek. In addition, the project includes comprehensive re-vegetation throughout the project area, and the addition of log structures within the creek and floodplain will provide habitat and improve conditions for fisheries and wildlife resources. Stabilizing the site and restoring and revegetating historically disturbed areas protect water quality and enhance the sites ecological resources. Reconnection of the floodplain will facilitate the formation of emergent and forested wetlands and create breeding and rearing habitat for reptiles and amphibians. The project will enhance stream complexity and cover using large wood in the stream channels, improve fish passage to the tributary areas and floodplain (in high water events), revegetate exposed areas, and restore the hydrologic function to the floodplain. The project also proposes to repair an existing stormwater outfall to improve water quality.

In sum, the proposed project is designed to restore the floodway to its natural state and increase its capacity to store and convey floodwaters. The project will cause no net-rise in flood elevations and no change in floodway capacity. *See* Exhibit 7. This standard is met.

14.035 Floodplain Development Permit

B. Applicability. Unless exempt per Section 14.035.C, below, approval of a Floodplain Development Permit shall be obtained before construction or development begins within any area of special flood hazard established in Section 14.010.B of this Chapter. The permit shall be for all structures including manufactured dwellings, as set forth in the Section 1.040 and for all development including fill and other activities, also as set forth in the Section 1.040.

Findings: Applicant is proposing in-stream, water dependent restoration activities. Applicant is requesting a Floodplain Development Permit. This standard is met.

C. Exemptions. The following activities do not require a Floodplain Development Permit:

Findings: The application is not seeking an exemption. This standard is not applicable or is otherwise met.

D. Submission Requirements. An application for a Floodplain Development Permit within the Flood Management Area shall include the following, and these requirements apply to

all applicants for development approval unless otherwise noted below:

> *1. A site plan showing the proposed development on the site, drawn to a standard scale, and including an illustrated scale for use in reductions. A site plan shall also consist of the following…*

Findings: The plan set (Exhibit 5) together with the floodplain assessment (Exhibit 7) depict all of the above applicable required information. This standard is met.

> *2. Topographic survey. The survey shall show the floodway and floodplain. The survey shall also show the location of existing and proposed improvements on the site, trees or tree clusters (including those to be removed), existing roads, utilities, and structures, buildings, structures, fencing, walls, landscaping, storage of materials or equipment, drainage facilities, parking areas, and other impervious surface areas. The survey shall be drawn to scale, with two (2) foot contours, and shall note the distance from Top-of-bank to the improvements on the site;*

Findings: The plan set includes construction drawings and a site plan that depict all the above applicable required information. This standard is met.

> *3. Where base flood elevation data is provided through the City's Flood Insurance Study, or by other means as permitted in this Chapter, the developer shall obtain and record the actual elevation of the lowest floor (including basement) of all new or substantially improved structures, including the placement of a manufactured dwelling, and whether or not the structure contains a basement. This information shall be based upon NAVD 88 and provided on a City Floodplain Development Permit form, and should include the following, as applicable…*

Findings: Applicant is not proposing development or improvement of any structures that are intended to be regulated by these standards. This standard is not applicable or otherwise met.

> *4. Hydrology and soils report. Where ground disturbance or vegetation removal is proposed that exposes the soil, this report shall be required…*

Findings: The above required information is provided in this narrative and attached exhibits. Maps, reports, and plan sheets depict and provide all the above required information. A technical memorandum and no-rise analysis and certification is included as Exhibit 7. This standard is met.

> *5. Grading plan. If grading is to occur, a grading plan shall be required that shows existing and finished contours (two-foot contour intervals), drainage, all cut and fill slopes and proposed drainage channels, direction of drainage flow, location of proposed structures and existing structures which may be affected by the proposed grading operations, and water quality facilities.*

Findings: This application includes a grading and erosion control plan and is designed for minimal impacts and the implementation of best management practices. Metro's proposed

restoration project includes the removal of two anthropogenic features of the property, an existing weir and cistern, as necessary to stabilize the site and enhance ecological values. The proposed activities also include the placement of large woody debris and vegetation to create in-stream and off-channel habitat. As indicated by the plan sheets, applicant is implementing best management practices to limit disturbances to areas adjacent to the restoration work. Equipment will be staged in designated areas and equipment access areas will be flagged to prevent equipment from encroaching into the resource areas other than what is necessary for the restoration work. Applicant is proposing restoration work that is intended to minimize erosion by increasing connectivity of floodwater to the floodplain and redirecting flows in a manner that should disburse energy. In addition, applicant is implementing several project design features related to erosion control and timing of restoration activities to the Oregon Department of Fish and Wildlife established in-water work timeline. Disturbed areas will be revegetated immediately following construction, and a comprehensive native revegetation is planned for the planting window following construction. Work will be isolated with sandbags and silt and turbidity curtains, among other measures, will be implemented as best management practices. The project is being reviewed by the U.S. Army Corps of Engineers and the Oregon Department of State Lands, and Oregon Department of Environmental Quality to confirm proposed erosion control is sufficient and effective. This standard is met.

> *6. Vegetation report. Where vegetation is to be removed or other impacts to the onsite vegetation is to be expected as a result of development, this report shall be required. This report shall consist of a survey of existing vegetation, whether it is native or introduced, and how it will be altered by the proposed development. Measures for enhancement of the site, including revegetation with approved plant species, will be clearly stated, as well as methods for immediate and long-term stabilization of slopes and control of soil erosion. The vegetation report shall be prepared by a landscape architect, landscape designer, botanist, arborist, wetland specialist, or other similar credentialed authority as determined by the Floodplain Manager with specific knowledge of approved plant species, planting and maintenance methods, survival rates, and their ability to control erosion and sedimentation. The contractor for installation and maintenance will be responsible for replacing any approved plant species that do not survive the first two (2) years after planting.*

Findings: The above required information is provided in this narrative and attached exhibits. Maps, reports, and plan sheets depict and provide all the above required information. This standard is met.

> *7. A "No-Rise" certification and a Letter of Map Change (LOMC) shall be submitted with the land use application for the following activities within the floodway as mapped by FEMA: a. Permanent bank stabilization that occurs in the floodway. b. Development, alterations, or relocations of the floodway, including any permanent fill within the floodway.*

Findings: Applicant submits the attached No-Rise analysis report and certification for the proposed restoration project. *See* Exhibit 7. These were prepared by registered professional engineers with substantial experience in river and creek restoration projects throughout the Pacific Northwest. This standard is met.

8. Building and structure elevations. For all existing and proposed, relocated, or expanded buildings and structures, elevation in relation to the Highest Adjacent Grade, the North American Vertical Datum 1988 (NAVD88), and the base flood elevation as applicable, of the…

Findings: Applicant is not proposing development or improvement of any structures that are intended to be regulated by these standards. This standard is not applicable or otherwise met.

9. Infrastructure. Location of all proposed infrastructure necessary to serve the proposed development shall be required when such new development is proposed by the applicant. Such infrastructure includes, but is not limited to, streets, driveways, water, sanitary sewer, and storm drainage.

Findings: Applicant is not proposing development that is intended to be regulated by these standards. The restoration activities do not include any proposed infrastructure. This standard is not applicable or otherwise met.

10. Floodplain or watercourse alterations. Where floodplain or watercourse alterations are proposed, a description of the extent to which any floodplain or watercourse is proposed to be altered or affected as a result of proposed development shall be required.

Findings: The application does not propose activities that alter or relocate the watercourse. Cascade Environmental Group/Otak evaluated water surface and hydraulic conditions for the proposed project and demonstrated no impacts to the 100-year floodplain elevation. As intended by the project design, hydraulic modeling projects slight local increase to water surface elevation directly upstream of the proposed wood structures that will encourage stream flows into side channel habitats. The slight increase in water surface elevation from the addition of large wood to the system and the slight decrease in water surface elevation from removal of the existing weir and cistern meet the no-rise criteria. The flood carrying capacity in the project area will be maintained. This standard is met.

11. All federally-mandated or state-mandated permits issued by other governmental agencies shall be obtained, or obtaining such permits shall be a Condition of Approval to be satisfied prior to issuance of any construction permit. Such permits include but are not limited to Section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1334, 16 U.S.C. 1531-1544, and State of Oregon Removal-Fill permits, as amended.

Findings: Applicant has submitted joint removal fill permit requests with the Oregon Department of State Lands and the US Army Corps of Engineers, and is also seeking permits from the Oregon Department of Environmental Quality. *See* Exhibit 6. This standard is met.

E. Application for Floodplain Development Permit. A Floodplain Development Permit shall be obtained before construction or development begins within any area of special flood hazard established in Section 14.010 of this Chapter. The permit shall be for all structures

including manufactured dwellings, as set forth in Section 1.040 and for all development including fill and other activities, also as set forth in Section 1.040. Applications for a Floodplain Development Permit shall be made on forms furnished by the Community Development Department and may include, but not be limited to, plans drawn to scale showing the nature, location, dimensions, elevations of the area in question, existing or proposed structures, fill, storage of materials, drainage facilities, and the location of the foregoing. …

2. A Type II Floodplain Development Permit is required for:

a. Any use in the underlying zoning district requiring a Type II Site Development review.

Findings: Applicant is seeking a Type II Floodplain Development Permit. This standard is met.

F. Review Criteria - Requests for approval of a Floodplain Development Permit shall be reviewed by the Floodplain Manager or designee to ensure:

1. Consistency with the standards from Sections 1.040, Chapter 2, and Section 14.040 of this Code, as applicable;

2. Consistency with other applicable standards of this Code and all other applicable policies and standards adopted by the City.

Findings: Applicant submits a Floodplain Development Permit application for review. Applicant has demonstrated compliance with all applicable standards through this narrative and attached exhibits. This standard is met.

G. Mandatory Conditions of Approval - The following Conditions of Approval are mandatory and shall be imposed on every approved Floodplain Development Permit:

1. Required During Construction Elevation Certificate. For all new construction, development, and substantial improvements, the permit holder shall provide to the Floodplain Manager or designee an as-built certification of the floor elevation or flood-proofing elevation immediately after the lowest floor or flood-proofing is placed and prior to further vertical construction. Any deficiencies identified by the Floodplain Administrator or designee shall be corrected by the permit holder immediately and prior to work proceeding. Failure to submit certification or failure to make the corrections shall be cause for the Floodplain Administrator or designee or the Building Official to issue a stop-work order for the project.

2. Required Documentation Prior to Issuance of Certificate of Occupancy a. In addition to the requirements of the Building Codes pertaining to Certificate of Occupancy, prior to the final inspection the owner or authorized agent shall submit the following documentation to the Floodplain Manager or designee and the documentation shall be prepared and sealed by a registered surveyor or engineer: i. For elevated buildings and structures in Special Flood Hazard Areas, the as-built elevation of the lowest floor,

including basement, or where no base flood elevation is available the height above highest adjacent grade of the lowest floor; ii. For buildings and structures that have been floodproofed, the elevation to which the building or structure was floodproofed. b. Failure to submit certification or failure to correct violations shall be cause for the Floodplain Manager or designee or the Building Official to withhold a Certificate of Occupancy until such deficiencies are corrected.

3. For applications for partitions and subdivisions, one of the following shall be required…

Findings: These standards do not contemplate the type of restoration activity proposed by applicant. However, applicant will complete all conditions of approval deemed applicable by the City. This standard is met.

14.040 Development Standards

The land use application shall establish through the use of narrative, site plans, and professional reports, the following:

A. Type II or III approval for new development, including additions or alterations to existing structures, except for single family dwellings, in the Flood Management Area may be allowed, provided that:

1. The applicant shall demonstrate that there is no reasonable nor practical alternative design or method of development that would have a lesser impact on the Flood Management Area than the one proposed.

Findings: The proposed project is a fish and wildlife habitat restoration project in and along South Beaver Creek– a water-dependent activity. Work within the water resource area is necessary and cannot be avoided. There is no alternative to the location of the proposed project. This standard is met.

2. If there is no reasonable nor practical alternative design or method of development the project shall be designed in compliance with applicable parts of Subsections (B) through (X) of this Section, so that the impacts on the Flood Management Area are limited and the plans shall include restoration, replacement, or rehabilitation of the vegetation within the Flood Management Area.

Findings: The proposed project is a fish and wildlife habitat restoration project in and along South Beaver Creek– a water-dependent activity. Work within the water resource area is necessary and cannot be avoided. There is no alternative to the location of the proposed project. Below, the applicant demonstrates compliance with applicable parts of Subsections (B) through (V) of this section. This standard is met.

3. The applicant shall provide mitigation to ensure that impacts to the functions and values of the vegetation corridor and integrity of the slope will be mitigated or restored to the extent practicable.

Findings: The proposed work will enhance stream complexity and cover using large wood in the stream channels, improve fish passage to the tributary areas and floodplain (in high water events), revegetate exposed areas, and restore the hydrologic function to the floodplain. The proposed improvements will also increase habitat for wildlife and provide suitable in-stream and off-channel habitat for salmon and steelhead, in an area where physical habitat quality, including off-channel habitat, has been identified as a limiting factor. As indicated by the plan sheets, disturbed areas will be revegetated as part of the project. Revegetation work will be initiated immediately following the construction activities. Any nuisance plants in the action areas will be removed and replaced with additional plantings to improve habitat areas. Aquatic resources will be enhanced. *See* Exhibit 5.

The subject application seeks to increase the quantity and quality of the site's stream, floodplain, and upland habitat to benefit fish, wildlife, and water quality. The proposed work will enhance stream complexity and cover using large wood in the stream channels, improve fish passage to the tributary areas and floodplain (in high water events), revegetate exposed areas, and restore the hydrologic function to the floodplain. The proposed improvements will also increase habitat for wildlife and provide suitable in-stream and off-channel habitat for salmon and steelhead, in an area where physical habitat quality, including off-channel habitat, has been identified as a limiting factor.

Upon completion, the Vegetation Corridor and water resource area will be restored to a better condition. The resource area, function, and value will be enhanced. No mitigation is required to off-set the project because the project will not result in the loss or degradation of a regulated natural resource. This standard is met.

> *B. A professional engineer registered in Oregon must certify that the development will not result in any increase in flood levels throughout the SFHA during the occurrence of the base flood discharge, and that water quality will not be adversely affected.*

Findings: Applicant submits the attached No-Rise analysis report and certification for the proposed restoration project. *See* Exhibit 7. These were prepared by registered professional engineers with substantial experience in river and creek restoration projects throughout the Pacific Northwest. This standard is met.

> *C. As applicable, the development must be authorized by the Oregon Department of State Lands, U.S. Army Corps of Engineers, the Oregon Department of Fish and Wildlife, and the Sandy Drainage Improvement Company. The applicant shall obtain and submit a copy of all required state and federal permits for any proposed development in the Flood Management Area, including Section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 USC 1334.*

Findings: Applicant has permits associated with this project pending with the U.S. Army Corps of Engineers and the Oregon Department of State Lands (under a Joint Permit), as well as a permit with the Oregon Department of Environmental Quality. *See* Exhibit 6. This standard is met.

D. Unless otherwise authorized under the provisions of this Chapter, the development shall comply with the underlying zoning district dimensional standards and the minimum vegetation corridor as established in Sections 4.316 and 4.317 of this Code. The applicant shall submit an exhibit that shows the location and provides a description of all actions to be provided to mitigate the impacts of permitted development as established in Section 4.314 of this Code.

Findings: Applicant demonstrates compliance with the underlying OS zoning district requirements and the vegetation corridor requirements in the discussion above. The proposed activities themselves are mitigation and restoration activities to offset the effects of urban uses and impacts occurring off-site. No additional mitigation is needed.

E. Protect the water quality resource, and Flood Management Area functions and values from uncontained areas of hazardous materials as defined by the State of Oregon Department of Environmental Quality water quality standards.

Findings: The proposed restoration activities are intended to conserve water quality and provide for wildlife and fisheries resources. The overall goals of the project are to restore and enhance aquatic, riparian, and wetland habitats along Beaver Creek; improve stream, wetland, and floodplain functions with the natural area; and protect vegetative and wildlife corridors. The subject application seeks to increase the quantity and quality of the site's stream, floodplain, and upland habitat to benefit fish, wildlife, and water quality. The proposed work will enhance stream complexity and cover using large wood in the stream channels, improve fish passage to the tributary areas and floodplain (in high water events), revegetate exposed areas, and restore hydrologic function to the floodplain and historic wetland areas. The proposed improvements will also increase habitat for wildlife and provide suitable in-stream and off-channel habitat for adult and juvenile fish. This standard is met.

F. Limit impervious surface areas in the Flood Management Area.

Findings: The application does not propose the development of any impervious surfaces. This standard is not applicable or is otherwise met.

G. Maintain flood storage capacity. The developer is required to offset new fill placed in the floodplain by excavating an additional flood-able area to replace the lost flood storage area, preferably at hydrologically equivalent sites. All development proposals in the SFHA shall provide compensatory mitigation for impacts to flood storage, water infiltration, and riparian vegetation to ensure that new development does not increase flood hazards on other properties. A mitigation plan shall be submitted with the land use application. All required actions derived from that plan shall be completed prior to issuance of a Certificate of Occupancy, a Certificate of Completion for a subdivision, or the final building inspection, as applicable. Balanced cut and fill is required for permitted development in the Flood Management Area. Excavation and fill shall be performed in a manner to maintain or increase flood storage and conveyance capacity and not increase design flood elevations. A professional engineer registered in Oregon must certify that the development will not result in any increase in flood levels throughout the SFHA during the occurrence of the base flood discharge.

Finding: The restoration proposes to stabilize and restore open space natural area along a stretch of South Beaver Creek. The proposed activities will remove the current encroachments to the Beaver Creek floodplain and restore the natural stream, wetlands, and floodplain functions. Natural vegetation and natural stream ecology will be allowed to dominate: the proposed project seeks to reinvigorate those processes that will support a mosaic of channels and wetlands over the larger floodplain surface to allow floodwaters to be stored and more appropriately conveyed through the project area and watershed.

Restoring natural processes to the site requires removing instream structures and reconnecting the creek channel to the floodplain through grading. Other restoration activities include installing large wood and revegetating with native plants. The bank surrounding an existing stormwater outfall will be stabilized to decrease further erosion and further improve the function of the floodplain.

The application includes documentation prepared by a registered civil engineer that demonstrates that the restoration project will be performed in a manner to maintain or increase flood storage and conveyance capacity and not increase design flood elevations. *See* Exhibit 7 for the Net-rise Analysis Technical Memo. This standard is met.

> *1. All fill placed at or below the design flood elevation in the Flood Management Area shall be balanced with at least an equal volume or amount of soil material removal. The development shall be designed to minimize development within the Flood Management Area and amount of fill necessary. Balanced cut and fill may be used to elevate structures but shall not be used for density transfer. Residential density must be calculated prior to changes to the floodplain as a result of balanced cut and fill.*

Finding: The project is designed to balance material cut and fill. Imported material will be limited to logs, and the larger material required for the proposed roughened channel at the flashboard dam. Off-haul will consist of concrete, CMU blocks, and grouted rocks associated with existing weir and cistern. The application includes documentation prepared by a registered civil engineer that demonstrates that the restoration project will balance cut and fills. *See* Exhibit 7. This standard is met.

> *2. Excavation shall not be counted as compensating for fill if such areas will be filled with water in non-storm winter conditions.*

Findings: The restoration project is designed to store floodwaters at the 2-year flood stage and is intended to reduce or mitigate the impact of these floodwaters. It is not expected to be filled with water in non-storm winter conditions. This standard is met.

> *3. The cumulative effect of any proposed development shall not increase the water surface elevation of the base flood. Onsite flood storage capacity shall not decrease as a result of development, vegetation removal, or excavation.*

Findings: The application does not propose activities that increase the water surface elevation. Cascade Environmental Group/Otak evaluated water surface and hydraulic conditions for the proposed project and demonstrated no impacts to the 100-year floodplain

elevation. As intended by the project design, hydraulic modeling projects slight local increase to water surface elevation directly upstream of the proposed wood structures that will encourage stream flows into side channel habitats. The slight increase in water surface elevation from the addition of large wood to the system and the slight decrease in water surface elevation from removal of the existing weir and cistern meet the no-rise criteria. The flood carrying capacity in the project area will be maintained. In addition, the proposed activities will not alter the watercourse, modify the floodplain boundaries, or modify base flood elevations. This standard is met.

> *4. A "No-Rise" certification is required for any fill or permitted development within the floodway pursuant to Section 60.3(d)(3) of the National Flood Insurance Program.*
>
> > *a. The "No-Rise" supporting data and a copy of the engineering certification must be submitted to, and reviewed by, the City prior to approval of development, and the data shall be submitted with the Floodplain Development Permit.*
> >
> > *b. The "No-Rise" certification and supporting technical data must stipulate no impact on the 100-year flood elevations, floodway elevations, or floodway widths at the new cross-sections and at all existing cross sections anywhere in the model.*
> >
> > *c. A sample "No-Rise" certification is available in the Community Development Department.*

Findings: The application includes documentation prepared by a registered civil engineer that demonstrates that the restoration project will not result in an increase in floodplain area on other properties; will not reduce natural flood storage volume; and will not result in an increase in erosive velocity of the stream that may cause channel scouring or reduced slope stability downstream of the site. *See* Exhibit 7 for the No Net-rise Analysis Technical Memo.

> *5. All new buildings built on fill in the regulatory floodplain shall be constructed on fill….*

Findings: This is a building standard and applicant is not proposing activities intended to be regulated by this standard. This standard is not applicable.

> *6. When a project proposes development that will alter a watercourse, modify floodplain boundaries, or modify Base Flood Elevations, the application shall obtain a Conditional Letter of Map Change from FEMA prior to grading and filling the site and then obtain and submit the final Letter of Map Change prior to final inspections, or issuance of a certificate of completion, or issuance of the certificate of occupancy as required under this Section. When a project applicant has demonstrated through the Floodplain Development Permit that, in addition to the standards listed for Section 14.040.G, the following standards have been achieved, a Conditional Letter of Map Change/Letter of Map Change may not be required:*

Findings: The application proposed activities that maintain the flood carrying capacity. Cascade Environmental Group/Otak evaluated water surface and hydraulic conditions for the proposed project and demonstrated no impacts to the 100-year floodplain elevation. As intended by the project design, hydraulic modeling projects slight local increase to water surface elevation directly upstream of the proposed wood structures that will encourage stream flows into side channel habitats. The slight increase in water surface elevation from the addition of large wood to the system and the slight decrease in water surface elevation from removal of the existing weir and cistern meet the no-rise criteria. The flood carrying capacity in the project area will be maintained. In addition, the proposed activities will not alter the watercourse, modify the floodplain boundaries, or modify base flood elevations.

In addition, applicant has submitted joint removal fill permit requests with the Oregon Department of State Lands and the US Army Corps of Engineers, and a permit with the Oregon Department of Environmental Quality. *See* Exhibit 6. This standard is met.

> *7. All proposals that include engineering analysis for maintenance of flood storage capacity are subject to review by a qualified engineer licensed in the State of Oregon. The applicant shall be responsible for the cost of this independent review and will be advised at the time of application of this expectation.*

Findings: The application includes documentation prepared by a registered civil engineer that demonstrates that the restoration project will not result in an increase in floodplain area on other properties; will not reduce natural flood storage volume; and will not result in an increase in erosive velocity of the stream that may cause channel scouring or reduced slope stability downstream of the site. *See* Exhibit 7 for the Net-rise Analysis Technical Memo. This standard is met.

…

> *K. Nonresidential Construction. New construction, development, and substantial improvement of any commercial, industrial, or other nonresidential structure shall have the lowest floor, including basement, elevated to no less than two (2) feet above the base flood elevation; or, together with attendant utility and sanitary facilities, shall:*

Findings: These are building construction and utility standards. Applicant is not proposing any structures that are intended to be regulated by these standards. Applicant's team including registered professional engineers, is very experienced in river and creek restoration projects. The structural components are designed and certified to withstand loads and other factors associated with river and creek conditions, including high water flows. This standard is not applicable or is otherwise met.

> *L. Remove temporary fills. Temporary fills permitted during construction or emergency bank stabilization shall be removed if not in compliance with the balanced cut and fill standard of this Code or prior to issuance of a Certificate of Occupancy or release of any bond issued for the development.*

Findings: All temporary fills permitted during construction are for the purposes laid out in the approved restoration plan and will be removed following construction. This standard is met and can be imposed as a condition of approval.

M. Preserve and/or restore the vegetation corridor within the disturbed areas, and retain the existing tree canopy as established in Sections 4.316, Width of Vegetation Corridor, and 4.317, Methods for Determining Vegetation Corridors Next to Primary Protected Water Features, of this Chapter. An enhancement plan for disturbed areas shall be prepared and implemented to stabilize slopes to prevent landslides on slopes and sedimentation of water features. This plan shall provide for the replanting and maintenance of approved plant species designed to achieve pre-disturbance conditions.

Findings: The proposed restoration activities are intended to conserve water quality and enhance wildlife and fisheries resources. The subject application seeks to increase the quantity and quality of the site's stream, floodplain, and upland habitat to benefit fish, wildlife, and water quality. The proposed work will enhance stream complexity and cover using large wood in the stream channels, improve fish passage to the tributary areas and floodplain (in high water events), revegetate exposed areas, and restore the hydrologic function to the floodplain. The proposed improvements will also increase habitat for wildlife and provide suitable in-stream and off-channel habitat for salmon and steelhead in an area where physical habitat quality, including off-channel habitat, has been identified as a limiting factor. Large wood will be incorporated into the natural environment and will not adversely affect any scenic qualities of the area. The project itself will enhance scenic resource and will not increase erosion concerns. This standard is met.

N. Maintain or reduce stream temperatures.

Findings: The purpose of the proposed restoration project is to stabilize, restore and enhance the water resource and fish and wildlife habitat with the resource area. South Beaver Creek has been heavily impacted by land use modifications through the watershed. The cumulative impacts of forced channelization, bank hardening, encroachment into riparian areas and floodplains, and infilling wetlands is readily apparent. Increases in the magnitude and frequency of flood events exacerbate channel incision, extensive bank erosion, and loss of in-channel habitat including the number of stable, deep pools and large wood structures. Annual floods that have access to floodplains allow for the creation of off-channel habitats and refugia. Off-channel habitats allow juvenile salmonids the opportunity to escape adverse conditions in the main channel resulting from high flows, high temperatures, and high pollutant loads, as well as provides feeding and other rearing opportunities. Flooding also allows for the formation of large wood jams. Stable and persistent large wood structures create important hydraulic controls that provide a variety of functions for fish and in-channel processes including deep pool formation, channel bed stability, and erosion control.

Upon completion, the impacted water resource area will be restored to a better condition. The resource area, function, and value will be enhanced. This standard is met.

O. Minimize erosive velocities, nutrient, and pollutant loading into water. Use filtering, infiltration, and natural water purification for stormwater runoff in compliance with the Erosion Control and Water Quality Standards of Section 5.600 of this Code. The applicant's engineering plans shall certify that runoff and sedimentation from the site will comply with the standards of Section 5.600 of this Code.

Findings: The application proposes conservation work to protect water quality and provide for wildlife and fisheries resources. The proposed project seeks to increase the quantity and quality of the site's stream, floodplain, and upland habitat to benefit fish, wildlife, and water quality. These activities will reduce erosive velocities. Stable and persistent large wood structures create important hydraulic controls that provide a variety of functions for fish and in-channel processes including deep pool formation, channel bed stability, and erosion control.

In addition, the proposed restoration project has been designed to avoid and minimize any impacts to water quality. The proposed project falls under U.S. Army Corps of Engineers SLOPES V – Restoration programmatic opinion and project engineering, best management practices, design criteria, and general construction comply with the criteria identified in the SLOPES V programmatic opinion. All staging and mobilization activities will take place above the ordinary high-water mark (OHWM). In-stream restoration activities necessitate work below OHWM; however, the project has been designed to minimize construction time below OHWM reducing impacts to the site. Project design measures include sequencing work to minimize activity below OHWM, stream dewatering in coordination with Oregon Department of Fish and Wildlife, fish exclusion and work area isolation, and upland staging areas. Work in and around flowing water involving heavy equipment and earth movement will take place during the July 15th to August 31st in-water work period.

The project does not involve any dredging and no permanent ground disturbance or impervious surface is proposed. No stockpiling or staging material will occur waterward of the OHWM. Temporary construction impacts are turbidity. No changes to the hydrology or the hydrolytic conditions of the site are anticipated as a result of this work.

All upland fill surfaces will be regraded and all disturbed areas, including staging areas, will be seeded with native erosion control mix and straw mulched. Comprehensive native revegetation of the site is planned following construction. This standard is met.

> *P. Anchoring. All new construction, development, and substantial improvements shall be anchored to prevent flotation, collapse, or lateral movement of the structure.*

Findings: These are building construction and utility standards. Applicant is not proposing any structures that are intended to be regulated by these standards. Applicant's team, including registered professional engineers, is very experienced in river and creek restoration projects. The structural components are designed and certified to withstand loads and other factors associated with river and creek conditions, including high water flows. *See* Exhibits 5 and 7. This standard is not applicable or is otherwise met.

> *Q. Construction Materials and Methods. All new construction, development, and substantial improvements shall use flood-resistant materials in accordance with the requirements of FEMA Technical Bulletin 2-93 "Flood Resistant Materials Requirements" and utilities shall be designed and installed in accordance with FEMA Publication 348 "Protecting Building Utilities from Flood Damage."*

Findings: These are building construction and utility standards. Applicant is not proposing any structures that are intended to be regulated by these standards. Applicant's team, including registered professional engineers, is very experienced in river and creek restoration

projects. The structural components are designed and certified to withstand loads and other factors associated with river and creek conditions, including high water flows. *See* Exhibits 5 and 7. This standard is not applicable or is otherwise met.

R. Utilities and Roads.

Findings: These standards do not apply.

S. For any alterations or relocations of a watercourse the developer shall be required to notify the Oregon Department of State Lands, the Oregon Department of Land Conservation and Development, and adjacent communities that will be impacted by the alteration or relocation. The developer shall be responsible for obtaining and submitting copies of any required project permits required by the Oregon Department of State Lands, U.S. Army Corps of Engineers, Oregon Department of Fish and Wildlife Service, Federal Emergency Management Agency, and other affected agencies, as applicable. The flood carrying capacity of the altered or relocated watercourse shall not be diminished and shall be maintained. Alterations will require a "No-Rise" certification for changes to the floodway, and changes that relocate the floodplain will require a Letter of Map Change (LOMC) from FEMA or may require a revised Flood Insurance Study and Flood Insurance Rate Map for the City. The burden for all engineering studies required to process these forms is the applicant's, not the City's.

Findings: The application does not propose activities that alter or relocate the watercourse. Cascade Environmental Group/Otak evaluated water surface and hydraulic conditions for the proposed project and demonstrated no impacts to the 100-year floodplain elevation. As intended by the project design, hydraulic modeling projects slight local increase to water surface elevation directly upstream of the proposed wood structures that will encourage stream flows into side channel habitats. The slight increase in water surface elevation from the addition of large wood to the system and the slight decrease in water surface elevation from removal of the existing weir and cistern meet the no-rise criteria. The flood carrying capacity in the project area will be maintained. In addition, applicant has submitted joint removal fill permit requests with the Oregon Department of State Lands and the US Army Corps of Engineers. *See* Exhibit 6. This standard is met.

…

14.045 Floodways

Located within areas of special flood hazard established in Section 14.010.B of this Chapter are areas designated as floodways. Since the floodway is an extremely hazardous area due to the velocity of floodwaters which carry debris, potential projectiles, and erosion potential, the following provisions apply:

A. Except as provided in Section 14.045.C, encroachments, including fill, new construction, development, substantial improvements, and other development are prohibited unless certification by a registered professional civil engineer is provided demonstrating through hydrologic and hydraulic analyses performed in accordance with

standard engineering practice that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.

Findings: The application does not propose development intended to be regulated by this standard. The proposed activities are restoration of the natural stream, wetland, and floodplain functions. Cascade Environmental Group/Otak evaluated water surface and hydraulic conditions for the proposed project and demonstrated no impacts to the 100-year floodplain elevation. As intended by the project design, hydraulic modeling projects slight local increase to water surface elevation directly upstream of the proposed wood structures that will encourage stream flows into side channel habitats. The flood carrying capacity in the project area will be maintained. The application includes documentation prepared by a registered civil engineer that demonstrates that the restoration project will be performed in a manner to maintain or increase flood storage and conveyance capacity and not increase design flood elevations. *See* Exhibit 7 for the Net-rise Analysis Technical Memo.

In addition, applicant has submitted joint removal fill permit requests with the Oregon Department of State Lands and the US Army Corps of Engineers. *See* Exhibit 6. This standard is met.

B. If Section 14.040.A is satisfied, all new construction, development, and substantial improvements shall comply with all applicable flood hazard reduction provisions of Section 14.040 of this Code.

Findings: Applicant has demonstrated compliance with the applicable flood hazard reduction provisions of Section 14.040 above. This standard is met.

C. Floodways and other high hazard zones are extremely hazardous areas due to exceptionally high flood and erosion potential. In these areas, the development actions permitted in high hazard zones shall be limited to water-dependent uses; bridges and other location-dependent uses; habitat restoration activities consistent with Sections 14.035.C(2); low-intensity recreation; and bioengineered banks.

Findings: The restoration proposes to stabilize and restore open space natural area along a stretch of South Beaver Creek. The proposed activities will remove the current encroachments to the Beaver Creek floodplain and restore the natural stream, wetlands, and floodplain functions. Natural vegetation and natural stream ecology will be allowed to dominate: the proposed project seeks to reinvigorate those processes that will support a mosaic of channels and wetlands over the larger floodplain surface to allow floodwaters to be stored and more appropriately conveyed through the project area and watershed.

Restoring natural processes to the site requires removing instream structures and reconnecting the creek channel to the floodplain through grading. Other restoration activities include installing large wood and revegetating with native plants. The bank surrounding an existing stormwater outfall will be stabilized to decrease further erosion and further improve the function of the floodplain.

Applicant's team, including registered professional engineers, is very experienced in river and creek restoration projects. The structural components are designed and certified to

withstand loads and other factors associated with river and creek conditions, including high water flows. This standard is met.

14.050 Before Regulatory Floodway

In areas where a regulatory floodway has not been designated, no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.

Findings: These standards do not apply.

14.055 Flood Management Area Variance Procedures

Variances from dimensional standards of the underlying zoning district or other provisions of this Code not part of this Chapter shall be processed in accordance with Section 6.800 of this Code.

Findings: These standards do not apply.

14.060 Prescribed Conditions for the Rehabilitation or Replacement of Pre-Existing Structures

The replacement of pre-existing structures or development damaged or destroyed accidentally is subject to following standards:

Findings: These standards do not apply.

Section V: Conclusion

Applicant has demonstrated compliance with all applicable criteria with findings supported by substantial evidence. Applicant respectfully requests that its application and permit requests be approved.

EXHIBIT 1

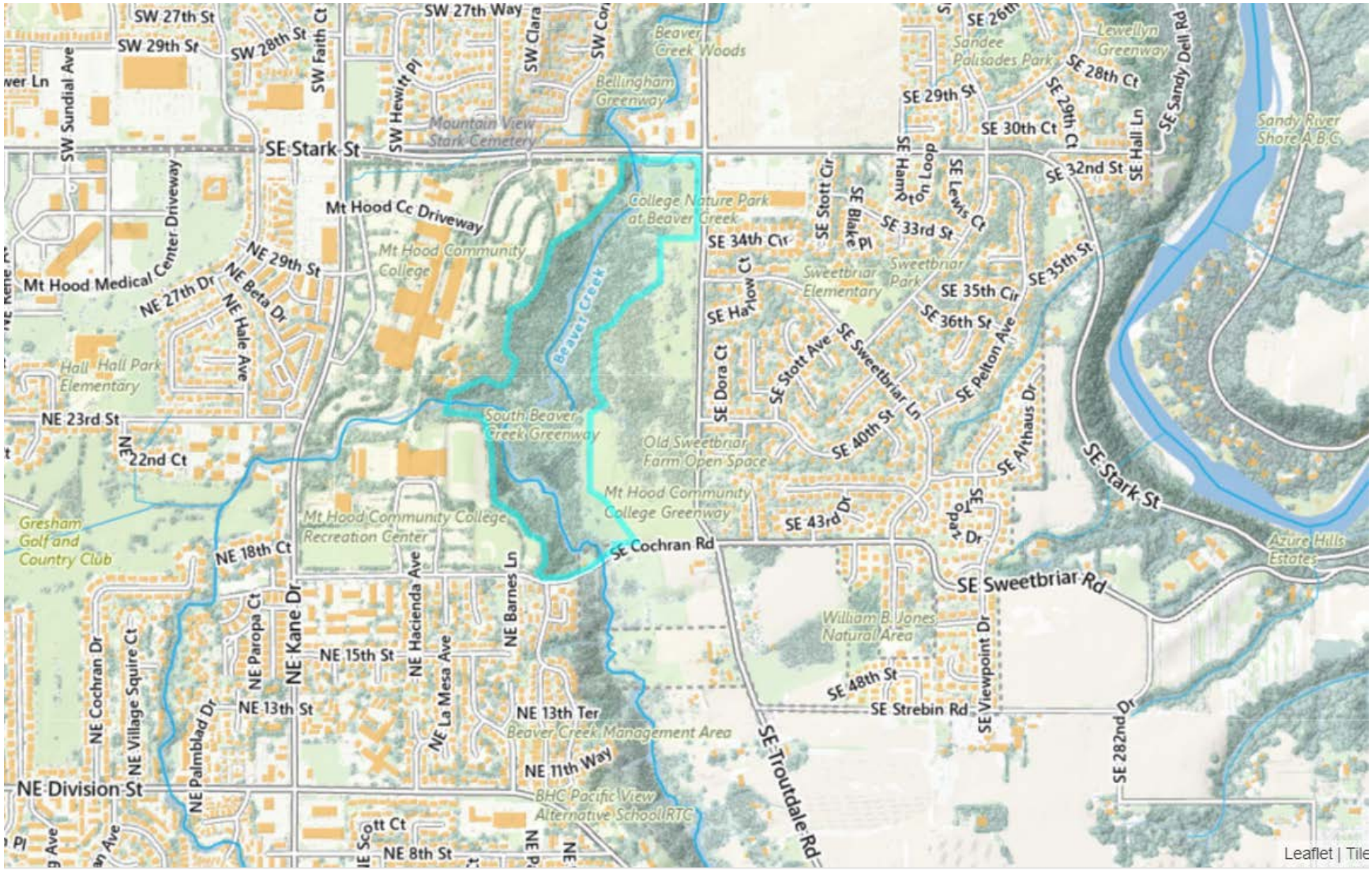

SW 27th St
SW 29th St
SW 28th St
SW Faith Ct
SW 27th Way
SW Clara
SW Hewitt Pl
SW Sundial Ave
wer Ln
Beaver Creek Woods
Bellingham Greenway
Mountain View Stark Cemetery
SE Stark St
Mt Hood Cc Driveway
College Nature Park at Beaver Creek
Mt Hood Community College
Mt Hood Medical Center Driveway
NE 29th St
NE 27th Dr
NE Beta Dr
NE Hale Ave
Beaver Creek
Hall Hall Park Elementary
NE 23rd St
NE 22nd Ct
South Beaver Creek Greenway
Old Sweetbriar Farm Open Space
Mt Hood Community College Greenway
Mt Hood Community College Recreation Center
Gresham Golf and Country Club
NE 18th Ct
NE Kane Dr
NE Cochran Dr
NE Village Squire Ct
NE Paropa Ct
NE Palmblad Dr
NE 15th St
NE Hacienda Ave
NE Barnes Ln
NE La Mesa Ave
NE 13th St
NE 13th Ter
Beaver Creek Management Area
NE 11th Way
NE Division St
BHC Pacific View Alternative School/RTC
NE 8th St
SE Cochran Rd
SE 43rd Dr
SE Topaz Dr
SE Sweetbriar Rd
William B. Jones Natural Area
SE 48th St
SE Strebin Rd
SE Viewpoint Dr
SE Troutdale Rd
SE 282nd Dr
SE 26th
Lewellyn Greenway
Sandee Palisades Park
SE 28th Ct
SE 29th St
SE 29th Ct
SE 30th Ct
SE Sandy Dell Rd
SE Hall Ln
Sandy River Shore A, B, C
SE 32nd St
SE Stott Cir
SE Blake Pl
SE 33rd St
SE Lewis Ct
SE Harlow Loop
SE 34th Cir
Sweetbriar Elementary
Sweetbriar Park
SE 35th Cir
SE 35th St
SE 36th St
SE Harlow Ct
SE Dora Ct
SE Stott Ave
SE Sweetbriar Ln
SE Pelton Ave
SE Althaus Dr
SE 40th St
Azure Hills Estates
Leaflet | Tile

EXHIBIT 2

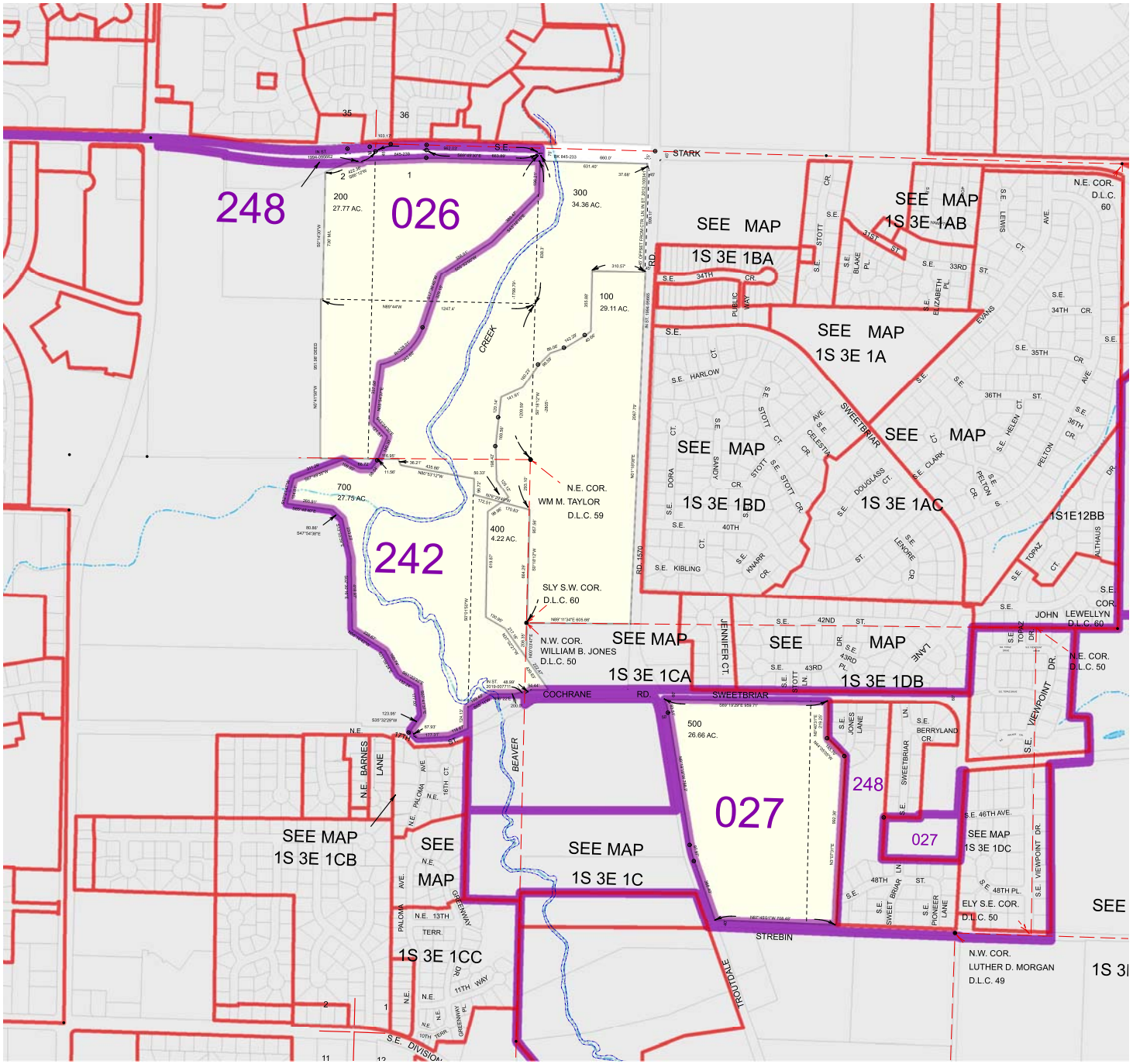

Mt Hood Cc Driveway
Mt Hood Community College
College Nature Park at Beaver
S Troutdale Rd
SE Dora Ct
South Beaver Creek Greenway
Kelly Creek
Mt Hood Community College Greenway
Mt Hood Community College Recreation Center
SE Cochran Rd

THIS MAP WAS PREPARED FOR ASSESSMENT PURPOSE ONLY

SECTION 1 T.1S. R.3E. W.M.
MULTNOMAH COUNTY
1" = 400'

EXHIBIT 3

1S 3E 1
TROUTDALE



1S 3E 1
TROUTDALE

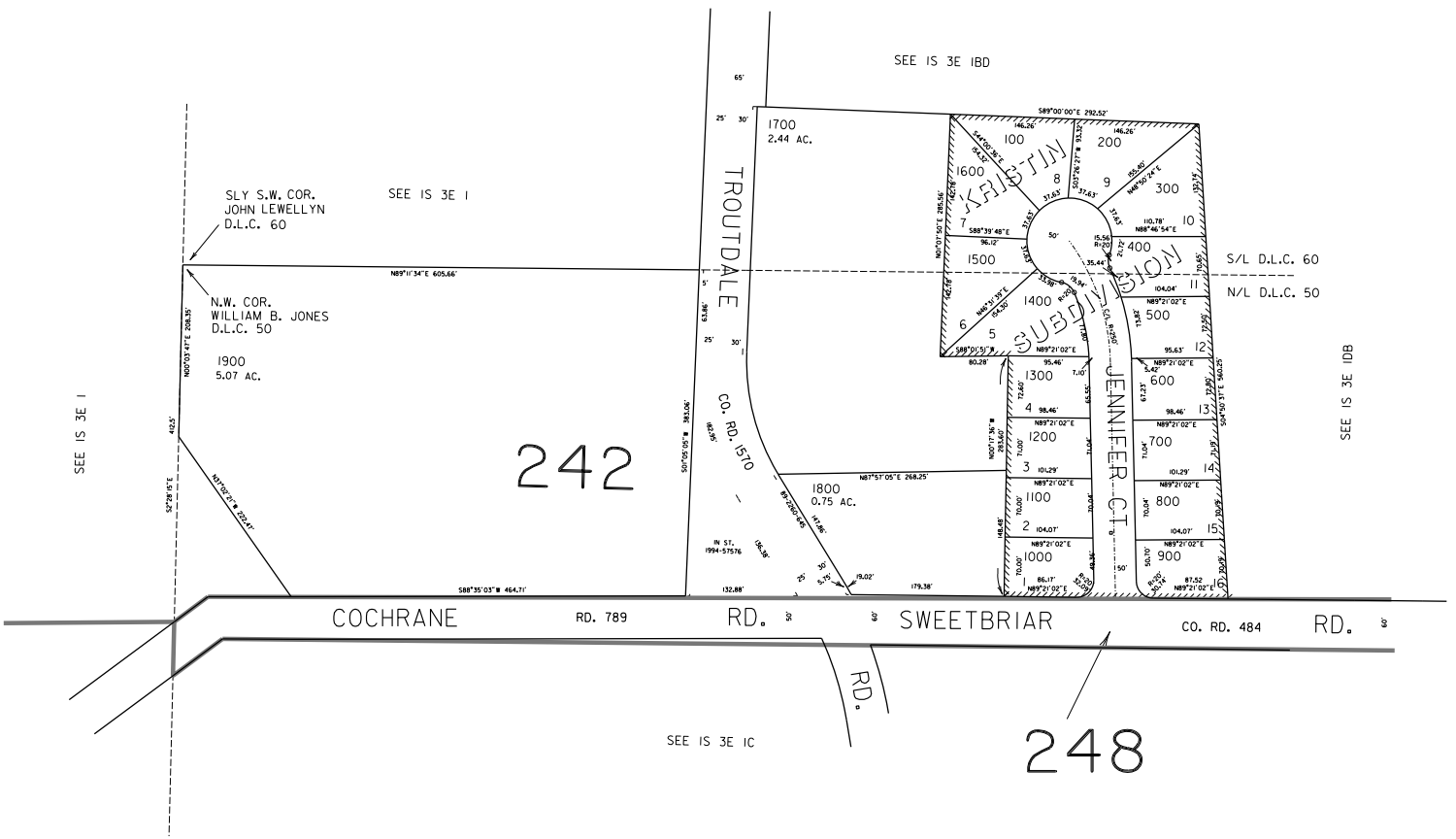
7/24/2019

THIS MAP WAS PREPARED FOR ASSESSMENT PURPOSE ONLY

NE1/4 SW1/4 SEC. 1 T.1S. R.3E. W.M.
MULTNOMAH COUNTY
1" = 100'

EXHIBIT 3

1S 3E 1CA
TROUTDALE



1S 3E 1CA
TROUTDALE

EXHIBIT 4

AFTER RECORDING RETURN TO:
METRO
600 NE Grand Avenue
Portland, Oregon 97232

Attn: Parks Department

Until a change is requested all tax statements shall be sent to the following address:

same as above

Escrow No: 5000-11590-CE
Order No: 218531

Recorded in MULTNOMAH COUNTY, OREGON
C. Swick, Deputy Clerk
A37 6 ATLJH
Total : 46.00

2004-130172 07/16/2004 01:54:19pm
Recorded in MULTNOMAH COUNTY, OREGON
C. Swick, Deputy Clerk
A37 6 ATKLM
Total : 30.00

2006-027920 02/14/2006 03:43:27pm

WARRANTY DEED - STATUTORY FORM
(INDIVIDUAL or CORPORATION)

MT. HOOD COMMUNITY COLLEGE, aka EASTSIDE AREA EDUCATION DISTRICT,
aka MT. HOOD COMMUNITY COLLEGE DISTRICT

THIS DEED IS BEING RE-RECORDED TO CORRECT THE GRANTOR'S NAME

Grantor, conveys and warrants to METRO, a municipal corporation and political subdivision of the State of Oregon

Grantee, the following described real property free of encumbrances except as specifically set forth herein:

(Continued)

SEE ATTACHED EXHIBIT "A", made a part hereof by reference.

This instrument will not allow use of the property described in this instrument in violation of applicable land use laws and regulations. Before signing or accepting this instrument, the person acquiring fee title to the property should check with the appropriate city or county planning department to verify approved uses and to determine any limits on lawsuits against farming or forest practices as defined in ORS 30.930.

ENCUMBRANCES:

(Continued)

SEE ATTACHED EXHIBIT "B", made a part hereof by reference.

The true consideration for this conveyance is $196,020.00

Dated July 14, 2004 ; if a corporate grantor, it has caused its name to be signed by order of its board of directors.

Robert M. Silverman
MT. HOOD COMMUNITY COLLEGE
BY: Robert M. Silverman
ITS: President

STATE OF OREGON, County of Multnomah)ss.
This instrument was acknowledged before me on _____,
by _____.
This instrument was acknowledged before me on July 14, 2004,
by Robert M. Silverman as President
of Mt. Hood Community College

June Jacobs
Notary Public for Oregon
My commission expires: March 22, 2008

OFFICIAL SEAL
JUNE JACOBS
NOTARY PUBLIC-OREGON
COMMISSION NO. 378762
MY COMMISSION EXPIRES MAR. 22, 2008

6

-530 11570-CE 5000-11590-CE Chicago Title Insurance Co. of Oregon

EXHIBIT 4

This conveyance is approved as to form and content and accepted by Metro.

METRO, a municipal corporation

By: _____
Michael Jordan, Chief Operating Officer

OFFICIAL SEAL
KAREN M. STARIN
NOTARY PUBLIC-OREGON
COMMISSION NO. 359850
MY COMMISSION EXPIRES SEPT. 29, 2006

State of Oregon)
)ss.
County of Multnomah)

On this 15th day of July, 2004, before me, the undersigned, Karen M. Starin, a Notary Public for Oregon, personally appeared William Stringer for Michael Jordan, as Chief Operating Officer for Metro, a municipal corporation, personally known to me to be the identical individual whose name is subscribed to this instrument and acknowledged to me that he executed the same freely and voluntarily.

_____
Notary Public for Oregon
My commission expires: 9/29/06

EXHIBIT 4

LEGAL DESCRIPTION

EXHIBIT "A"

PARCEL I:

A tract of land in the West one-half of Section 1, Township 1 South, Range 3 East, Willamette Meridian, in the County of Multnomah and State of Oregon, to-wit:

Beginning at the intersection of the South line of SE Stark Street (County Road No. 924) with the Northerly extension of the East line of the Wm. M. Taylor Donation Land Claim No. 59, which point bears South 89°49'00" East, 962.90 feet and South 00°18'46" West, 75.00 feet from the Northwest corner of said Section 1; thence South 89°49'00" East along the South line of SE Stark Street, 631.40 feet to the West line of S. Troutdale Road, County Road No. 1570; thence South 21°36'11" East along said West line, 37.68 feet; thence continuing along said West line, South 01°05'05" West, 599.11 feet to a 5/8-inch iron rod; thence leaving said West line, West, 310.57 feet to a 5/8-inch iron rod; thence South, 355.88 feet to a 5/8-inch iron rod; thence South 52°18'20" West, 40.66 feet to a 5/8-inch iron rod; thence South 57°34'37" West, 142.29 feet to a 5/8-inch iron rod; thence South 68°19'02" West, 86.06 feet to a 5/8-inch iron rod; thence South 44°39'58" West, 99.59 feet to a 5/8-inch iron rod; thence South 32°54'43" West, 160.23 feet to a 5/8-inch iron rod; thence South 64°38'21" West, 141.91 feet to a 5/8-inch iron rod; thence South 05°12'55" West, 120.14 feet to a 5/8-inch iron rod; thence South 04°20'58" West, 169.56 feet to a 5/8-inch iron rod; thence South 02°50'29" East, 198.42 feet to a 5/8-inch iron rod; thence South 35°57'22" East, 125.12 feet to a 5/8-inch iron rod; thence South 55°18'44" West, 50.33 feet; thence North 76°29'45" West, 172.51 feet; thence North 00°01'13" East, 98.72 feet; thence North 80°53'12" West, 435.86 feet; thence North 23°53'12" West, 36.21 feet to the North line of said Taylor Donation Land Claim; thence South 89°06'48" West along said North line, 116.95 feet; thence leaving said North line, North 20°43'07" East, 140.30 feet to a 5/8-inch iron rod; thence North 43°24'06" West, 121.51 feet to a 5/8-inch iron rod; thence North 05°55'01" East, 337.58 feet to a 5/8-inch iron rod and point of nontangent curvature; thence along the arc of a 328.01 foot radius curve left (the radius point of which bears North 12°18'05" West) through a central angle of 59°51'09", 342.65 feet (chord bears North 47°46'20" East 327.28 feet) to a 5/8-inch iron rod; thence North 17°37'08" East, 329.15 feet to a 5/8-inch iron rod; thence North 55°52'24" East, 356.01 feet to a 5/8-inch iron rod; thence North 43°16'39" East, 389.52 feet to the Northerly extension of the East line of said Taylor Donation Land Claim; thence North 00°18'46" East, 196.21 feet to the point of beginning.

Including an easement for ingress and egress purposes over a 30-foot wide strip of land, the centerline of said strip being more particularly described as follows:

Beginning at a point on the North line of said Section 1, which point bears South 89°49'30" East, 209.83 feet from the Northwest corner of said Section 1; thence South 00°44'53" West, 131.98 feet to the point of curve left of a 100.00-foot radius curve; thence along the arc of said curve left through a central angle of 26°17'47", 45.90 feet (chord bears South 12°24'00" East, 45.49 feet); thence South 25°32'54" East, 331.65 feet to the point of curve right of a 225.00-foot radius curve; thence along the arc of said curve right though a central angle of 41°03'01", 161.20 feet (chord bears South 05°01'24" East, 157.78 feet); thence South 15°30'07" West, 127.82 feet; thence South 74°29'53" East, 56.72 feet to the Westerly line of the above described "BEAVER CREEK BASIN" and the terminus of this strip.

The sidelines of the strip shall be lengthened or shortened as necessary to meet the South line of SE Stark Street and the Westerly line of the above-described "BEAVER CREEK BASIN".

PARCEL II:

A tract of land in the West one-half of Section 1 and the East one-half of Section 2, Township 1 South, Range 3 East, Willamette Meridian, in the County of Multnomah and State of Oregon, to-wit:

Commencing at the Easterly Southwest corner of the John Lewellyn Donation Land Claim No. 60; thence South 00°03'47" West along the West line of the William B. Jones Donation Land Claim No. 50, 208.35 feet to the true point of beginning of the tract herein described; thence leaving said West line, South 37°02'21" East, 222.47 feet to the North line of Cochran Road, County Road No. 789; thence South 88°35'03" West along said North line, 94.44 feet; thence continuing along said North line, South 54°23'03" West, 48.99 feet to the West line of said Jones Donation Land Claim; thence North 00°03'47" East along said West line, 2.54 feet to the North line of that certain tract of land described in Deed Book 963, Page 1458, recorded December 17, 1973, Multnomah County Deed Records; thence tracing the boundary of said Book 963, Page 1458 tract along the following courses and distances:
South 88°35'03" West, 200.00 feet; thence South 57°24'03" West, 159.40 feet; thence South 00°29'27" East, 124.13 feet to the North line of said Cochran Road; thence South 65°31'03" West along said North line, 118.67 feet; thence continuing along said North line, South 85°31'03" West, 177.31 feet; thence continuing along said North line, North 60°27'57" West, 67.97 feet; thence leaving said North line, North

Order No: 218531

LEGAL DESCRIPTION

35°32'52" East, 123.56 feet to a 5/8-inch iron rod; thence North 07°41'14" West, 177.00 feet to a 5/8-inch iron rod; thence North 61°23'09" West, 132.34 feet to a 5/8-inch iron rod; thence North 31°09'01" West, 160.74 feet to a 5/8-inch iron rod; thence North 58°16'18" West, 228.67 feet to a 5/8-inch iron rod; thence North 02°29'52" West, 418.97 feet to a 5/8-inch iron rod; thence North 13°59'31" West, 233.23 feet to a 5/8-inch iron rod; thence North 47°54'14" West, 80.86 feet; thence North 83°48'17" West, 265.91 feet to a 5/8-inch iron rod; thence North 12°22'10" East, 154.01 feet to a 5/8-inch iron rod; thence North 67°49'58" East, 311.29 feet to a 5/8-inch iron rod; thence South 64°08'09" East, 109.93 feet to a 5/8-inch iron rod; thence South 89°31'16" East, 68.72 feet to a 5/8-inch iron rod; thence North 36°00'55" East, 58.34 feet to a 5/8-inch iron rod; thence North 20°43'07" East, 11.55 feet to the North line of the Wm. M. Taylor Donation Land Claim No. 59; thence North 89°06'48" East along said North line, 116.95 feet; thence leaving said North line, South 23°53'12" East, 36.21 feet; thence South 80°53'12" East, 435.86 feet; thence South 00°01'13" West, 98.72 feet; thence South 76°29'45" East 172.51 feet; thence South 55°18'44" West, 96.96 feet to a 5/8-inch iron rod; thence South 00°01'13" West, 619.87 feet to a 5/8-inch iron rod; thence South 60°39'54" East, 130.95 feet to a 5/8-inch iron rod; thence South 37°02'21" East, 217.16 feet to the true point of beginning.

Encumbrances, continued

EXHIBIT 'B'

1. Taxes, including the current fiscal year, not assessed because of School Districts Exemption. If the exempt status is terminated under the statute prior to the date on which the assessment roll becomes the tax roll in the year in which said taxes were assessed, an additional tax may be levied.
   Code: 026
   Property ID No.: R337205
   Alternate Account No.: R993010060
   Map No.: 1S3E01
   Tax Lot No.: 00300

   Taxes, including the current fiscal year, not assessed because of School Districts Exemption. If the exempt status is terminated under the statute prior to the date on which the assessment roll becomes the tax roll in the year in which said taxes were assessed, an additional tax may be levied.
   Code: 026
   Property ID No.: R337219
   Alternate Account No.: R993010240
   Map No.: 1S3E02
   Tax Lot No.: 00700

2. Rights of the public and of governmental bodies in and to that portion of the premises herein described lying below the high water mark of Kelly Creek and Beaver Creek.

3. The rights of the public in and to that portion of the premises herein described lying within the limits of highways, streets and roads.

4. An easement created by instrument, including terms and provisions thereof;
   Dated: January 27, 1972
   Recorded: February 29, 1972
   Book: 842
   Page: 1000
   In Favor Of: Multnomah County
   For: Slope
   Affects: Northerly portion of Parcel I

5. Sanitary Sewer Agreement, including the terms and provisions thereof;
   Dated: October 10, 1974
   Recorded: October 18, 1974
   Book: 1012
   Page: 945
   By and Between: The City of Gresham, Mt. Hood Community College and the City of Troutdale

6. Easement Agreement, including the terms and provisions thereof;
   Dated: February 22, 1984
   Recorded: March 21, 1984
   Book: 1734
   Page: 1468
   By and Between: Mount Hood Community College and the City of Troutdale, a municipal corporation
   For: The purposes of constructing, maintaining, operating, inspecting and repairing public utilities and improvements
   Affects: Easterly portion of Parcel II

7. An easement created by instrument, including terms and provisions thereof;
   Dated: May 18, 1994
   Recorded: June 21, 1994
   Recorder's Fee No.: 94-95663
   In Favor Of: Multnomah County, a political subdivision of the State of Oregon
   For: Slope and drainage
   Affects: Northerly portion of Parcel I

Encumbrances, continued

8. An easement created by instrument, including terms and provisions thereof;
   Dated: May 18, 1994
   Recorded: June 21, 1994
   Recorder's Fee No.: 94095665
   In Favor Of: Multnomah County
   For: Slopes and utilities
   Affects: Easterly portion of Parcel I

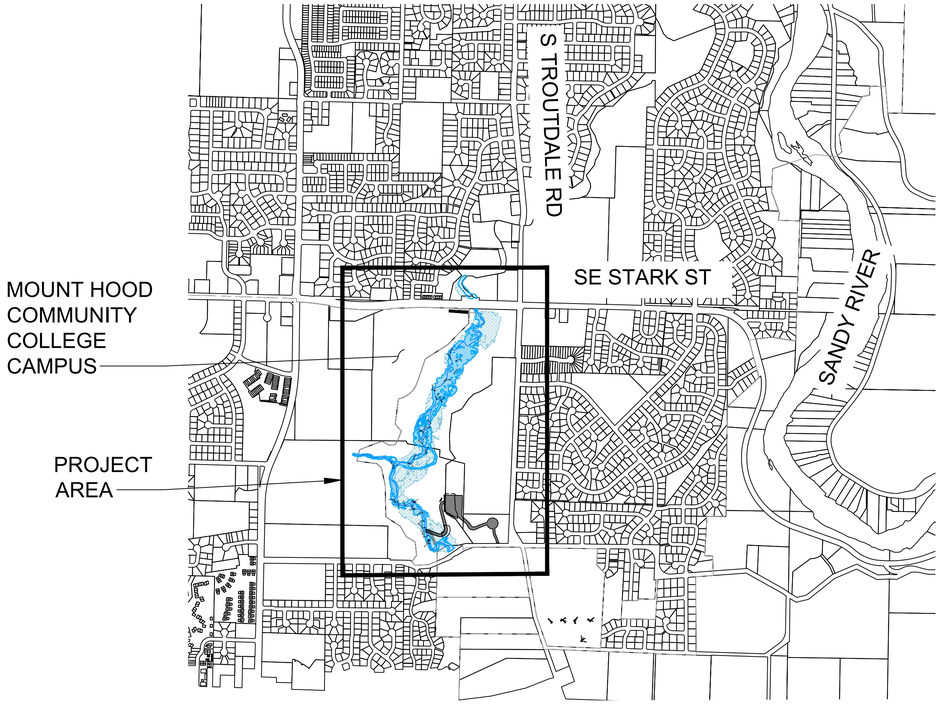
9. Well Agreement, including the terms and provisions thereof;
   Dated: September 4, 1997
   Recorded: March 5, 1998
   Recorder's Fee No.: 98034398
   By and Between: Mt. Hood Community College and the Water Resources Department

10. Terms and provisions, including obligations for maintenance of easement as established by Oregon Law and by instrument,
    Recorded: April 15, 2002
    Recorder's Fee No.: 2002-067985

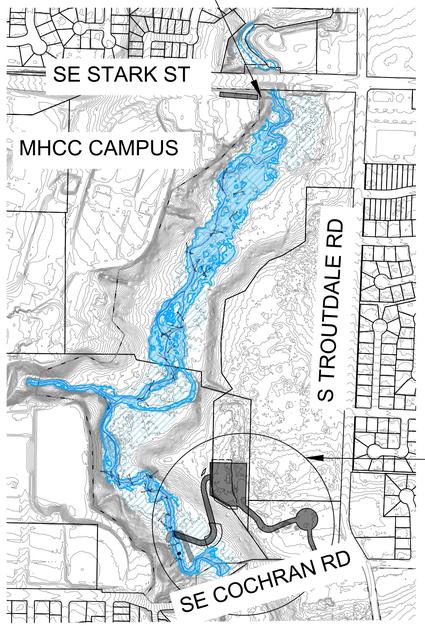
EXHIBIT 5

METRO - SOUTH BEAVER CREEK NATURAL AREA
RESTORATION AND HELICOPTER-PLACED LARGE WOOD PROJECT

MULTNOMAH COUNTY, OREGON



VICINITY MAP
N.T.S.



SE 130TH AVE PROJECT MAP
N.T.S.

CALL BEFORE YOU DIG
1-800-332-2344

ATTENTION EXCAVATORS: Oregon Law requires compliance with OAR 952-001-0010 through OAR 952-001-0090. These rules may be obtained by calling the Oregon Notification Center 503-232-1987 or at www.digsafelyoregon.com. Contractor must notify the center at least two working days before, but not more than ten days before, commencing excavation. The Contractor, in locating and protecting underground utilities, must comply with the regulations of O.R.S. 757.541 to 757.562 and 757.993.

APPLICANT / OWNER

NAME:	METRO
ADDRESS:	600 NE GRAND AVE PORTLAND, OR 97232
CONTACT:	BRIAN VAUGHN
PHONE:	503-797-1919

CIVIL ENGINEER

NAME:	OTAK, INC.
CIVIL ENGINEER:	ROD LUNDBERG, PE
ADDRESS:	808 SW THIRD AVENUE, SUITE 800 PORTLAND, OR 97204
PHONE:	(503) 415-2334

SHEET INDEX

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CONSULTANT

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METRO SOUTH BEAVER CREEK NATURAL AREA
TROUTDALE, OREGON
RESTORATION AND HELICOPTER-PLACED LARGE WOOD PROJECT
COVER SHEET

TITLE

#	DATE	DESCRIPTION

REVISIONS

DATUM

PTK / RPL
DRAWN BY / CHECKED BY

PRELIMINARY
STATUS

APRIL 19, 2023
DATE

21184
PROJECT NUMBER

G01

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Plotted: Apr 19, 2023 - 12:59pm Rod Lundberg L:\Project\21100\21184\04 CAD\ACAD\Dwg\21184_G01-G03.dwg Layout Name: G01

EXHIBIT 5

GENERAL NOTES:

THE CONTRACTOR SHALL ATTEND A PRE-CONSTRUCTION MEETING WITH OWNER AND OWNER'S REPRESENTATIVE PRIOR TO MOBILIZING TO SITE AND BEGINNING CONSTRUCTION.

ALL WORK SHALL CONFORM TO THE CURRENT EDITIONS OF STANDARD PLANS AND SPECIFICATIONS OF THE OREGON STATE DEPARTMENT OF TRANSPORTATION (ODOT) AND LOCAL STANDARDS UNLESS INDICATED OTHERWISE BY THE CONTRACT DOCUMENTS. IN CASE OF A CONFLICT BETWEEN THE REGULATORY STANDARDS OR SPECIFICATIONS, THE MORE STRINGENT WILL PREVAIL.

ODFW IN-WATER WORK PERIODS
WORK SHALL OCCUR DURING THE ODFW PERMITTED IN-WATER WORK PERIOD:
JULY 15-AUGUST 31, UNLESS OTHERWISE COORDINATED WITH ODFW AND APPROVED IN WRITING BY DSL.

EXISTING DATA
GIS DATA INCLUDING: AERIAL PHOTOGRAPHY, LIDAR, LAND OWNERSHIP, AND TRANSPORTATION ROUTES PROVIDED BY METRO.

SOILS
NO SUBSURFACE SOIL INVESTIGATIONS WERE COMPLETED AS PART OF THIS DESIGN. THE CONTRACTOR MAY COORDINATE WITH THE OWNER TO COMPLETE SUBSURFACE INVESTIGATIONS AT CONTRACTOR'S EXPENSE.

SUBSURFACE SOILS ARE EXPECTED TO BE SAND, GRAVEL, COBBLES, BOULDERS, AND SEDIMENTARY HARDPAN, AND MAY BE ENCOUNTERED AT THE SURFACE OR AT SHALLOW DEPTHS.

UTILITIES
THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR HAVING UTILITIES LOCATED PRIOR TO BEGINNING ANY CONSTRUCTION ACTIVITIES.

THE CONTRACTOR SHALL CALL (800-332-2344) FOR UTILITY LOCATES PRIOR TO CONSTRUCTION.

THE CONTRACTOR SHALL IMMEDIATELY CONTACT THE AFFECTED UTILITY SERVICE TO REPAIR ANY DAMAGED OR DESTROYED UTILITIES AT NO ADDITIONAL COST TO THE OWNER.

FIRE PROTECTION REQUIREMENTS
DURING THE CLOSED FIRE SEARSON (AS OBSERVED BY THE NORTH CASCADES CM-1 FIRE PROTECTION DISTRICT), CONTRACTOR COMPLETING WORK UNDER THIS CONTRACT SHALL ADHERE TO ALL OREGON REVISED STATUTES (ORS) AND OREGON ADMINISTRATIVE RULES (OAR) FOR FIRE PROTECTION. IN THE EVENT A FIRE WATCH IS REQUIRED, CONTRACTOR SHALL BE LIMITED TO INVOICING FOR ONE PERSON AT AN HOURLY LABOR RATE FOR THE HOURS REQUIRED FOR THE FIRE WATCH. IF A FIRE OCCURS, THE CONTRACTOR SHALL PROMPTLY REPORT THE FIRE TO 911 AND COOPERATE IN THE CONTROL AND SUPPRESSION OF THE FIRE.

FISH RESCUE
CONTRACTOR SHALL PERFORM ANY REQUIRED FISH RESCUE IN ACCORDANCE WITH PERMIT CONDITIONS. ALL FISH RESCUE EFFORTS SHALL BE PERFORMED BY PERSONNEL EXPERIENCED WITH THE COLLECTION AND HANDLING OF SALMONIDS FROM CONSTRUCTION SITES AND SHALL COMPLY WITH ALL REGULATORY STANDARDS AND PERMITS.

ALL FISH TRAPPED IN RESIDUAL POOLS WITHIN THE PROJECT AREA WILL BE CAREFULLY COLLECTED BY SEINE AND/OR DIP NETS AND PLACED IN CLEAN TRANSFER CONTAINERS WITH AN ADEQUATE VOLUME OF FRESH RIVER WATER.

CAPTURED FISH SHALL BE IMMEDIATELY RELEASED INTO THE RIVER AT AREAS SELECTED BY EXPERIENCED PERSONNEL. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING AN ODFW/NMFS SCIENTIFIC TAKE PERMIT.

CONSTRUCTION MATERIALS
LOCATION, ORIENTATION, AND ELEVATION OF LARGE WOOD MATERIAL ARE SUBJECT TO ADJUSTMENT BASED ON FIELD CONDITIONS AND MATERIAL SIZE.

THE CONTRACTOR SHALL DISPOSE OF NON-NATIVE MATERIAL ENCOUNTERED IN AN APPROVED, LEGAL OFFSITE DISPOSAL FACILITY.

GENERAL NOTES (CONT.):

EROSION CONTROL
THE CONTRACTOR SHALL SUBMIT AN EROSION CONTROL PLAN TO THE OWNER FOR APPROVAL PRIOR TO IMPLEMENTATION.

CONTRACTOR SHALL BE SOLELY RESPONSIBLE, AT OWN EXPENSE, FOR PROVIDING AND MAINTAINING ALL NECESSARY EROSION CONTROL FACILITIES TO COMPLY WITH APPLICABLE EROSION CONTROL REGULATIONS, PERMIT CONDITIONS AND TO MAINTAIN CLEAN ACCESS ROUTES.

CONSTRUCTION STAKING
CONTRACTOR SHALL MEET WITH THE OWNER AND OWNER'S REPRESENTATIVE TO DEFINE AND MARK THE LIMITS OF DISTURBANCE PRIOR TO MOBILIZATION OF EQUIPMENT ONTO THE SITE.

OWNER'S REPRESENTATIVE WILL IDENTIFY AND FLAG LOCATIONS FOR HELICOPTER-PLACED WOOD PRIOR TO FLIGHT. ADDITIONAL FIELD ADJUSTMENTS TO THESE LOCATIONS ARE TO BE EXPECTED GIVEN THE NATURE OF HELICOPTER WORK.

THE CONTRACTOR SHALL REPLACE DAMAGED OR DESTROYED CONSTRUCTION STAKES AT NO ADDITIONAL COST TO THE OWNER.

EQUIPMENT WASHING
OWNER REQUIRES MECHANIZED EQUIPMENT TO BE CLEANED (PRESSURE WASHED OR BLOWN WITH PRESSURIZED AIR) AND INSPECTED BEFORE MOVING INTO THE NATURAL AREA TO REDUCE THE RISK OF SPREADING NOXIOUS WEED SEEDS ONTO DISTURBED AREAS. EQUIPMENT INSPECTION WILL BE ARRANGED WITH THE OWNER'S REPRESENTATIVE AND CONDUCTED AT A LOCATION NOT IN THE PROJECT AREA THAT IS MUTUALLY AGREED TO BY THE METRO PROJECT MANAGER AND THE CONTRACTOR.

CONSTRUCTION ACCESS/TRAFFIC CONTROL
CONTRACTOR SHALL SUBMIT AN ACCESS AND EROSION CONTROL PLAN TO OWNER'S REPRESENTATIVE FOR APPROVAL PRIOR TO MOBILIZATION.

THE CONTRACTOR IS SOLELY RESPONSIBLE FOR OBTAINING ANY REQUIRED TRAFFIC CONTROL OR ACCESS PERMITS AND FOR PROVIDING TRAFFIC CONTROL IN ACCORDANCE WITH THE SPECIFICATIONS.

THE CONTRACTOR IS SOLELY RESPONSIBLE FOR COORDINATING ANY REQUIRED PEDESTRIAN AND VEHICULAR TRAFFIC CONTROL DURING AERIAL TRANSPORT OF LARGE WOOD MATERIAL.

ALL EQUIPMENT, MATERIALS, AND PERSONNEL SHALL REMAIN WITHIN THE LIMITS OF DISTURBANCE UNLESS APPROVED BY OWNER.

THE CONTRACTOR SHALL KEEP THE WORK AREAS IN A NEAT CONDITION, FREE OF DEBRIS AND LITTER FOR THE DURATION OF THE PROJECT.

THE CONTRACTOR SHALL PREVENT GENERATION AND TRANSPORT OF ROTOR WASH. DUST GENERATION SHALL BE KEPT TO A MINIMUM, INCLUDING DURING CONCRETE DEMOLITION ACTIVITIES. DUST ABATEMENT MEASURES SUCH AS MISTING OR OTHER APPROVED METHOD SHALL BE DEPLOYED TO PREVENT DUST FROM LEAVING THE WORK AREAS.

ALL DISTURBED AREAS INCLUDING DRIVEWAYS AND ACCESS ROUTES SHALL BE RESTORED TO MATCH OR BETTER EXISTING CONDITIONS.

ALL DISTURBED AREAS OUTSIDE THE LIMITS OF DISTURBANCE SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER AT NO ADDITIONAL COST TO THE OWNER.

ARCHAEOLOGICAL DISCOVERIES
CONTRACTOR IS RESPONSIBLE FOR ADHERING TO A METRO-PROVIDED INADVERTENT DISCOVERY PLAN. OWNER, OWNER'S REPRESENTATIVE, OR QUALIFIED ARCHAEOLOGIST MAY HALT OR DELAY EXCAVATION WORK TO COMPLY WITH CONDITIONS OF ARCHAEOLOGICAL INADVERTENT DISCOVERY AND MONITORING PLAN. CONTRACTOR SHALL ANTICIPATE THAT ALL WORK AREAS WILL BE INSPECTED AND MONITORED BY A QUALIFIED ARCHAEOLOGIST THROUGHOUT CONSTRUCTION.

ABBREVIATIONS:

'	FEET
"	INCH
%	PERCENT
AC	ACRE
CONT.	CONTINUED
CY	CUBIC YARD
DBH	DIAMETER AT BREAST HEIGHT
DSL	DEPARTMENT OF STATE LANDS
ELEV	ELEVATION
EXIST	EXISTING
FT	FEET
IN	INCH
NO.	NUMBER
NMFS	NATIONAL MARINE FISHERIES SERVICE
ODFW	OREGON DEPARTMENT OF FISH AND WILDLIFE
ODOT	OREGON DEPARTMENT OF TRANSPORTATION
OHW	ORDINARY HIGH WATER
OR	OREGON
RD	ROAD
STA	STATION
TYP	TYPICAL

HELICOPTER PLACED WOOD QUANTITIES	
ITEM	QUANTITY
IMPORTED ROOTWAD LOG (70 FT x 24" DBH)	74
SLASH BUNDLE	72 CY

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METRO SOUTH BEAVER CREEK NATURAL AREA

TROUTDALE, OREGON

RESTORATION AND HELICOPTER-PLACED LARGE WOOD PROJECT

GENERAL NOTES

TITLE

#	DATE	DESCRIPTION

REVISIONS

DATUM

PTK DRAWN BY | RPL CHECKED BY

PRELIMINARY STATUS

APRIL 19, 2023 DATE

21184 PROJECT NUMBER

G02

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Plotted: Apr 19, 2023 - 12:59pm Rod Lundberg L:\Project\21100\21184\04 CAD\ACAD\Dwg\21184_G01-G03.dwg Layout Name: G02

EXHIBIT 3

WETLANDS AND WATERBODIES

THE ORDINARY HIGH WATER (OHW) LINES DISPLAYED ON THESE PLANS WERE DELINEATED USING THE MODELED 2-YEAR INUNDATION EXTENTS AND FIELD VERIFICATION.

WETLANDS SHOWN ARE FROM A DELINEATION COMPLETED BY CASCADE ENVIRONMENTAL GROUP, LLC IN MARCH 2023.

NOTES AND BASIS FOR QUANTITIES

EXCAVATED BERM NOTCH MATERIAL IS ALL LOCATED ABOVE OHW.

APPROXIMATELY 75% OF THE WEIR CONCRETE VOLUME IS LOCATED BELOW OHW.
APPROXIMATELY 50% OF THE WEIR BANK GRADING VOLUME IS LOCATED BELOW OHW.

THE CONCRETE CISTERN IS ENTIRELY BELOW OHW.

LOG AND ROOTWAD QUANTITIES ARE ESTIMATED USING A 70-FT TOTAL LENGTH PIECE WITH DBH OF 24", TAPERING TO 12" AT THE CUT STEM. 80% OF WOOD VOLUME IS ASSUMED TO BE PLACED BELOW OHW BASED ON MODELED OHW INUNDATION LIMITS, CHANNEL GEOMETRY, AND SITE INSPECTIONS.

EXCAVATED SOILS FOR BERM NOTCH AND WEIR REMOVAL GRADING WILL BE HAULED OFF SITE TO AN APPROVED DISPOSAL FACILITY.

CONCRETE WILL BE BROKEN UP USING JACK-HAMMER AND STINGER-TYPE EXCAVATOR ATTACHMENTS. NO CONRETE SAW-CUTTING OR SLURRY GENERATION WILL OCCUR.

JURISDICTIONAL QUANTITIES

REMOVAL

WATERBODY	ACTIVITY	LOCATION	LENGTH (FT)	WIDTH (FT)	DEPTH (FT)	AREA (AC)	VOLUME (CY)	DURATION OF IMPACT	MATERIAL
BEAVER CREEK	WEIR REMOVAL	BELOW OHW	35	19	1	0.015	30.8	PERM	CONCRETE
BEAVER CREEK	WEIR REMOVAL BANK GRADING	BELOW OHW	25	25	5	0.014	58.3	PERM	SOIL
BEAVER CREEK	CISTERN AND APRON REMOVAL	BELOW OHW	12	21	1	0.006	14.4	PERM	CONCRETE
BEAVER CREEK	CONCRETE RUBBLE REMOVAL	BELOW OHW	10	15	1.5	0.003	8.3	PERM	CONCRETE
BEAVER CREEK	SOIL REMOVAL FOR STORM OUTFALL ENERGY DISSIPATION BASIN	BELOW OHW	7	6	5	0.001	7.8	PERM	SOIL
SUM OF TEMPORARY						0	0	TEMP	
SUM OF PERMANENT						0.04	120	PERM	

FILL

WATERBODY	ACTIVITY	LOCATION	LENGTH (FT)	WIDTH (FT)	DEPTH (FT)	AREA (AC)	VOLUME (CY)	DURATION OF IMPACT	MATERIAL
BEAVER CREEK	WORK AREA ISOLATION	WEIR REMOVAL AREA	40	3	3	0.003	13	TEMP	BULK BAGS FILLED WITH SOIL
BEAVER CREEK	HELICOPTER PLACED WOOD AND SLASH (SEE NOTE)	BELOW OHW	70	N/A	N/A	0.16	402	PERM	LOG & ROOTWAD ATTACHED
BEAVER CREEK	STREAM SUBSTRATE PLACEMENT AT WEIR REMOVAL	BELOW OHW	35	20	1	0.016	25.9	PERM	SAND, GRAVEL, COBBLE, FINES
BEAVER CREEK	STREAM SUBSTRATE PLACEMENT AT CISTERN APRON REMOVAL	BELOW OHW	12	15	1	0.004	14.4	PERM	SAND, GRAVEL, COBBLE, FINES
BEAVER CREEK	STORMWATER OUTFALL ROCK ARMORING FOR EROSIONAL GULLY	BELOW OHW	27	6	1.5	0.004	16.8	PERM	QUARRY SPALLS
SUM OF TEMPORARY						0.003	13	TEMP	
SUM OF PERMANENT						0.19	459	PERM	

NOTE: HELICOPTER PLACED WOOD QUANTITIES - LENGTH SHOWN IS FOR AN INDIVIDUAL PIECE. AREA AND VOLUME ARE AGGREGATED TOTALS FOR 74 INDIVIDUAL PIECES INSTALLED ALONG THE PROJECT REACH.

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TROUTDALE, OREGON

RESTORATION AND HELICOPTER-PLACED LARGE WOOD PROJECT

JURISDICTIONAL NOTES

TITLE

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STATUS

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DATE

21184
PROJECT NUMBER

G03

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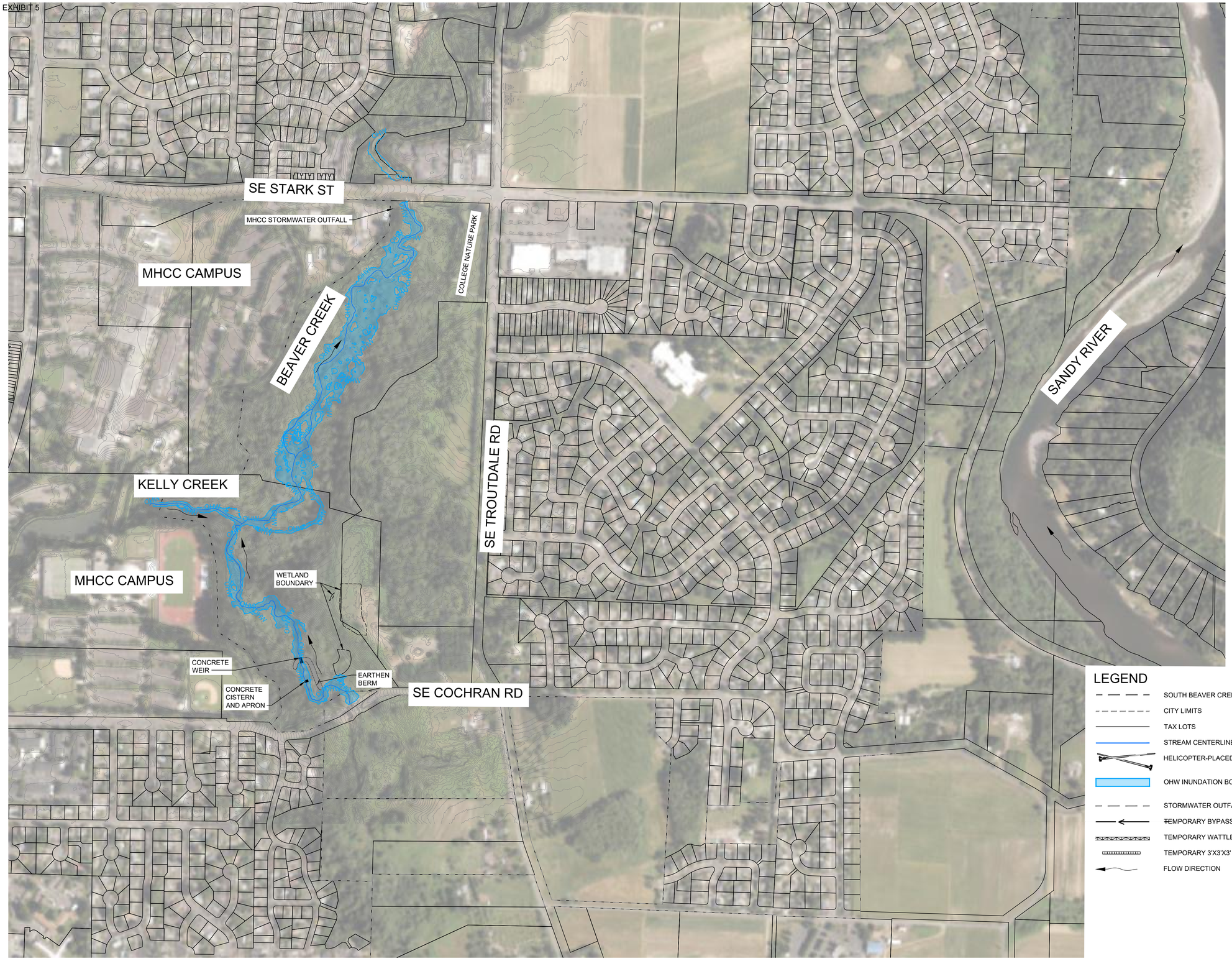
EXHIBIT 5



NOTES:

WETLANDS SHOWN ON THIS MAP WERE DELINEATED BY CASCADE ENVIRONMENTAL GROUP IN JULY 2022.

LEGEND

- SOUTH BEAVER CREEK NATURAL AREA
- CITY LIMITS
- TAX LOTS
- STREAM CENTERLINE
- HELICOPTER-PLACED LARGE WOOD
- OHW INUNDATION BOUNDARY
- STORMWATER OUTFALL
- ~~T~~EMPORARY BYPASS PIPE
- TEMPORARY WATTLES
- TEMPORARY 3'X3'X3' BULK BAG BARRIER
- FLOW DIRECTION

0 300 600
SCALE IN FEET

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TROUTDALE, OREGON

RESTORATION AND HELICOPTER-PLACED LARGE WOOD PROJECT

EXISTING CONDITIONS

TITLE

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REVISIONS

DATUM

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PRELIMINARY
STATUS

APRIL 19, 2023
DATE

21184
PROJECT NUMBER

EX01

Plotted: Apr 19, 2023 - 1:02pm Rod Lundberg L:\Project\21100\21184\04 CAD\ACAD\Dwg\21184_EX01_EC01.dwg Layout Name: EX01

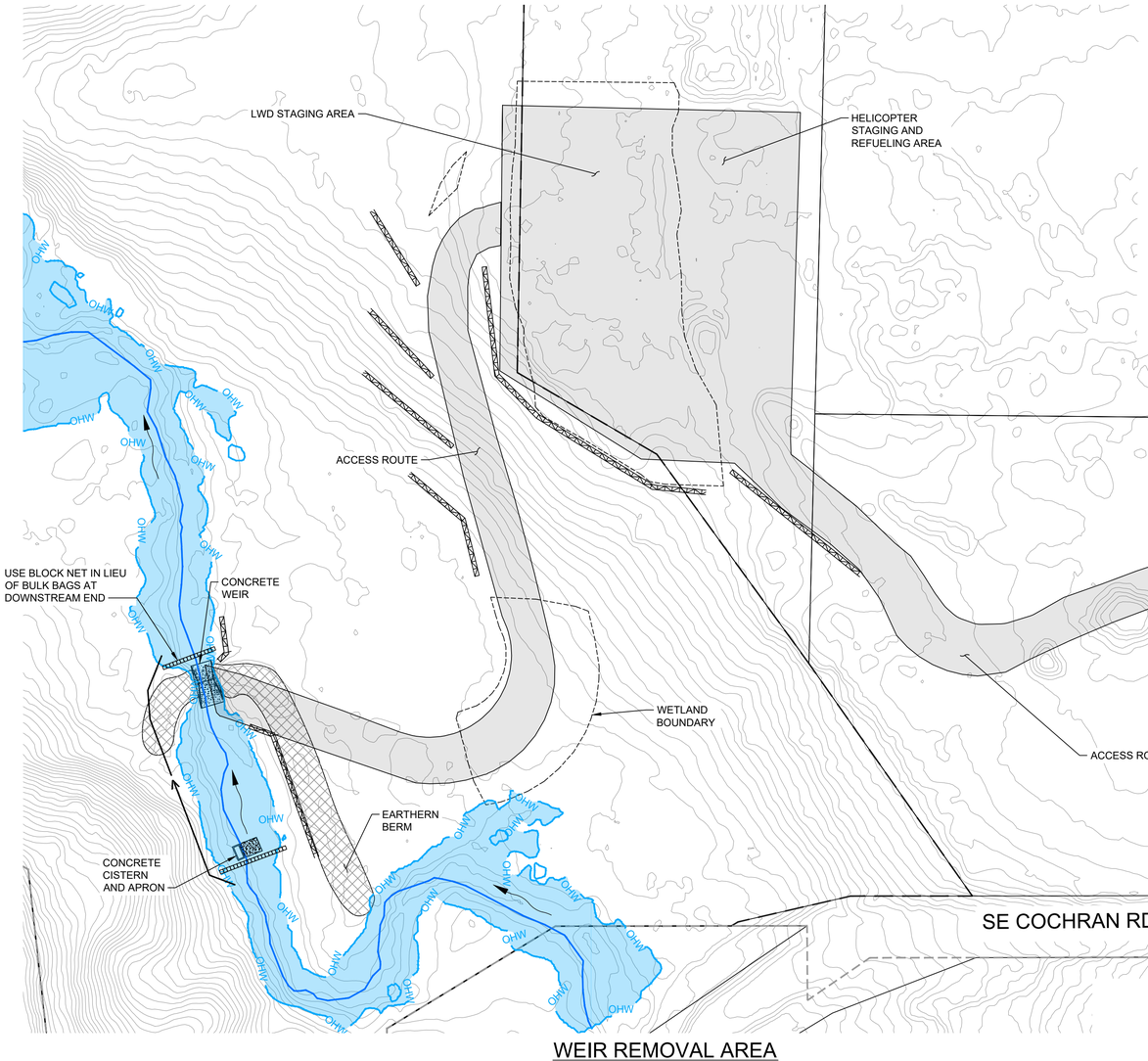
EXHIBIT 5

WEIR REMOVAL AREA NOTES:

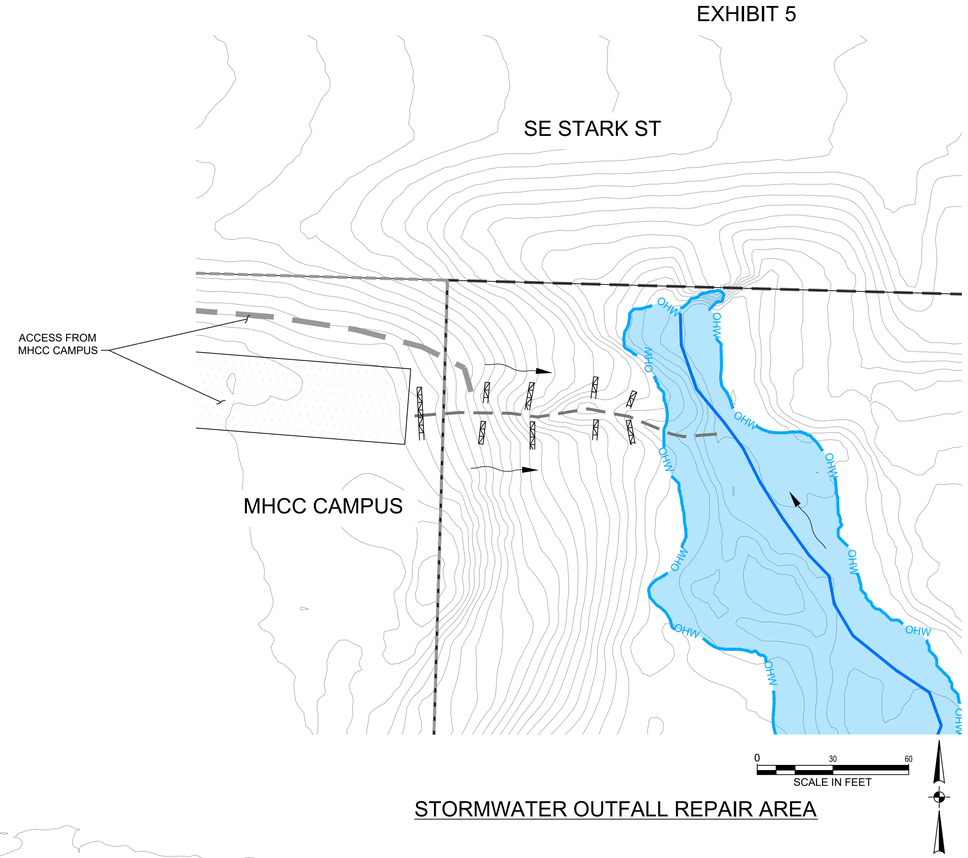
1. CONTRACTOR TO PROVIDE WORK AREA ISOLATION FOR WEIR AND CISTERN REMOVAL. SEE SHEET G02 FOR FISH SALVAGE REQUIREMENTS.
2. SEE SHEET D01 FOR WEIR REMOVAL DETAILS.
3. APPLY SEED, MULCH, AND EROSION CONTROL BLANKET TO FINISH GRADED SURFACES AT WEIR AND CISTERN REMOVAL AREAS, AND AT BERM NOTCH GRADED SLOPES.
4. APPLY SEED AND MULCH TO ALL DISTURBED SURFACES IMMEDIATELY FOLLOWING CONSTRUCTION.

STORMWATER OUTFALL REPAIR AREA NOTES:

1. SEE SHEET D02 FOR STORMWATER OUTFALL REPAIR DETAILS.
2. APPLY SEED, MULCH, AND EROSION CONTROL BLANKET TO FINISH GRADED SURFACES.
3. APPLY SEED AND MULCH TO ALL DISTURBED SURFACES IMMEDIATELY FOLLOWING CONSTRUCTION.



WEIR REMOVAL AREA



STORMWATER OUTFALL REPAIR AREA

LEGEND

- SOUTH BEAVER CREEK NATURAL AREA
- CITY LIMITS
- TAX LOTS
- STREAM CENTERLINE
- HELICOPTER-PLACED LARGE WOOD
- OHW INUNDATION BOUNDARY
- STORMWATER OUTFALL
- ~~TEMPORARY~~ BYPASS PIPE
- TEMPORARY WATTLES
- TEMPORARY 3'X3'X3' BULK BAG BARRIER
- FLOW DIRECTION

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METRO SOUTH BEAVER CREEK NATURAL AREA

TROUTDALE, OREGON

RESTORATION AND HELICOPTER-PLACED LARGE WOOD PROJECT

STAGING AND EROSION CONTROL

TITLE

#	DATE	DESCRIPTION

REVISIONS

DATUM

PTK DRAWN BY | RPL CHECKED BY

PRELIMINARY STATUS

APRIL 19, 2023 DATE

21184 PROJECT NUMBER

EC01

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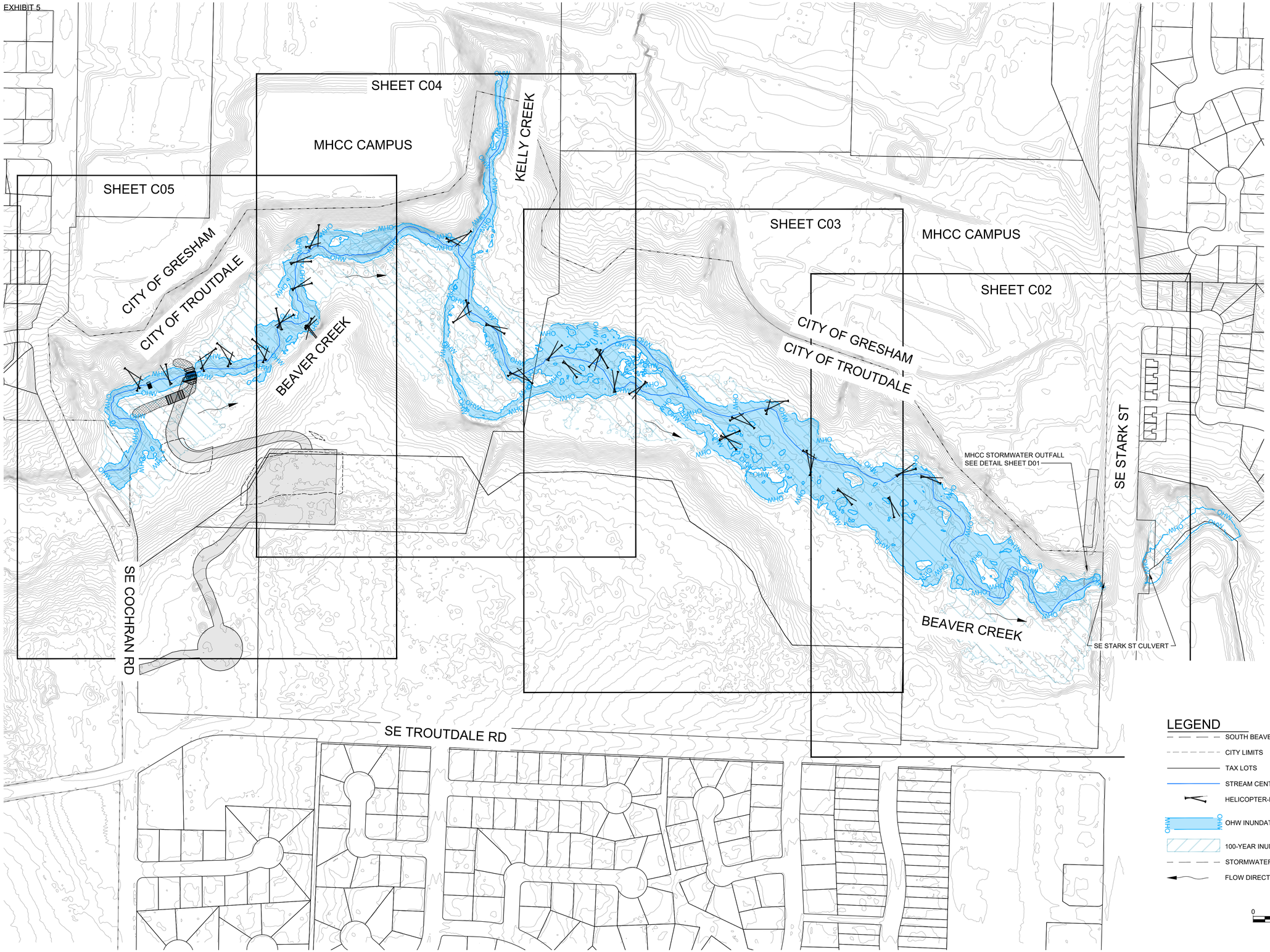
Plotted: Apr 19, 2023 - 1:03pm Rod Lundberg L:\Project\21100\21184\04 CAD\A\CAD\Dwg\21184_EX01_EC01.dwg Layout Name: EC01

EXHIBIT 5



LEGEND

- SOUTH BEAVER CREEK NATURAL AREA
- CITY LIMITS
- TAX LOTS
- STREAM CENTERLINE
- HELICOPTER-PLACED LARGE WOOD
- OHW INUNDATION BOUNDARY
- 100-YEAR INUNDATION BOUNDARY
- STORMWATER OUTFALL
- FLOW DIRECTION

0 150 300
SCALE IN FEET

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TROUTDALE, OREGON

RESTORATION AND HELICOPTER-PLACED LARGE WOOD PROJECT

PLAN OVERVIEW

TITLE

#	DATE	DESCRIPTION

REVISIONS

DATUM

PTK — DRAWN BY
RPL — CHECKED BY

PRELIMINARY
STATUS

APRIL 19, 2023
DATE

21184
PROJECT NUMBER

C01

Plotted: Apr 19, 2023 - 1:06pm Rod Lundberg L:\Projects\21100\21184\04 CAD\ACAD\Dwg\21184_C01-C05.dwg Layout Name: C01

EXHIBIT 5

SE STARK ST

SE STARK ST CULVERT

ACCESS THROUGH PAVED SURFACES OF MHCC CAMPUS. NOTE: EQUIPMENT WILL NEED TO TRACK ALONG THE SIDESLOPE, AROUND A CONCRETE WALL NORTH OF THE PAVEMENT AS SHOWN.

MHCC STORMWATER OUTFALL SEE DETAIL SHEET D02

MHCC CAMPUS

8 D03 2-LOG PLACEMENT

8 D03 2-LOG PLACEMENT

12 D04 FLOODPLAIN LOG PLACEMENT

12 D04 FLOODPLAIN LOG PLACEMENT

BEAVER CREEK

SE TROUTDALE RD

MATCHLINE - SEE SHEET C03

LEGEND

- SOUTH BEAVER CREEK NATURAL AREA
- CITY LIMITS
- TAX LOTS
- STREAM CENTERLINE
- HELICOPTER-PLACED LARGE WOOD
- OHW INUNDATION BOUNDARY
- STORMWATER OUTFALL
- FLOW DIRECTION

0 60 120
SCALE IN FEET

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TROUTDALE, OREGON

RESTORATION AND HELICOPTER-PLACED LARGE WOOD PROJECT

PROPOSED PLAN

TITLE

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REVISIONS

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PRELIMINARY STATUS

APRIL 19, 2023 DATE

21184 PROJECT NUMBER

C02

Plotted: Apr 19, 2023 - 1:07pm Rod Lundberg L:\Projects\21100\21184\04 CAD\ACAD\Dwg\21184_C01-C05.dwg Layout Name: C02

EXHIBIT 5

MHCC CAMPUS

MATCHLINE - SEE SHEET C02

EXTG LWD JAM

10 / D04 3-LOG PLACEMENT

10 / D04 3-LOG PLACEMENT

10 / D04 3-LOG PLACEMENT

12 / D04 FLOODPLAIN LOG PLACEMENT

BEAVER CREEK

8 / D03 2-LOG PLACEMENT

8 / D03 2-LOG PLACEMENT

9 / D03 4-LOG PLACEMENT

MATCHLINE - SEE SHEET C04

OHW

LEGEND

- SOUTH BEAVER CREEK NATURAL AREA
- CITY LIMITS
- TAX LOTS
- STREAM CENTERLINE
- HELICOPTER-PLACED LARGE WOOD
- OHW INUNDATION BOUNDARY
- STORMWATER OUTFALL
- FLOW DIRECTION

0 60 120
SCALE IN FEET

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PROPOSED PLAN

TITLE

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APRIL 19, 2023
DATE

21184
PROJECT NUMBER

C03

Plotted: Apr 19, 2023 - 1:07pm Rod Lundberg L:\Project\21100\21184\04 CAD\ACAD\Dwg\21184_C01-C05.dwg Layout Name: C03

EXHIBIT 5

MHCC CAMPUS

MATCHLINE - SEE SHEET C03

KELLY CREEK

BEAVER CREEK

12 D04 FLOODPLAIN LOG PLACEMENT

8 D03 2-LOG PLACEMENT

8 D03 2-LOG PLACEMENT

10 D04 3-LOG PLACEMENT

10 D04 3-LOG PLACEMENT

10 D04 3-LOG PLACEMENT

MHCC CAMPUS

BEAVER CREEK

MATCHLINE - SEE SHEET C05

EXTG BEAVER DAMS

PROPOSED STAGING/STOCKPILING AREA

LEGEND

- SOUTH BEAVER CREEK NATURAL AREA
- CITY LIMITS
- TAX LOTS
- STREAM CENTERLINE
- HELICOPTER-PLACED LARGE WOOD
- OHW INUNDATION BOUNDARY
- STORMWATER OUTFALL
- FLOW DIRECTION

0 60 120
SCALE IN FEET

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TROUTDALE, OREGON

RESTORATION AND HELICOPTER-PLACED LARGE WOOD PROJECT

PROPOSED PLAN

TITLE

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STATUS

APRIL 19, 2023
DATE

21184
PROJECT NUMBER

C04

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EXHIBIT 5

MHCC CAMPUS

MATCHLINE - SEE SHEET C04

BEAVER CREEK

10 D04 3-LOG PLACEMENT

11 D04 5-LOG PLACEMENT

8 D03 2-LOG PLACEMENT

8 D03 2-LOG PLACEMENT

9 D03 4-LOG PLACEMENT

10 D04 3-LOG PLACEMENT

10 D04 3-LOG PLACEMENT

10 D04 3-LOG PLACEMENT

EXISTING EARTHEN BERM

EXISTING CONCRETE WEIR AND APRON

8 D03 2-LOG PLACEMENT

WEIR REMOVAL SEE DETAIL SHEET D01

EXISTING CONCRETE CISTERN AND APRON

10 D04 3-LOG PLACEMENT

PROPOSED STAGING/STOCKPILING AREA

SE COCHRAN RD

SE COCHRAN RD BRIDGE

LEGEND

- SOUTH BEAVER CREEK NATURAL AREA
- CITY LIMITS
- TAX LOTS
- STREAM CENTERLINE
- HELICOPTER-PLACED LARGE WOOD
- OHW INUNDATION BOUNDARY
- STORMWATER OUTFALL
- FLOW DIRECTION
- EXISTING EARTHEN BERM
- BERM NOTCH/REMOVAL AREA

0 60 120
SCALE IN FEET

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RESTORATION AND HELICOPTER-PLACED LARGE WOOD PROJECT

PROPOSED PLAN

TITLE

#	DATE	DESCRIPTION

REVISIONS

DATUM

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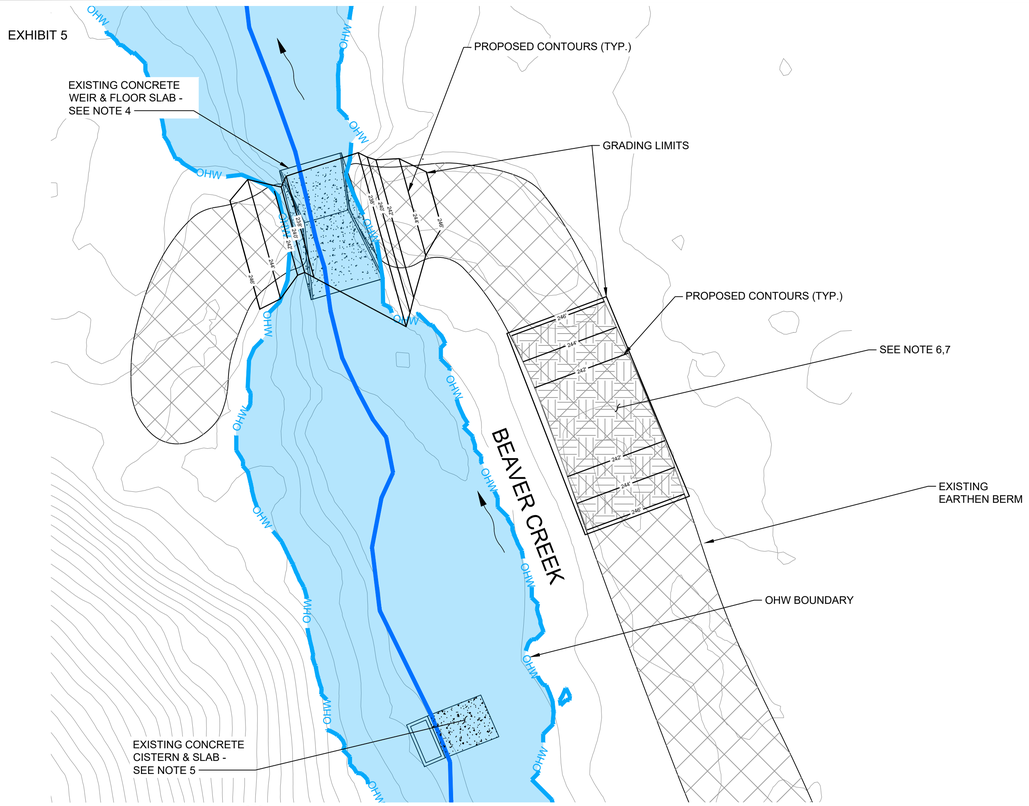
PRELIMINARY STATUS

APRIL 19, 2023 DATE

21184 PROJECT NUMBER

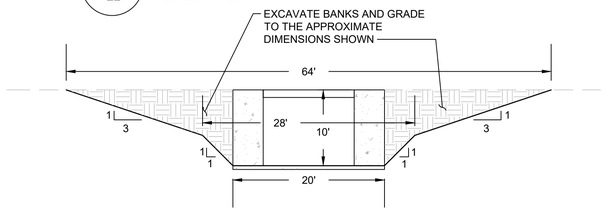
C05

Plotted: Apr 19, 2023 - 1:09pm Rod Lundberg L:\Project\21100\21184\04 CAD\ACAD\Dwg\21184_C01-C05.dwg Layout Name: C05



1 -- WEIR REMOVAL AREA DETAIL PLAN

SCALE : 1" = 20'



2 -- WEIR REMOVAL SECTION

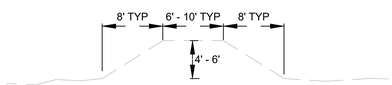
SCALE : 1" = 10'

NOTES:

1. SEE SHEET EC01 FOR WORK AREA ISOLATION MEASURES.
2. CONCRETE WALLS ARE TYPICALLY SIX INCHES THICK.
3. CONTRACTOR TO REMOVE MISCELLANEOUS CONCRETE RUBBLE SCATTERED THROUGH WEIR REMOVAL AREA UPSTREAM AND DOWNSTREAM OF WEIR.
4. DEMOLISH AND REMOVE EXISTING CONCRETE WEIR WALLS AND FLOOR SLAB. FLOOR SLAB THICKNESS IS UNKNOWN. SEE DETAIL 2 THIS SHEET.
5. DEMOLISH AND REMOVE EXISTING CONCRETE CISTERN AND CHANNEL SLAB. SLAB EXTENDS INTO CHANNEL TO THE APPROXIMATE LIMITS SHOWN. SLAB THICKNESS IS UNKNOWN.
6. EXCAVATE NOTCH THROUGH EXISTING EARTHEN BERM. SEE DETAIL 4 THIS SHEET.
7. BERM NOTCH EARTHWORK IS ALL ABOVE OHW.
8. IMPORT AND PLACE STREAM SUBSTRATE MIX WITHIN FOOTPRINT OF REMOVED WEIR AND CISTERN CONCRETE SLABS.

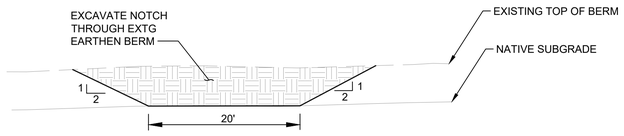
LEGEND

- SOUTH BEAVER CREEK NATURAL AREA
- CITY LIMITS
- TAX LOTS
- STREAM CENTERLINE
- HELICOPTER-PLACED LARGE WOOD
- OHW INUNDATION BOUNDARY
- FLOW DIRECTION
- EXISTING EARTHEN BERM
- BERM NOTCH/REMOVAL AREA



3 -- EARTH BERM TYPICAL SECTION

SCALE : 1" = 10'



4 -- EARTH BERM NOTCH GRADING SECTION

SCALE : 1" = 10'

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RESTORATION AND HELICOPTER-PLACED LARGE WOOD PROJECT

WEIR REMOVAL DETAILS

TITLE

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APRIL 19, 2023
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21184
PROJECT NUMBER

D01

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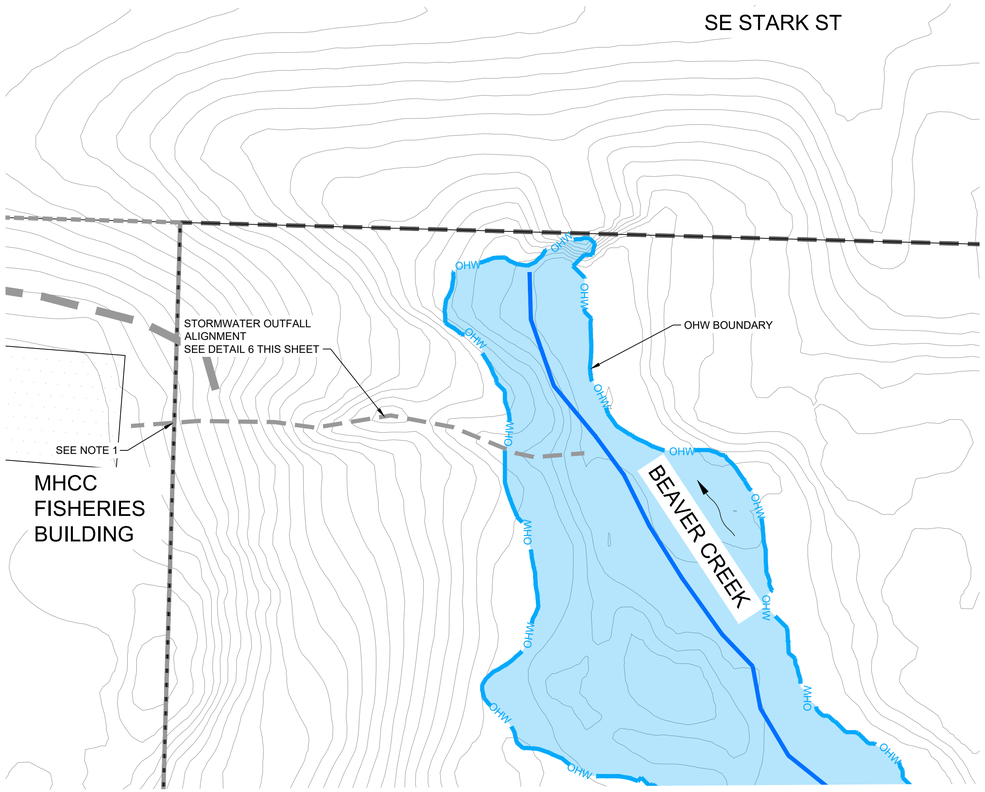
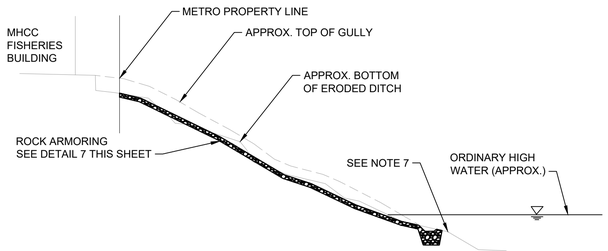
EXHIBIT 5

NOTES:

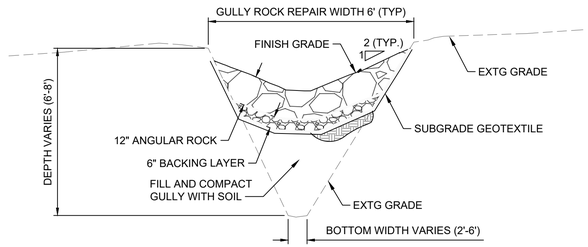
1. STORMWATER OUTFALL REPAIR WORK LIMITED TO AREA WITHIN METRO PROPERTY.
2. GULLY SIDESLOPES TO BE TRIMMED BACK TO APPROXIMATELY 1.5H:1V SLOPE.
3. GRADING SPOILS TO BE PLACED IN 12" LIFTS IN BOTTOM OF DITCH AND COMPACTED WITH A VIBRATORY PLATE TO ACHIEVE 85% MAXIMUM DRY DENSITY PER AASHTO T 99.
4. DITCH PROFILE TO BE GRADED WITH BENCHING TO PROVIDE STABLE SURFACE FOR SUBSEQUENTLY PLACED ARMORING MATERIAL.
5. PLACE FILTER FABRIC IN DITCH BOTTOM BENEATH FULL FOOTPRINT OF ROCK ARMOR. SEE SECTION 7 THIS SHEET.
6. WASH NATIVE FINES INTO PLACED ROCK ARMORING UNTIL ROCK MATRIX IS FULLY SEALED.
7. EXCAVATION FOR ROCK ARMOR ENERGY DISSIPATION BASIN TO TERMINATE A MINIMUM OF 2 FT BACK FROM TOP OF STREAM BANK. EXCAVATED MATERIAL SHALL NOT BE ALLOWED TO ENTER THE CHANNEL.



5 -- MHCC STORMWATER OUTFALL REPAIR AREA
SCALE : 1" = 20'



6 -- STORMWATER OUTFALL PROFILE
SCALE : 1" = 20'



7 -- STORMWATER OUTFALL TYPICAL SECTION
SCALE : N.T.S.

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RESTORATION AND HELICOPTER-PLACED LARGE WOOD PROJECT

STORMWATER OUTFALL DETAILS

TITLE

#	DATE	DESCRIPTION

REVISIONS

DATUM

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STATUS

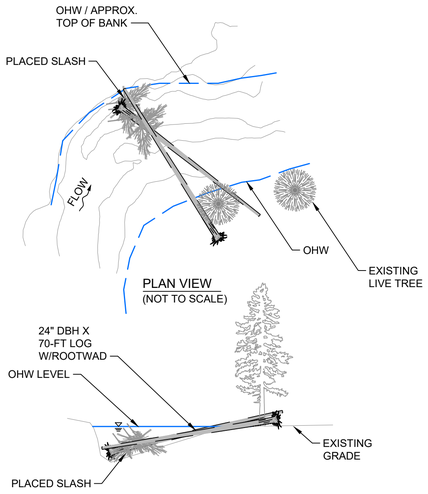
APRIL 19, 2023
DATE

21184
PROJECT NUMBER

D02

Plotted: Apr 19, 2023 - 1:11pm Rod Lundberg L:\Projects\21100\21184\04 CAD\ACAD\Dwgs\21184_D01-D03.dwg Layout Name: D02

EXHIBIT 5



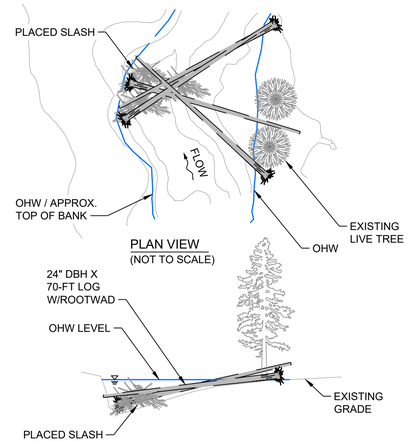
TYPICAL SECTION

8 -- 2-LOG PLACEMENT DETAIL

SCALE : N.T.S.

NOTES:

1. PLACE 2 CY OF SLASH VIA HELICOPTER. USE GROUND CREWS TO HAND-PACK SLASH AFTER LOG PLACEMENTS, OR PLACE SLASH BUNDLES VIA HELICOPTER IN CONJUNCTION WITH LOG PLACEMENTS.
2. FINAL CONFIGURATION OF EACH LOG PLACEMENT LOCATION WILL VARY DEPENDING ON GROUND CONDITIONS, CHANNEL BANKS, AND PRESENCE OF EXISTING MATURE RIPARIAN TRESS.
3. BRACE LOGS BETWEEN EXISTING MATURE RIPARIAN TREES OR ON THE UPSTREAM SIDE OF EXISTING TREES WHEREVER POSSIBLE.
4. SLASH TO CONSIST OF 2"-8" DIAMETER LIMBS WITH BRANCH TIPS ATTACHED TO THE EXTENT PRACTICABLE. SLASH PIECE LENGTHS RANGE FROM 10' TO 20'.



TYPICAL SECTION

9 -- 4-LOG PLACEMENT DETAIL

SCALE : N.T.S.

NOTES:

1. PLACE 4 CY OF SLASH VIA HELICOPTER. USE GROUND CREWS TO HAND-PACK SLASH AFTER LOG PLACEMENTS, OR PLACE SLASH BUNDLES VIA HELICOPTER IN CONJUNCTION WITH LOG PLACEMENTS.
2. FINAL CONFIGURATION OF EACH LOG PLACEMENT LOCATION WILL VARY DEPENDING ON GROUND CONDITIONS, CHANNEL BANKS, AND PRESENCE OF EXISTING MATURE RIPARIAN TRESS.
3. BRACE LOGS BETWEEN EXISTING MATURE RIPARIAN TREES OR ON THE UPSTREAM SIDE OF EXISTING TREES WHEREVER POSSIBLE.
4. SLASH TO CONSIST OF 2"-8" DIAMETER LIMBS WITH BRANCH TIPS ATTACHED TO THE EXTENT PRACTICABLE. SLASH PIECE LENGTHS RANGE FROM 10' TO 20'.

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TROUTDALE, OREGON

RESTORATION AND HELICOPTER-PLACED LARGE WOOD PROJECT

LARGE WOOD DETAILS

TITLE

#	DATE	DESCRIPTION

REVISIONS

DATUM

PTK — DRAWN BY
RPL — CHECKED BY

PRELIMINARY
STATUS

APRIL 19, 2023
DATE

21184
PROJECT NUMBER

D03

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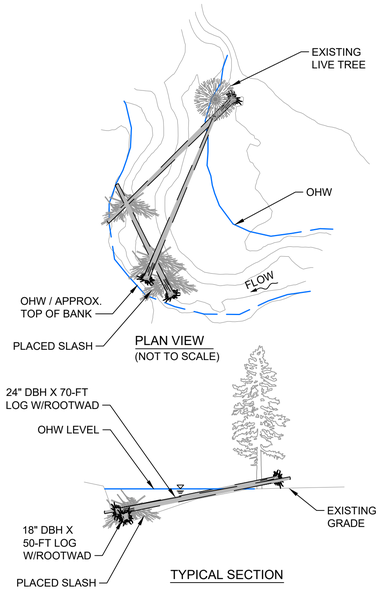
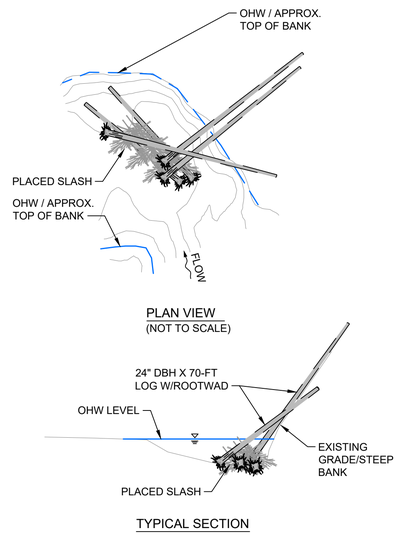
EXHIBIT 5



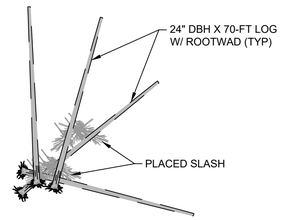
10 -- HELICOPTER-PLACED 3-LOG PLACEMENT DETAIL

SCALE : N.T.S.



11 -- HELICOPTER-PLACED 5-LOG PLACEMENT DETAIL

SCALE : N.T.S.



12 -- HELICOPTER-PLACED FLOODPLAIN LOG PLACEMENT SCHEMATIC

SCALE : N.T.S.

NOTES:

1. PLACE 3 CY OF SLASH VIA HELICOPTER. USE GROUND CREWS TO HAND-PACK SLASH AFTER LOG PLACEMENTS, OR PLACE SLASH BUNDLES VIA HELICOPTER IN CONJUNCTION WITH LOG PLACEMENTS.
2. FINAL CONFIGURATION OF EACH LOG PLACEMENT LOCATION WILL VARY DEPENDING ON GROUND CONDITIONS, CHANNEL BANKS, AND PRESENCE OF EXISTING MATURE RIPARIAN TRESS.
3. BRACE LOGS BETWEEN EXISTING MATURE RIPARIAN TREES OR ON THE UPSTREAM SIDE OF EXISTING TREES WHEREVER POSSIBLE.
4. SLASH TO CONSIST OF 2"-8" DIAMETER LIMBS WITH BRANCH TIPS ATTACHED TO THE EXTENT PRACTICABLE. SLASH PIECE LENGTHS RANGE FROM 10' TO 20'.

NOTES:

1. PLACE 3 CY OF SLASH VIA HELICOPTER. USE GROUND CREWS TO HAND-PACK SLASH AFTER LOG PLACEMENTS, OR PLACE SLASH BUNDLES VIA HELICOPTER IN CONJUNCTION WITH LOG PLACEMENTS.
2. FINAL CONFIGURATION OF EACH LOG PLACEMENT LOCATION WILL VARY DEPENDING ON GROUND CONDITIONS, CHANNEL BANKS, AND PRESENCE OF EXISTING MATURE RIPARIAN TRESS.
3. BRACE LOGS BETWEEN EXISTING MATURE RIPARIAN TREES OR ON THE UPSTREAM SIDE OF EXISTING TREES WHEREVER POSSIBLE.
4. SLASH TO CONSIST OF 2"-8" DIAMETER LIMBS WITH BRANCH TIPS ATTACHED TO THE EXTENT PRACTICABLE. SLASH PIECE LENGTHS RANGE FROM 10' TO 20'.

NOTES:

1. FLOODPLAIN LOGS ALL PLACED WITHIN LIMITS OF OHW.
2. STACK 2-4 LOGS IN THE GENERAL CONFIGURATION SHOWN.
3. PLACE SLASH, 1 CY PER LOG PLACED, VIA HELICOPTER. USE GROUND CREWS TO HAND-PACK SLASH AFTER LOG PLACEMENTS, OR PLACE SLASH BUNDLES VIA HELICOPTER IN CONJUNCTION WITH LOG PLACEMENTS.

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TROUTDALE, OREGON

RESTORATION AND HELICOPTER-PLACED LARGE WOOD PROJECT

LARGE WOOD DETAILS

TITLE

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REVISIONS

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PRELIMINARY STATUS

APRIL 19, 2023 DATE

21184 PROJECT NUMBER

D04

Plotted: Apr 19, 2023 - 1:13pm Rod Lundberg L:\Project\21100\21184\04 CAD\ACAD\Dwg\21184_D01-D03.dwg Layout Name: D04

EXHIBIT 5

Quantity	Botanical Name	Common Name	Indicator	O.C. Spacing
	Wetland/Riparian Forest: (0.15 Ac or 6,534 Sq/ft)			
Trees				
70	*Alnus rubra*	Red alder	FAC	10'
45	*Fraxinus latifolia*	Oregon ash	FACW	10'
35	*Tsuga heterophylla*	Western hemlock	FACU	10'
Shrubs				
75	*Rosa pisocarpa*	Swamp rose	FAC	5'
65	*Rubus spectabilis*	Salmonberry	FAC	5'
50	*Salix sitchensis*	Sitka willow	FACW	5'
60	*Symphoricarpos albus*	Snowberry	FACU	5'
150	**Total Trees**			
250	**Total Shrubs**			
2,667	**Approximate Stems per Acre**			
	Upland Forest: (0.44 Ac or 19,166 Sq Ft)			
Trees				
125	*Abies grandis*	Grand fir	FACU	10'
150	*Alnus rubra*	Red alder	FACU	10'
90	*Rhamnus purshiana*	Cascara	FAC	10'
65	*Tsuga heterophylla*	Western hemlock	FACU	10'
Shrubs				
60	*Acer circinatum*	Vine Maple	FAC	5'
200	*Holodiscus discolor*	Oceanspray	FACU	5'
400	*Mahonia aquifolium*	Tall Oregon Grape	FACU	5'
125	*Rosa gymnocarpa*	Baldhip rose	FACU	5'
200	*Symphoricarpos albus*	Snowberry	FACU	5'
430	**Total Trees**			
985	**Total Shrubs**			
2,669	**Approximate Stems per Acre**			

Notes

Throughout all of the planting zone:

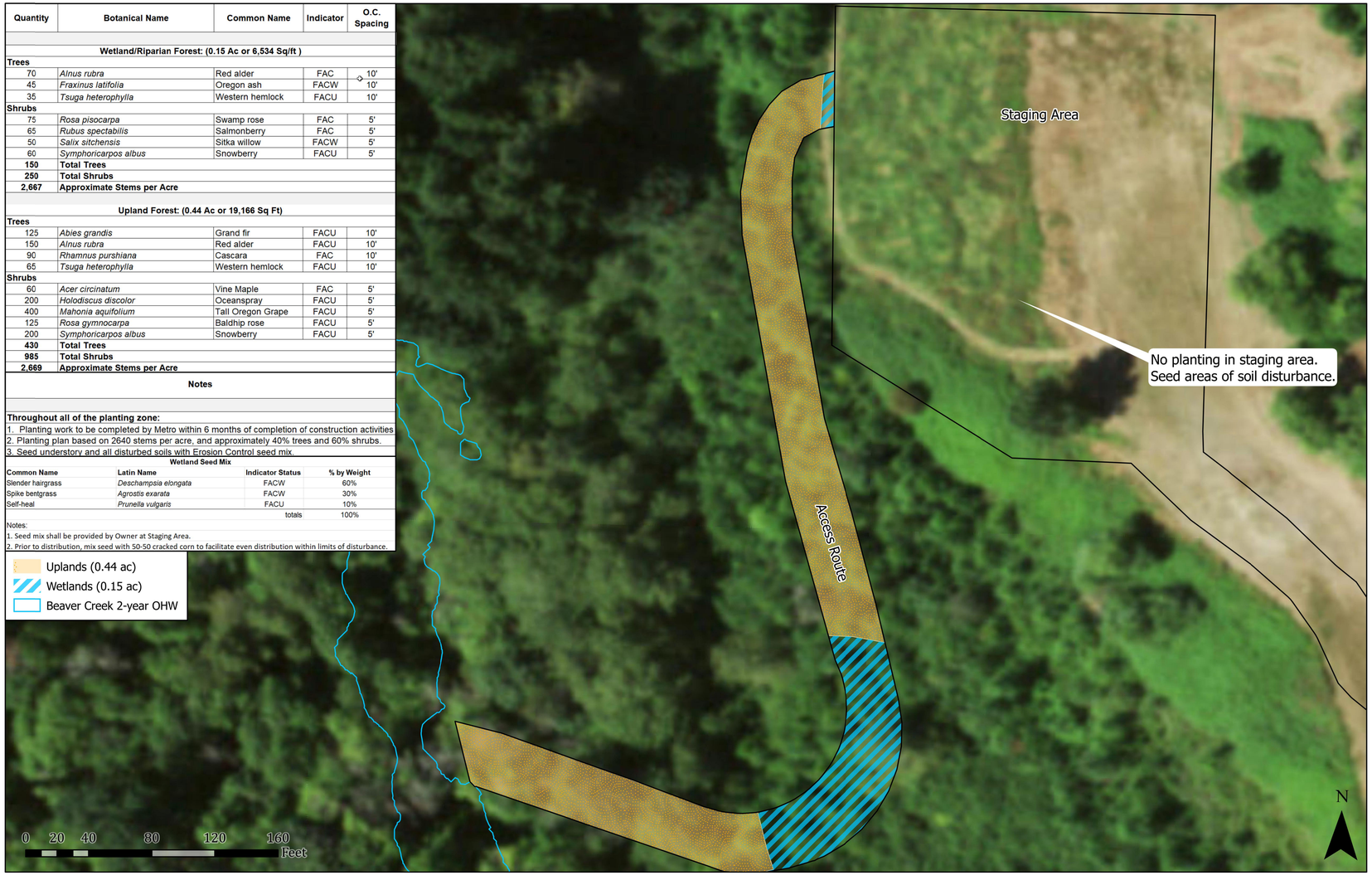
1. Planting work to be completed by Metro within 6 months of completion of construction activities
2. Planting plan based on 2640 stems per acre, and approximately 40% trees and 60% shrubs.
3. Seed understory and all disturbed soils with Erosion Control seed mix.

Wetland Seed Mix

Common Name	Latin Name	Indicator Status	% by Weight
Slender hairgrass	*Deschampsia elongata*	FACW	60%
Spike bentgrass	*Agrostis exarata*	FACW	30%
Self-heal	*Prunella vulgaris*	FACU	10%
		totals	100%

Notes:

1. Seed mix shall be provided by Owner at Staging Area.
2. Prior to distribution, mix seed with 50-50 cracked corn to facilitate even distribution within limits of disturbance.



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STAMP

CONSULTANT

60% DESIGN - FOR PERMITTING

METRO SOUTH BEAVER CREEK NATURAL AREA

TROUTDALE, OREGON

RESTORATION AND HELICOPTER-PLACED LARGE WOOD PROJECT

REVEGETATION DETAILS

TITLE

#	DATE	DESCRIPTION

REVISIONS

DATUM

PTK DRAWN BY

RPL CHECKED BY

PRELIMINARY STATUS

APRIL 19, 2023 DATE

21184 PROJECT NUMBER

D05

Plotted: Apr 21 2023 - 8:49am Rod Lundberg I:\Projects\21100\21184\04 CAD\ACAD\Dwgs\21184_D01-D03.dwg Layout Name: D05

Joint Permit Application

This is a joint application, and must be sent to all agencies (Corps, DSL, and DEQ). Alternative forms of permit applications may be acceptable; contact the Corps and DSL for more information.

Date Stamp

U.S. Army Corps of Engineers Portland District	Oregon Department of State Lands	Oregon Department of Environmental Quality
Action ID Number	Number	

(1) TYPE OF PERMIT(S) IF KNOWN (check all that apply)

Corps: Individual **X** Nationwide No.: 27 Regional General Permit _____ Other (specify): _____

DSL: X Individual GP Trans GP Min Wet GP Maint Dredge GP Ocean Energy No Permit Waiver

(2) APPLICANT AND LANDOWNER CONTACT INFORMATION

	Applicant	Property Owner (if different)	Authorized Agent (if applicable) ☐ Consultant ☐ Contractor
Name (Required) Business Name Mailing Address 1 Mailing Address 2 City, State, Zip	Brian Vaughn Metro 600 NE Grand Ave Portland, OR 97232		
Business Phone Cell Phone Fax Email	503-797-1919 503-830-8719 brian.vaughn@oregonmetro.gov		

(3) PROJECT INFORMATION

A. Provide the project location.

Project Name	Latitude & Longitude*
South Beaver Creek Natural Area Restoration Project	45.510010, -122.390270 (upstream); 45.518778, -122.389157 (downstream)

Project Address / Location	City (nearest)			County
S of SE Stark St, N of Cochran Road	Troutdale			Multnomah
Township	**Range**	**Section**	**Quarter / Quarter**	**Tax Lot**
T1S	R3E	1	NW/NW & SW/NW	00400, 00700,00300 (Map 1S3E01)
T1S	R3E	1	NW/NW & SW/NW	01900 (Map 1S3E01CA)

Brief Directions to the Site: Drive E on I-84 to exit 17. Continue onto NW Frontage Rd and turn right onto SW 257th Dr. Continue to SE Stark St, and turn left. Drive to S Troutdale Rd and turn right. Drive to SE Cochran Rd and turn right. Drive approx. 250' and park in gravel driveway. Walk along SE Cochran Rd to Beaver Creek.

B. What types of waterbodies or wetlands are present in your project area? (Check all that apply.)

☒ River / Stream ☒ Non-Tidal Wetland ☐ Lake / Reservoir / Pond

☐ Estuary or Tidal Wetland ☐ Other ☐ Pacific Ocean

Waterbody or Wetland Name**	River Mile	6th Field HUC Name	6th Field HUC (12 digits)
Beaver Creek		Beaver Creek-Sandy River	1700800010703

* In decimal format (e.g., 44.9399, -123.0283)

** If there is no official name for the wetland or waterbody, create a unique name (such as "Wetland 1" or "Tributary A").

C. Indicate the project category. (Check all that apply.)

☐ Commercial Development	☐ Industrial Development	☐ Residential Development
☐ Institutional Development	☐ Agricultural	☐ Recreational
☐ Transportation	☐ Restoration	☐ Bridge
☐ Dredging	☐ Utility lines	☐ Survey or Sampling
☐ In- or Over-Water Structure	☐ Maintenance	☒ Other: Habitat Restoration

(4) PROJECT DESCRIPTION

A. Summarize the overall project including work in areas both in and outside of waters or wetlands.

Metro is proposing the South Beaver Creek Natural Area Restoration Project to address impairments to salmonid habitat in Beaver Creek. The South Beaver Creek Natural Area is a 62-acre site bordered by Mount Hood Community College (MHCC) on the west and southeast, SE Cochran Road to the south, SE Stark Street to the north, and S Troutdale Road to the east (Figures 1 and 2). Metro purchased the site from MHCC using money from the 1995 natural areas bond measure with the intention to complete habitat restoration activities on the Project reach of Beaver Creek.

The site includes a highly productive reach of Beaver Creek, the confluence of Beaver and Kelly Creeks, seasonal side channels, beaver dams, and upland riparian forest areas. Beaver Creek is located within a valley that has steep canyon walls, particularly along the west side of the site. The reach of Beaver Creek located within the South Beaver Creek Natural Area provides some of the best potential salmon spawning and rearing habitat in the watershed due to its low gradient, seasonal flows, in-stream habitat conditions, intact riparian corridor, and accessible off-channel refuge habitat. Despite this, the area has been affected by surrounding urban land uses, including increased impervious areas associated with the steady growth of Troutdale and water withdrawals upstream in agricultural areas. These effects have altered stream flows, water temperatures, and aquatic habitat quality (e.g., reduced wood recruitment, increased turbidity and sedimentation).

Based on these existing conditions and a desire to provide a cost-effective restoration strategy, the Project focuses on strategic instream restoration actions that will improve salmon habitat. Proposed habitat restoration activities include the following:

1. Removal of a concrete weir and instream cistern structure. The weir forms a constriction in the creek, poses a hydraulic and fish passage constraint and will be removed to restore the channel migration zone through this area. The cistern is an artificial feature that can affect stream geomorphic processes.
2. Installation of large wood log structures that will provide habitat structure, create pools and channel complexity and improve stream and habitat functions beneficial to native fish species.
3. Stabilization of a stormwater outfall that drains the MHCC parking areas and discharges sediment laden water to Beaver Creek.

These restoration actions will take place on Metro owned property, with access and staging to occur on MHCC owned property. Restoration elements are described below and are included in Attachment 1.

Weir and Cistern Removal: The concrete weir was part of a flash board dam used to create a pond within the creek. It is comprised of ~6" thick concrete walls and a concrete apron that extends out to the edge of the wingwalls. During low-flow periods, the concrete apron likely creates a fish passage barrier due to low-flow depths. There is a containment berm along the eastern side of the creek that leads to the weir; both the weir and berm confine the creek in this reach of the Project. The flash boards are no longer used, but the weir and berm both are flow constrictions during high-flow events. The concrete weir, apron, and wingwalls will be demolished and all rubble, including some existing concrete rubble currently in the channel, will be removed from Beaver Creek and hauled offsite. After the concrete weir is removed, the creek banks will be graded to match the topography of the surrounding areas and a small notch will be excavated in the earthen berm to allow for high flow events to engage with the surrounding high quality riparian floodplain.

The instream concrete cistern is immediately upstream of the weir. The cistern structure will be demolished and removed.

Refer Attachment 1, Sheet D01 for details on the weir, earthen berm notch and cistern removal.

Helicopter Placed Large Wood Structures: Five different configurations of large wood structures are proposed to be placed in Beaver Creek and its floodplain. The large wood pieces are designed to be self-stabilizing due to their length relative to bankfull width, and will be placed by helicopter using bracing with existing trees where possible. Five configurations are proposed, based on location and conditions of the creek.

The logs will be placed by helicopter. Helicopter placement has been used recently by Metro, in collaboration with the Portland Water Bureau, to install large wood structures near Oxbow Park – successful methods applied at Oxbow Park will be applied for the Project. Helicopter placement allows for rapid project completion, minimal habitat disturbance, a small construction crew, and accurate material placement. It is expected that this means of wood structure placement will provide cost-efficient stream habitat benefits for salmon. The proposed large wood structures are shown in Attachment 1, detailed on Sheet D04.

Stormwater Outfall Stabilization: The Project stormwater outfall is just upslope, and west of the SE Stark Street Beaver Creek culvert crossing. It drains stormwater runoff to the creek through a steep, incised and erosive channelized gully. To reduce erosion and sedimentation delivery into Beaver Creek, energy dissipation features will be placed in the channel. The gully side slopes will be laid back and the bottom of the channel graded with benching to provide a stable surface for the placement of angular rock armoring. This work is shown in Attachment 1, detailed on Sheet D02.

B. Describe work within waters and wetlands.

Work within wetlands and waters will take place for the purpose of the restoration activities. Work within wetlands includes temporary log storage and temporary access for equipment to reach the weir removal site and for hauling the weir/cistern and related excavation spoils offsite. Neither the log storage or access route will have rock placement or other improvements other than temporary vegetation clearing.

Work within and below the OHW of Beaver Creek will include placement of large wood structures, dewatering and work area isolation for the weir and cistern removal, and placement of rock below the Beaver Creek OHW for the lowest portion of the stormwater outfall stabilization.

C. Construction Methods. Describe how the removal and/or fill activities will be accomplished to minimize impacts to waters and wetlands.

Design plans are included in Attachment 1 and were developed anticipating an engineer-led field construction process. The design details were scaled accordingly, assuming minor field adjustments will be required to accommodate log placement, chosen construction methods, available budget, and selected log structure locations.

Project construction elements will generally follow a sequence of: mobilization, fish exclusion and work area isolation at the weir and cistern removal site, bank layback at weir and cistern removal site, weir and cistern removal, berm notching, placement of large wood habitat structures throughout the Project area, outfall stabilization, and site restoration/stabilization. The summer construction schedule, anticipated low water levels, and use of helicopter wood placement were selected to minimize potential impacts to fish and water quality.

Sheet EC-01 of Attachment 1 shows ESC measures and other BMPs that will be undertaken on the Project site.

Site Preparation and Mobilization

Staging area for logs and slash material and the helicopter landing site is on a MHCC property that contains a disturbed terrace area located east of the Metro property and north of SE Cochran Road. This site has a secured gravel access driveway entering from Cochran Road. It is not anticipated that a rocked entrance will be needed at the entrance off of SE Cochran Rd in the southeastern portion of the site (Sheet EC01). This entrance is within uplands, graveled, and work will be completed in the dry season. This entrance leads to the contractor staging area, the access route to the creek, the helicopter staging area, and the log staging area.

Earthwork will occur in dry, summer conditions per the in-water work window. Wetlands and native plant communities to be protected within site work limits will be flagged for protection prior to construction.

The following construction ESC measures will be taken to further limit impacts to aquatic resources:

- The access route to the weir removal area and berm will be cleared only as necessary. Portions of the access route follow what appears to be an old road.
- Access route, clearing, and construction limits will be flagged prior to construction.
- Wattles will be installed around the wood staging area and downslope of the access route to the weir removal area. Wattles will be installed perpendicular to direction of potential flow, as shown on Sheet EC-01 of Attachment 1.
- Construction equipment will be staged and refueled in the designated staging areas, within uplands.
- Log storage will occur within the designated log staging area; this area will remain vegetated and clearing is not required (the grass covered area may be mowed).
- No clearing or work is proposed for the helicopter operations staging area, this is an existing gravel parking and equipment storage yard.
- Helicopter staging and refueling will occur in the designated upland helicopter staging area.
- The contractor will prevent generation and transport of rotor wash (blowing caused by the rotors); water trucks or other approved dust abatement measures will be onsite if conditions warrant dust management.
- Equipment refueling will occur within staging areas or in uplands via a pickup truck outfitted with appropriate containment devices. A spill kit will be available, and contractor is responsible for placing disposable absorbent mat "diapers" on the ground beneath fueling operations.
- Contractor will be required to clean (pressure washed or pressurized air) all equipment to be used in the Natural Area to limit the spread of noxious weed seeds.
- Contractor will inspect machinery daily for fuel or lubricant leaks.
- Vegetated buffers will remain intact adjacent to Beaver Creek.
- Wattles will be maintained to prevent the discharge of sediment to the Beaver Creek.
- Work will be competed in the in-water work window for Sandy River tributaries (July 15-August 31) or as required by ODFW.
- Monitor and inspection of erosion control measures and site water management features will occur daily, and observation will be record in a log.
- Exposed soils will be protected from erosion during rain events.
- BMPs and protective devices will be installed at the end of each work day when rain is forecast within 24-hrs.

Work Area Isolation and Fish Rescue

Work area isolation will occur prior to the weir and cistern removal to allow structure demolition and removal to occur in the dry. Temporary work area isolation methods will use soil filled bulk bags, pipes and a block net. It is assumed one upstream row of bulk bags will be placed across the creek upstream of the cistern structure, and a block net will be used at the downstream end of the work area below the weir. A gravity pipe or pumped flow will bypass flow past the work area.

The following construction BMPs and measures will be taken to further limit impacts to aquatic resources and fish:

- Visual turbidity monitoring will occur. Bulk bag removal will occur first at edges and proceed inward to allow turbidity to settle.
- If pumps are required, pump intakes will be screened per ODFW requirements and pump screens will be monitored.
- The contractor will perform any fish rescue in accordance with permit conditions and will be performed by personnel experienced with collection and handling of salmonids.
- All fish trapped in residual pools within the weir removal area will be collected with a seine or dip nets and

placed in clean transfer containers with cold, fresh creek water.

- Any captured fish will be immediately released into Beaver Creek downstream of the weir removal area in locations selected by the contractor.
- The contractor will obtain the ODFW/NMFS Scientific Take Permit prior to construction.

Excavation and Grading

The majority of the Project work areas are below the OHW of Beaver Creek, however very little excavation or grading is proposed as part of the Project. Demolition of the weir and cistern will likely occur with a jackhammer, or similar equipment. No saw cutting that generates slurry will be used. Excavation is limited to laying the banks back to conform with site topography at the weir removal site and will occur with an excavator and haul truck. Material removed from the weir and for the bank layback will be disposed of offsite at an approved disposal facility. Streambed fines, gravels, cobbles will be placed to fill streambed void left by concrete apron removal and cistern structure removal. This streambed substrate will be imported to the site.

The berm notching will occur last, as equipment leaves the site and will be done with a small excavator. Concrete and berm spoils will be hauled offsite via the access route identified on Sheet C05 of Attachment 1.

A helicopter will be used for all wood placement. Metro and the Project engineer will identify and flag locations of the wood prior to helicopter flight. Adjustments will be made at the approval of the Project engineer. Structure stability will rely on self-stabilization or bracing against existing trees where possible. Logs with rootwads will be sized appropriately for the bankfull width of the creek and appropriate for self-stabilization to occur. No anchoring is proposed. Slash will be obtained from logs (branch trimmings) will be placed in conjunction with and around the logs to provide extra debris and habitat complexity. Contractor will supply local, conifer logs with rootwads for the Project.

The stormwater outfall stabilization will be completed on Metro property limits with access from the MHCC campus (Sheet D02, Attachment 1). The erosional channel (gully) side slopes will be graded back and these spoils placed in the bottom of the channel and compacted. The channel profile will be graded with benching to provide a stable base for the rock. A small basin will be excavated at the base, and below OHW of Beaver Creek, that will also be lined with rock to provide a basin for energy dissipation during high flows. The stormwater outfall channel will be lined with filter fabric above OHW before lining the entire length with quarry spalls; no filter fabric will be placed below the Beaver Creek OHW (Sheet D02 of Attachment 1). The stormwater outfall gully lacks bed and bank or other OHW indicators.

All Additional BMPs to minimize impacts to wetlands and waters include:

- Two site access routes will be used; from SE Cochran Road for weir and cistern removal and from SE Stark Street for stormwater outfall stabilization. (Sheets EC01 and C02 of Attachment 1)
- The contractor will take measures to minimize rutting or other damage by construction vehicles on the primary access route shown to the east of Beaver Creek at the southern end of the Project.
- No excavation will occur in the wetted area of the channel is planned for wood structure placement. Structures are intended to be placed with as little disturbance to the channel and aquatic habitat as practicable.
- Biodegradable, non-toxic hydraulic fluids will be used in construction equipment specifically working below OHW.

Seeding, Planting and Site Restoration

Seeding and planting will occur on all disturbed areas in the access corridor and log staging areas, if needed. Site revegetation is shown on Sheet D05 of Attachment 1. Metro will plant areas of the Natural Area independent of this Project to reach their goals of restoring long-term processes via riparian vegetation enhancements. Finish grade surfaces of the weir grading bank layback areas and the berm notch side slopes will be seeded, mulched, and covered with erosion control blanket.

(4) PROJECT DESCRIPTION (continued)

D. Describe source of fill material and disposal locations if known.

Fill below the OHW is limited to logs and slash, substrate (sand, gravel, cobble, fines) to fill void left by the weir and cistern concrete apron removal, and quarry spalls for the stormwater outfall stabilization. The logs have been sourced locally and include conifer logs with rootwads. Substrate to be placed in the Beaver Creek channel and quarry spalls for the stormwater outfall stabilization will be imported and sourced locally by the contractor.

Concrete from the weir and cistern structures, and miscellaneous rubble observed in the creek, will be removed and disposed offsite at an approved disposal facility. The spoils from laying back the banks adjacent to the weir and from the berm notching will be also be hauled to offsite at an approved disposal facility. Spoils from the stormwater outfall stabilization will be placed above the OHW in uplands to backfill and reshape the erosional channel (gully) prior to rock placement.

E. Construction timeline.

What is the estimated project start date? **8/1/2023**

What is the estimated project completion date? **9/15/2023 (demob & site stabilization)**

Is any of the work underway or already complete? If yes, please describe. **Yes** ☒ **No**

F. Removal Volumes and Dimensions (if more than 7 impact sites, include a summary table as an attachment)

Wetland / Waterbody Name *	Removal Dimensions					Time Removal is to remain**	Material***
	Length (ft.)	Width (ft.)	Depth (ft.)	Area (sq.ft. or ac.)	Volume (c.y.)		
Beaver Creek	35	19	1	0.015 ac	30.8	Perm	Concrete (weir/structure rem.)
Beaver Creek	25	25	5	0.014 ac	58.3	Perm	Native Soils for bank layback
Beaver Creek	12	21	1	0.006 ac	14.4	Perm	Concrete (cistern/apron rem.)
Beaver Creek	10	15	1.5	0.003 ac	8.3	Perm	Concrete (rubble in creek)
Beaver Creek	7	6	5	0.001 ac	7.8	Perm	Native (Stormwater outfall stabilization: energy dissipation basin below OHW)

G. Total Removal Volumes and Dimensions

Total Removal to Wetlands and Other Waters	Length (ft.)	Area (sq. ft or ac.)	Volume (c.y.)
Total Removal to Wetlands	0	0	0
Total Removal Below Ordinary High Water	89	0.04 ac	120
Total Removal Below Highest Measured Tide	NA	NA	NA
Total Removal Below High Tide Line	NA	NA	NA
Total Removal Below Mean High Water Tidal Elevation	NA	NA	NA

H. Fill Volumes and Dimensions (if more than 7 impact sites, include a summary table as an attachment)

Wetland / Waterbody Name*	Fill Dimensions					Time Fill is to remain**	Material***
	Length (ft.)	Width (ft.)	Depth (ft.)	Area (sq. ft. or ac.)	Volume (c.y.)		
Beaver Creek	40	3	3	0.003 ac	13	Temp	Bulk bags, block net
Beaver Creek	70	Varies	Varies	0.16 ac	402	Perm	Logs with rootwads, slash
Beaver Creek	35	20	1	0.016 ac	25.9	Perm	Sand, gravel, cobble, fines to fill creek bed void after weir removal
Beaver Creek	12	15	1	0.004	14.4	Perm	Sand, gravel, cobble, fines to fill creek bed void after cistern removal
Beaver Creek	27	6	1.5	0.004	16.8	Perm	Quarry spalls

(4) PROJECT DESCRIPTION (continued)

I. Total Fill Volumes and Dimensions

Total Fill to Wetlands and Other Waters	Length (ft.)	Area (sq. ft or ac.)	Volume (c.y.)
Total Fill to Wetlands	0	0	0
Total Fill Below Ordinary High Water	184	0.19 ac	472
Total Fill Below Highest Measured Tide	NA	NA	NA
Total Fill Below High Tide Line	NA	NA	NA
Total Fill Below Mean High Water Tidal Elevation	NA	NA	NA

*If there is no official name for the wetland or waterbody, create a unique name (such as "Wetland 1" or "Tributary A").
**Indicate whether the proposed area of removal or fill is permanent or, if you are proposing temporary impacts, specify the days, months or years the fill or removal is to remain.
*** Example: soil, gravel, wood, concrete, pilings, rock etc.

(5) PROJECT PURPOSE AND NEED

Provide a statement of the purpose and need for the overall project.

The purpose of the Project is to remove existing structures that constrict flows and place large wood structures within Beaver Creek to arrest channel incision, dramatically roughen the channel and floodplain, restore floodplain connectivity, increase sediment deposition and retention, enhance instream habitat complexity, and restore the resiliency Beaver Creek, benefitting both the populations of ESA listed winter steelhead (*Onchorhynchus mykiss*), Chinook salmon (*Oncorhynchus tshawytscha)* and coho salmon (*Onchorhynchus kisutch*), as well as species of concern (Pacific lamprey (*Entosphenus tridentatus*) Coastal cutthroat trout *(Oncorhynchus clarkii clarkia)* within the project reaches, as well as the downstream populations of salmonids that inhabit the Sandy and Columbia Rivers. All large wood placement is for the purpose of habitat restoration.

The Project is needed to address the limiting factors affecting the survival of native salmonids inhabiting the Project reaches and completes recommended actions identified for Beaver Creek in the Sandy Basin Aquatic Habitat Restoration Strategy for Beaver Creek (Sandy River Basin Working Group 2007). Proposed restoration actions will:

- Restore long-term processes for improved water quality (Tier 2)
- Restore short-term processes associated with in-stream habitat (Tier 4)

Riparian habitat restoration (Tier 3) actions are being addressed by Metro through a separate effort at the Project site.

Ecosystem Diagnosis and Treatment (EDT) highlights the following survival factors that are critical to salmonids in this reach of Beaver Creek that will be addressed with the large wood structure placement, weir and cistern removal, and stormwater outfall stabilization: sediment load, channel stability, key habitat quantity (wood and other habitat complexity characteristics), and channel stability. All salmonid life stages are affected by the lack of habitat diversity and sediment, followed by key habitat quantity, channel stability, flow, and temperature.

(6) DESCRIPTION OF RESOURCES IN PROJECT AREA

A. Describe the existing physical, chemical, and biological characteristics of each wetland or waterbody. Reference the wetland and waters delineation report if one is available. Include the list of items provided in the instructions.

A Wetland and Waters Assessment Memo was completed to provide a determination of the location and extent of existing wetlands and other waters within Metro's Beaver Creek Restoration Project, and to provide an assessment of the Projects effects on wetland and stream functions to support the permitting of this voluntary habitat restoration project; this is included as Attachment 2. The Determination Area includes the limits of all potential construction disturbance which is the extent of the modeled 2-year flow inundation boundary for Beaver Creek, the construction staging areas and access routes for construction equipment, and the stormwater outfall stabilization area. The memo describes methods used to determine the boundaries of wetlands and waters, wetland delineation data sheets, and a photo appendix of the Project area. The Memo also includes a photo appendix of the site.

The17.77-acre Determination Area includes the Beaver Creek stream corridor, a mature forested riparian area along Beaver Creek, and a mix of mowed fields and upland forests in the staging and access areas. The forested riparian area extends the length of Beaver Creek in the Determination Area, occurring in a canyon that becomes broader to the north, as the creek approaches Stark Street. The creek corridor is vegetated with Douglas fir (*Pseudotsuga menziesii*, FACU),

bigleaf maple (*Acer macrophyllum*, FACU), red alder (*Alnus rubra*, FAC), red elderberry (*Sambucus racemosa*, FACU), and other common forest species. The access and staging areas include mature Douglas fir forest and open fields of creeping bentgrass (*Agrostis stolonifera*, FAC), velvet grass (*Holcus lanatus*, FAC), black medic (*Medicago lupulina*, FACU), white clover (*Trifolium repens*, FAC); an area covered exclusively in reed canarygrass (*Phalaris arundinacea*, FACW) occurs at the top of the canyon slope. The stormwater outfall is located west of Beaver Creek, at the northern end of the Determination Area. The outfall consists of a 10-inch concrete pipe that discharges to the canyon slope, causing erosion that has undermined the lower pipe segments – pieces of decayed pipe are laying on the slope in the eroded soils.

One wetland and one water were identified within the Determination Area boundaries and are shown in Figures 5a-5e; onsite wetlands total 1.25 acres and waters total 15.48 acres.

Wetlands:

Wetland A is a palustrine forested/emergent, slope wetland that originates in the project staging area, and extends off site to the south, and then crosses the Determination Area again where the steep valley slopes transition to the Beaver Creek floodplain. In total, 1.25 acres of Wetland A occurs within the Determination Area. Vegetation includes native forested species such as red alder, Oregon ash, twinberry (*Lonicera involucrata*, FAC), and Nootka rose (*Rosa nutkana*, FAC), Armenian blackberry (*Rubus armeniacus*, FAC), spotted jewelweed (*Impatiens capensis*, FACW), largeleaf avens (*Geum macrophyllum*, FAC), and trailing buttercup (*Ranunculus repens*, FAC) where the wetland crosses the Determination Area at the slope toe; palustrine emergent wetland areas at the top of slope are dominated by reed canarygrass.

Waters:

Onsite waters include Beaver Creek and a segment of Kelly Creek at its confluence with Beaver Creek. Beaver Creek is a perennial water that supports native fish. The main stem of the South Beaver Creek Natural Area Restoration project reach is 6,325 feet in length, extending from SE Cochran Road downstream to SE Stark Street. In general, the Project reach of Beaver Creek provides some sections of good channel complexity composed of woody material accumulations and accessible side channels. This is particularly true in the reach downstream of the Kelly Creek confluence. However, in-stream wood is significantly lacking in size and quantity throughout the project reach, relative to a more pristine, natural stream reach. Upstream of Kelly Creek, Beaver Creek has confined reaches due to berms and a concrete weir. A detailed existing conditions and restoration recommendations reports was prepared for Metro and is included as Attachment 3.

In total, the area below OHW is 15.48 acres. The OHW for Beaver Creek was established using a modeled 2-year flow elevation developed for the project design. Wetland biologists field-inspected the 2-year flow elevation to confirm the model results include all areas with OHW field indicators included in Corps Regulatory Guidance Letter No. 05-05 and DSL guidance.

To address items in Block 8 of this Application:

Fish and Wildlife

Numerous songbirds and waterfowl occupy the site, as do coyotes, deer and other mammals. Beavers were not observed but likely occur, and are expected to recolonize the site.

An ORBIC Report and IPAC Resource list was generated to evaluate species under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the Project site and includes the following Threatened or Endangered Species: Steaked Horned Lark (*Eremophila alpstris strigata*), Northern Spotted Owl (*Strix occidentalis caurina*), Yellow-billed Cuckoo (*Coccyzus americanus*), Nelson's Checkermallow (*Sidalcea nelsoniana*), Willamette Daisy (*Erigeron decumbens*), and Fender's Blue Butterfly (*Icaricia icariodes fenderi*). No observations of these species have been made at the Project site, and in the existing condition does not currently contain suitable habitat for these 6 species. Given the timing of the in water work window, it is unlikely the Project site will overlap with breeding season or affect breeding migratory birds. Attachment 4 includes a summary of the species within the ORBIC and IPAC reports for the Project.

Beaver Creek, within the natural area, provides spawning, rearing, and migration habitat for Endangered Species Act (ESA)-listed fall Chinook salmon, coho salmon, and winter steelhead, as well as various native and non-native fish species. Appendix C of the *South Beaver Creek Natural Area Restoration Project Existing Conditions Report* (AECOM 2021; Attachment 3) lists all fish species documented in the Beaver Creek watershed.

ESA-Listed and Sensitive Fish Species in the Study Area are shown the table below.

Fish Species	DPS/ESU[1]	ESA Listing Status[2]		CH/EFH in Study Area?[3]	Habitat Use Type[4]
		Federal	State		
Fall Chinook salmon *(Oncorhynchus tshawytscha)*	Lower Columbia River ESU	T	SC	CH/EFH	S/R/M
Coho salmon *(Oncorhynchus kisutch)*	Lower Columbia River ESU	T	E	CH/EFH	S/R/M
Winter steelhead (*Oncorhynchus mykiss*)	Lower Columbia River DPS	T	SC	CH	S/R/M
Coastal cutthroat trout *(Oncorhynchus clarkii clarkii)*	NA	SOC	S	NA	U
Pacific lamprey (*Entosphenus tridentatus*)	NA	SOC	S	NA	YR

Notes:
[1] DPS= Distinct Population Segment; ESU= Evolutionarily Significant Unit
[2] E= Endangered; T = Threatened; S= Sensitive; SC= Sensitive-Critical; SOC = Species of Concern
[3] EFH= Essential Fish Habitat; CH= Critical Habitat
[4] S = Spawning, R = Rearing, M = Migration, U = Unknown, YR = Year round Sources: ORBIC 2019; StreamNet 2021; WFC 2011

100-Year Floodplain

Project work will occur within the FEMA mapped floodway and 100-year floodplain. The floodplain region is designated as Zone AE and a No-Rise Analysis was completed for the project during design and engineering.

B. Describe the existing navigation, fishing and recreational use of the waterbody or wetland.

The Natural Area is used only informally. The wetlands and waters are not easily accessed due to lack of trails, dense vegetation, and steep slopes.

(7) PROJECT SPECIFIC CRITERIA AND ALTERNATIVES ANALYSIS

Describe project-specific criteria necessary to achieve the project purpose. Describe alternative sites and project designs that were considered to avoid or minimize impacts to the waterbody or wetland.*

Metro purchased the Project site specifically with the intent to complete restoration of habitat functions on Beaver Creek. Additional alternatives were considered for different habitat uplift scenarios, but all habitat restoration work would take place in waters.

1. Kelly Creek was evaluated for wood placement, but it was determined that it may be too steep (2- 4% gradient) for wood placement because the substrate is relatively large and cannot be easily mobilized to create pools.
2. Prior studies in this reach (Cramer Fish Sciences in 2012) have suggested that LWD placement and gravel enhancement could improve spawning in Kelly Creek and could provide public viewing opportunities. However, this would largely benefit only winter steelhead spawning, thus less overall benefit for the effort. Given the existing dam at the upstream end of the Kelley Creek reach, the benefits do not currently warrant the investment in Kelly Creek enhancements. Therefore, this Project focuses on Beaver Creek enhancements for better return on investment.
3. Alternate access corridors were evaluated, but those too contained wetlands and there was no alternate access corridor that would fully avoid crossing wetlands.

The proposed Project used many ecological references and studies to guide Project planning and design:

- *Sandy Basin Aquatic Habitat Restoration Strategy for Beaver Creek* (Sandy River Basin Working Group 2007)
- *South Beaver Creek Natural Area Restoration Project Existing Conditions Report* (AECOM 2021; Attachment 3)
- Metro completed projects on Johnson Creek (Ambleside), North Fork Deep Creek, Newell Creek
- There are ecological reference sites that were used to drive project design that can be observed in the larger Sandy River basin, and from Projects completed in Beaver Creek. The channel spanning logjams found in and further up in the basin where LWD recruitment is still an active stream function was used as a natural analog and as reference for large wood structures functionally trapping sediment, provide overhead cover, hydraulic complexity and creating spawning habitat.

(8) ADDITIONAL INFORMATION

Are there state or federally listed species on the project site?	**X Yes**	**No**	**Unknown**
Is the project site within designated or proposed critical habitat?	**X Yes**	**No**	**Unknown**
Is the project site within a national Wild and Scenic River ?	**X Yes**	**No**	**Unknown**
Is the project site within a State Scenic Waterway?	**Yes**	**X No**	**Unknown**
Is the project site within the 100-year floodplain?	**X Yes**	**No**	**Unknown**

If yes to any above, explain in Block 6 and describe measures to minimize adverse effects to those resources in Block 7.

Is the project site within the Territorial Sea Plan (TSP) Area?	**Yes**	**X No**	**Unknown**

If yes, attach TSP review as a separate document for DSL.

Is the project site within a designated Marine Reserve?	**Yes**	**X No**	**Unknown**

If yes, certain additional DSL restrictions will apply.

Will the overall project involve ground disturbance of one acre or more?	**Yes**	**X No**	**Unknown**

If yes, you may need a 1200-C permit from the Oregon Department of Environmental Quality (DEQ).

Is the fill or dredged material a carrier of contaminants from on-site or off-site spills?	**Yes**	**X No**	**Unknown**
Has the fill or dredged material been physically and/or chemically tested?	**Yes**	**X No**	**Unknown**

If yes, explain in Block 6 and provide references to any physical/chemical testing report(s).

Has a cultural resource (archaeological and/or built environment) survey been performed on the project area?	**X Yes**	**No**	**Unknown**
Do you have any additional archaeological or built environment documentation, or correspondence from tribes or the State Historic Preservation Office?	**Yes**	**X No**	**Unknown**

If yes, provide a copy of the survey and/or documentation of correspondence with this application to the Corps only. Do not describe any resources in this document. Do not provide the survey or documentation to DSL.

* Not required by the Corps for a complete application, but is necessary for individual permits before a permit decision can be rendered.

Is the project part of a DEQ Cleanup Site? No [X] Yes☐ Permit number _____

DEQ contact._

Will the project result in new impervious surfaces or the redevelopment of existing surfaces? Yes ☐ No [X]

If yes, the applicant must submit a post-construction stormwater management plan as part of this application to DEQ's 401 WQC program for review and approval, see https://www.oregon.gov/deq/FilterDocs/401wqcertPostCon.pdf

Identify any other federal agency that is funding, authorizing or implementing the project.

Agency Name	Contact Name	Phone Number	Most Recent Date of Contact

List other certificates or approvals/denials required or received from other federal, state or local agencies for work described in this application.

Agency	Certificate / approval / denial description	Date Applied

Other DSL and/or Corps Actions Associated with this Site (Check all that apply.)

☐ Work proposed on or over lands owned by or leased from the Corps (may require authorization pursuant to 33 USC 408). These could include the federal navigation channel, structures, levees, real estate, dikes, dams, and other Corps projects.

☐ State owned waterway DSL Waterway Lease #:

☐ Other Corps or DSL Permits Corps # DSL #

☐ Violation for Unauthorized Activity Corps # DSL #

☐ Wetland and Waters Delineation Corps # DSL #

Submit the entire delineation report to the Corps; submit only the concurrence letter (if complete) and approved maps to DSL. If not previously submitted to DSL, send under a separate cover letter

(9) IMPACTS, RESTORATION/REHABILITATION, AND COMPENSATORY MITIGATION

A. Describe unavoidable environmental impacts that are likely to result from the proposed project. Include permanent, temporary, direct, and indirect impacts.

All impacts are temporary and related to construction activities that will restore salmon and native fish habitat to a degraded system. No direct or indirect impacts are anticipated as the reach of Beaver Creek will be improved as a result of the proposed Project.

Clearing for access to the weir removal site will temporarily impact wetlands by clearing (no grubbing) vegetation. Installation of the large wood structures, installation and removal of work area isolation measures, removal of the weir and cistern (and components), and features to be installed as part of the stormwater outfall may result in temporary and minor turbid water inputs in Beaver Creek. Visual monitoring and erosion control best management practices will be used to minimize impacts to water quality and aquatic species, and to ensure that turbid water does not exceed allowable limits.

Direct impacts to fish from potential fish handling will be minimized by following the handling protocols established by ODFW and NMFS. Only experienced personnel will be involved with fish rescue (capture, handling and salvage).

B. For temporary removal or fill or disturbance of vegetation in waterbodies, wetlands or riparian (i.e., streamside) areas, discuss how the site will be restored after construction to include the timeline for restoration.

All temporary disturbance areas are will be restored per the construction plans. All areas of bare soils will be seeded immediately following construction, followed up by installation of bare-root, live stake material during winter following the construction. The weir removal area and stormwater outfall area will be seeded, mulched and erosion blanket installed after finish grades are reached.

Compensatory Mitigation

C. Proposed mitigation approach. Check all that apply:

Permittee responsible ☐ Onsite Mitigation	Permittee responsible ☐ Offsite Mitigation	Mitigation Bank or ☐ In-Lieu Fee Program	Payment In-Lieu ☐ (Not approved for use with Corps permits)

D. Provide a brief description of proposed mitigation approach and the rationale for choosing that approach. If you believe mitigation should not be required, explain why.

This habitat restoration project will self-mitigate through significant ecological uplift resulting from wood placement and other stream function and habitat improvements. All temporary impacts below the OHW of Beaver Creek will be self-mitigating as they are necessary to complete restoration project that will result in the following aquatic and fish habitat uplift:

- large woody debris enhancement,
- trapping sediment (spawning gravels),
- increasing habitat diversity,
- fringe habitat complexity,
- key habitat quantity,
- juvenile rearing complexity and flood refuge,
- adult holding cover,
- scours new pools,
- increase floodplain connectivity,
- reduction of sediment transport to downstream reaches

Project benefits to wetland and stream functions are described in Attachment 2: *Beaver Creek Wetland and Waters Assessment Memo.*

Mitigation Bank / In-Lieu Fee Information:

Name of mitigation bank or in-lieu fee project:

Type and amount of credits to be purchased:

If you are proposing permittee-responsible mitigation, have you prepared a compensatory mitigation plan?

☐ Yes. Submit the plan with this application and complete the remainder of this section.

☐ No. A mitigation plan will need to be submitted (for DSL, this plan is required for a complete application).

Mitigation Location Information (Fill out only if permittee-responsible mitigation is proposed)

Mitigation Site Name/Legal Description	Mitigation Site Address	Tax Lot #
County	City	Latitude & Longitude (in DD.DDDD format)

Township	Range	Section	Quarter/Quarter

(10) ADJACENT PROPERTY OWNERS FOR PROJECT AND MITIGATION SITE		
[X] Pre-printed mailing labels of adjacent property owners attached separately (if more than 30).	**Project Site Adjacent Property Owners**	**Mitigation Site Adjacent Property Owners**
Contact Name Address 1 Address 2 City, ST ZIP Code		
Contact Name Address 1 Address 2 City, ST ZIP Code		
Contact Name Address 1 Address 2 City, ST ZIP Code		

(11) CITY/COUNTY PLANNING DEPARTMENT LAND USE AFFIDAVIT (TO BE COMPLETED BY LOCAL PLANNING OFFICIAL)

I have reviewed the project described in this application and have determined that:

- ☐ This project is not regulated by the comprehensive plan and land use regulations
- ☐ This project is consistent with the comprehensive plan and land use regulations
- ☐ This project is consistent with the comprehensive plan and land use regulations with the following:
  - ☐ Conditional Use Approval
  - ☐ Development Permit
  - ☐ Other Permit (explain in comment section below)
- ☐ This project is not currently consistent with the comprehensive plan and land use regulations. To be consistent requires:
  - ☐ Plan Amendment
  - ☐ Zone Change
  - ☐ Other Approval or Review (explain in comment section below)

An application or variance request has ☐ has not ☐ been filed for the approvals required above.

Local planning official name (print)	Title	City / County

Signature	Date

Comments:

(12) COASTAL ZONE CERTIFICATION

If the proposed activity described in your permit application is within the Oregon Coastal Zone, the following certification is required before your application can be processed. The signed statement will be forwarded to the Oregon Department of Land Conservation and Development (DLCD) for its concurrence or objection. For additional information on the Oregon Coastal Zone Management Program and consistency reviews of federally permitted projects, contact DLCD at 635 Capitol Street NE, Suite 150, Salem, Oregon 97301 or call 503-373-0050 or click here.

CERTIFICATION STATEMENT

I certify that, to the best of my knowledge and belief, the proposed activity described in this application complies with the approved Oregon Coastal Zone Management Program and will be completed in a manner consistent with the program.

Print /Type Applicant Name	Title

Applicant Signature	Date

(13) SIGNATURES

Application is hereby made for the activities described herein. I certify that I am familiar with the information contained in the application, and, to the best of my knowledge and belief, this information is true, complete and accurate. I further certify that I possess the authority to undertake the proposed activities. By signing this application I consent to allow Corps or DSL staff to enter into the above-described property to inspect the project location and to determine compliance with an authorization, if granted. I hereby authorize the person identified in the authorized agent block below to act in my behalf as my agent in the processing of this application and to furnish supplemental information in support of this permit application. I understand that the granting of other permits by local, county, state or federal agencies does not release me from the requirement of obtaining the permits requested before commencing the project. I understand that payment of the required state processing fee does not guarantee permit issuance.

To be considered complete, the fee must accompany the application to DSL. The fee is not required for submittal of an application to the Corps.

Fee Amount Enclosed	$

Applicant Signature (required) must match the name in Block 2	
Print Name	Title
Signature	Date
Authorized Agent Signature	
Print Name	Title
Signature	Date

Landowner Signature(s)*	
Landowner of the Project Site (if different from applicant)	
Print Name	Title
Signature	Date
Landowner of the Mitigation Site (if different from applicant)	
Print Name	Title
Signature	Date
Department of State Lands, Property Manager (to be completed by DSL)	
If the project is located on state-owned submerged and submersible lands, DSL staff will obtain a signature from the Land Management Division of DSL. A signature by DSL for activities proposed on state-owned submerged/submersible lands only grants the applicant consent to apply for a removal-fill permit. A signature for activities on state-owned submerged and submersible lands grants no other authority, express or implied and a separate proprietary authorization may be required.	
Print Name	Title
Signature	Date

* Not required by the Corps.

(14) ATTACHMENTS

- [X] Drawings
  - [X] Location map with roads identified
  - [X] U.S.G.S topographic map
  - [X] Tax lot map
  - [X] Site plan(s)
  - [X] Plan view and cross section drawing(s) Recent aerial photo
  - [X] Project photos
  - [X] Erosion and Pollution Control Plan(s), if applicable
  - [ ] DSL / Corps Wetland Concurrence letter and map, if approved and applicable
- [X] Pre-printed labels for adjacent property owners (Required if more than 30)
- [ ] Incumbency Certificate if applicant is a partnership or corporation
- [X] Restoration plan or rehabilitation plan for temporary impacts
- [ ] Mitigation plan
- [ ] Wetland functional assessments, if applicable
  - Cover Page
  - Score Sheets
  - ORWAP OR, F, T, & S forms ORWAP Reports
  - Assessment Maps
  - ORWAP Reports: Soils, Topo, Assessment area, Contributing area
- [ ] Stream Functional Assessments, if applicable
  - Cover Page
  - Score Sheets
  - SFAM PA, PAA, & EAA forms SFAM Report
  - Assessment Maps
    - Aerial Photo Site Map and Topo Site Map (Both maps should document the PA, PAA, & EAA)
- [ ] Compensatory Mitigation (CM) Eligibility & Accounting Worksheet
  - Matching Quickguide sheet(s)
  - CM Eligibility & Accounting sheet
- [ ] Alternatives analysis
- [ ] Biological assessment (if requested by the Corps project manager during pre-application coordination)
- [ ] Stormwater management plan (may be required by the Corps or DEQ)
- [X] Other

Please describe:

Attachment 2. Beaver Creek Restoration - Wetland and Other Waters Assessment
Attachment 3. South Beaver Creek Natural Area Restoration Project Existing Conditions Report
Attachment 4. IPAC and ORBIC Species

For U.S. Army Corps of Engineers send application to:

USACE Portland District
ATTN: CENWP-ODG-P
PO Box 2946
Portland, OR 97208-2946
Phone: 503-808-4373
portlandpermits@usace.army.mil

U.S. Army Corps of Engineers ATTN: CENWP-ODG-E
211 E. 7th AVE, Suite 105
Eugene, OR 97401-2722
Phone: 541-465-6868
portlandpermits@usace.army.mil

Counties:
Baker, Benton, Clackamas, Clatsop, Columbia, Gilliam, Grant, Hood River, Jefferson, Lincoln, Linn, Malheur, Marion, Morrow, Multnomah, Polk, Sherman, Tillamook, Umatilla, Union, Wallowa, Wasco, Washington, Wheeler, Yamhill

Counties:
Coos, Crook, Curry, Deschutes, Douglas, Jackson, Josephine, Harney, Klamath, Lake, Lane

For Department of State Lands send application to:

West of the Cascades:
Department of State Lands
775 Summer Street NE, Ste 100
Salem, OR 97301-1279
Phone: 503-986-5200
https://www.oregon.gov/dsl/WW/Documents/uploadinstructions_removalfill.pdf

East of the Cascades:
Department of State Lands 951 SW Simpson Ave, Ste 104
Bend, OR 97702
Phone: 541-388-6112
https://www.oregon.gov/dsl/WW/Documents/uploadinstructions_removalfill.pdf

For Department of Environmental Quality:

Submit all application materials electronically through *Your DEQ Online*.

For questions related to *Your DEQ Online*, please visit the *Your DEQ Online* help page, email YourDEQOnline@deq.state.or.us, or call 503-229-6184

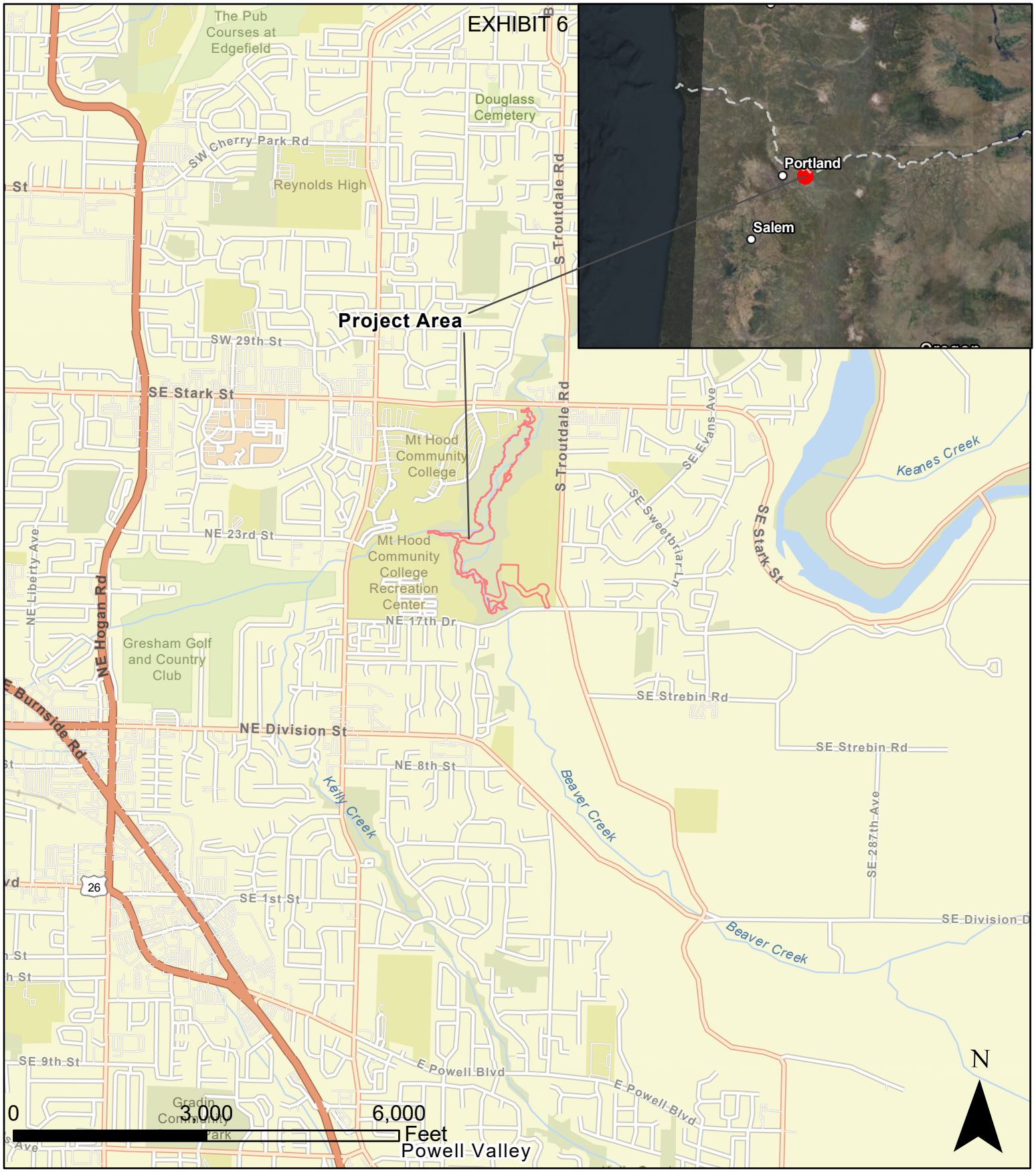
EXHIBIT 6

List of Figures and Attachments

EXHIBIT 6

Figures

EXHIBIT 6



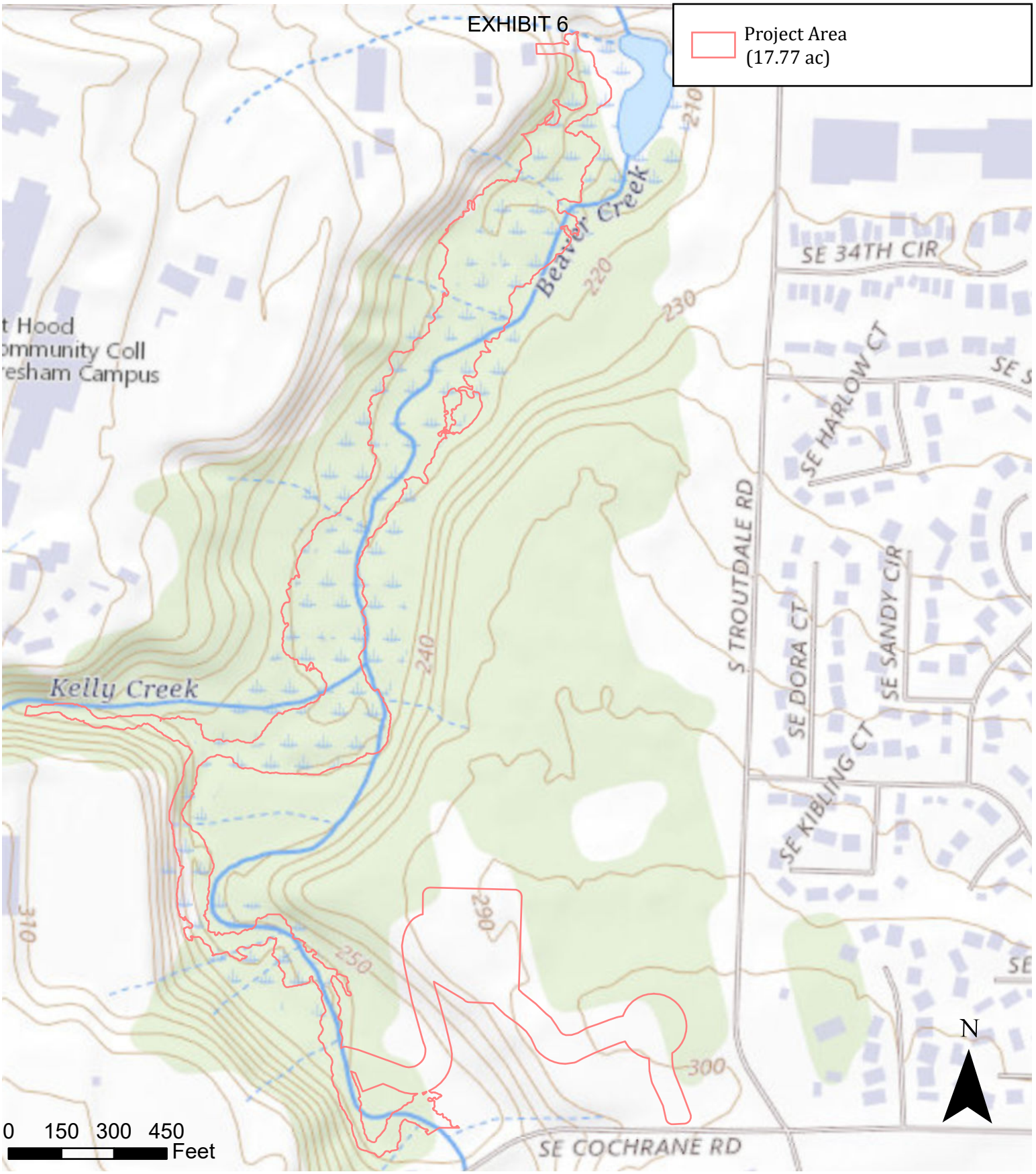
Date: 3/30/2023
Data Source: ESRI, 2020

Figure 1. Location

Beaver Creek Restoration Joint Permit Application

CASCADE ENVIRONMENTAL GROUP

Z:\GIS\252_BeaverCkWL\BeaverCk_backup.aprx



Date: 3/30/2023
Data Source: USDA NAIP, 2020

Figure 2. USGS Topographic Map

Beaver Creek Restoration Joint Permit Application

CASCADE ENVIRONMENTAL GROUP

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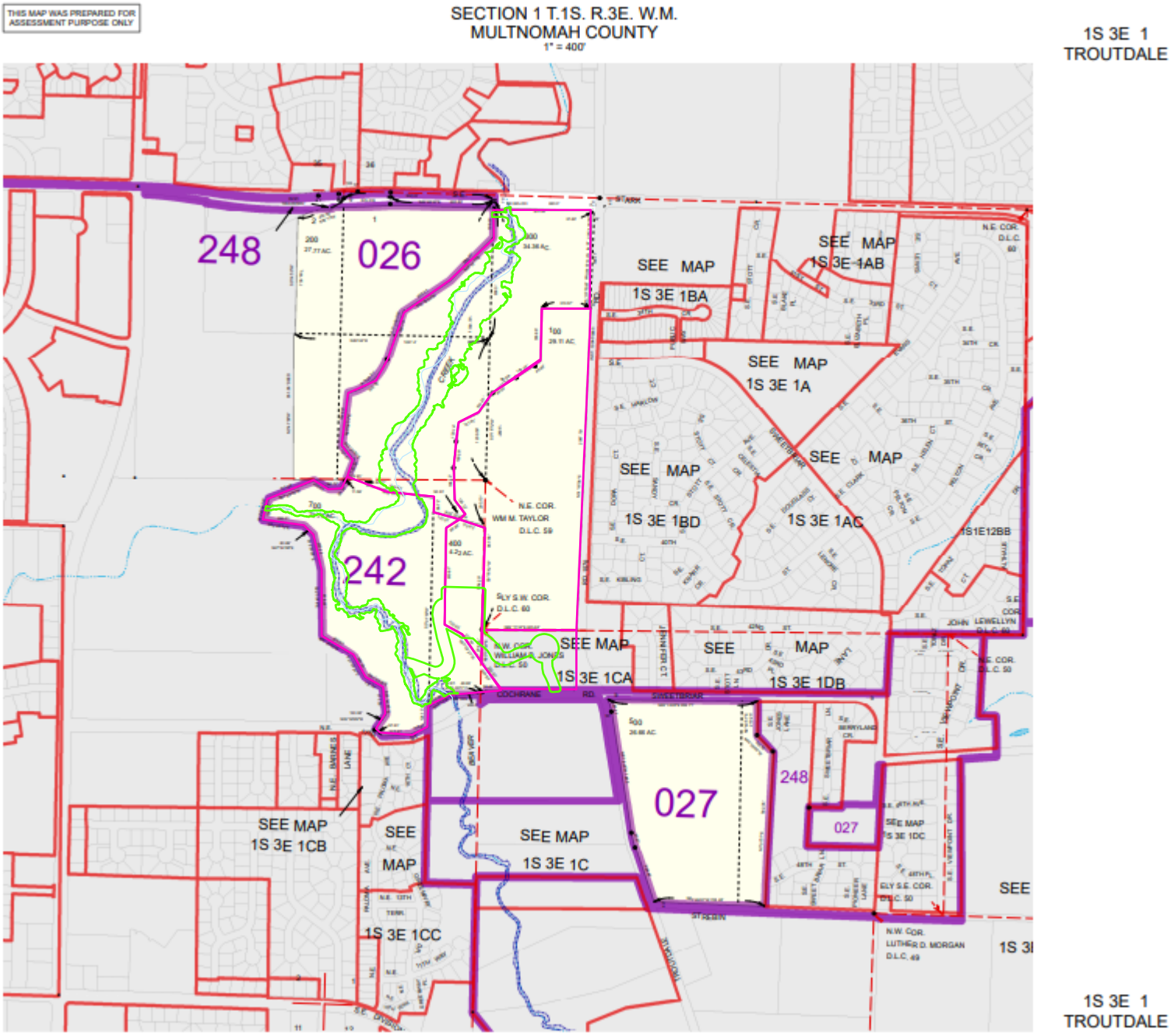
EXHIBIT 6

Project Boundary

Taxlot Boundaries



Date: 3/30/2023
Data Source: ORMAP

Figure 3. Taxlot Map

Beaver Creek Restoration Joint Permit Application

CASCADE ENVIRONMENTAL GROUP

Z:\GIS\252_BeaverCkWL\BeaverCk_backup.aprx

Date: 3/30/2023
Data Source: USDA NAIP, 2020

Figure 4. Recent Aerial (2020)

Beaver Creek Restoration Joint Permit Application

CASCADE ENVIRONMENTAL GROUP

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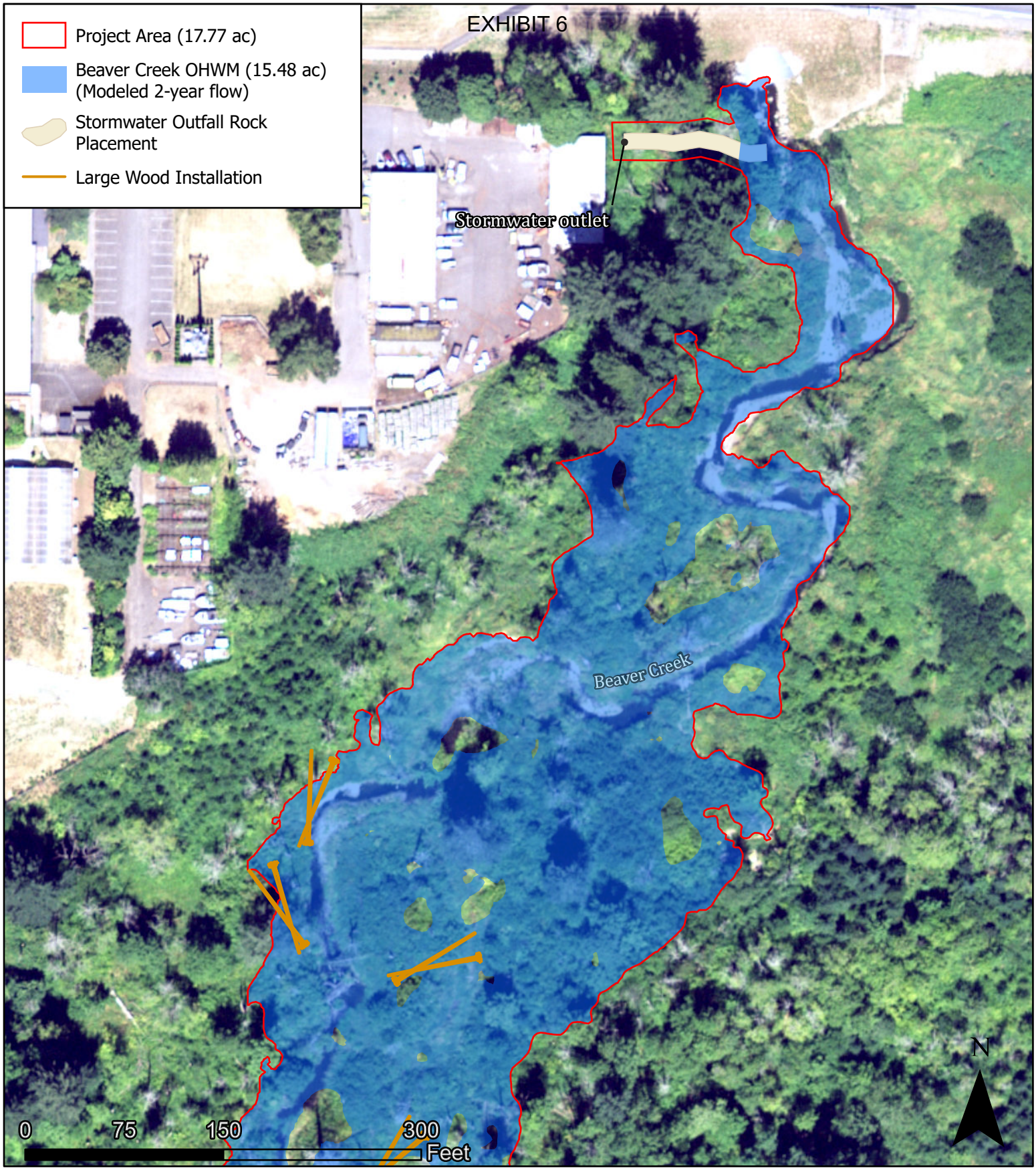

Date: 3/31/2023
Data Source: AECOM, 2022
USDA NAIP, 2020

Figure 5a. Site Plan

Beaver Creek Restoration Joint Permit Application

CASCADE ENVIRONMENTAL GROUP

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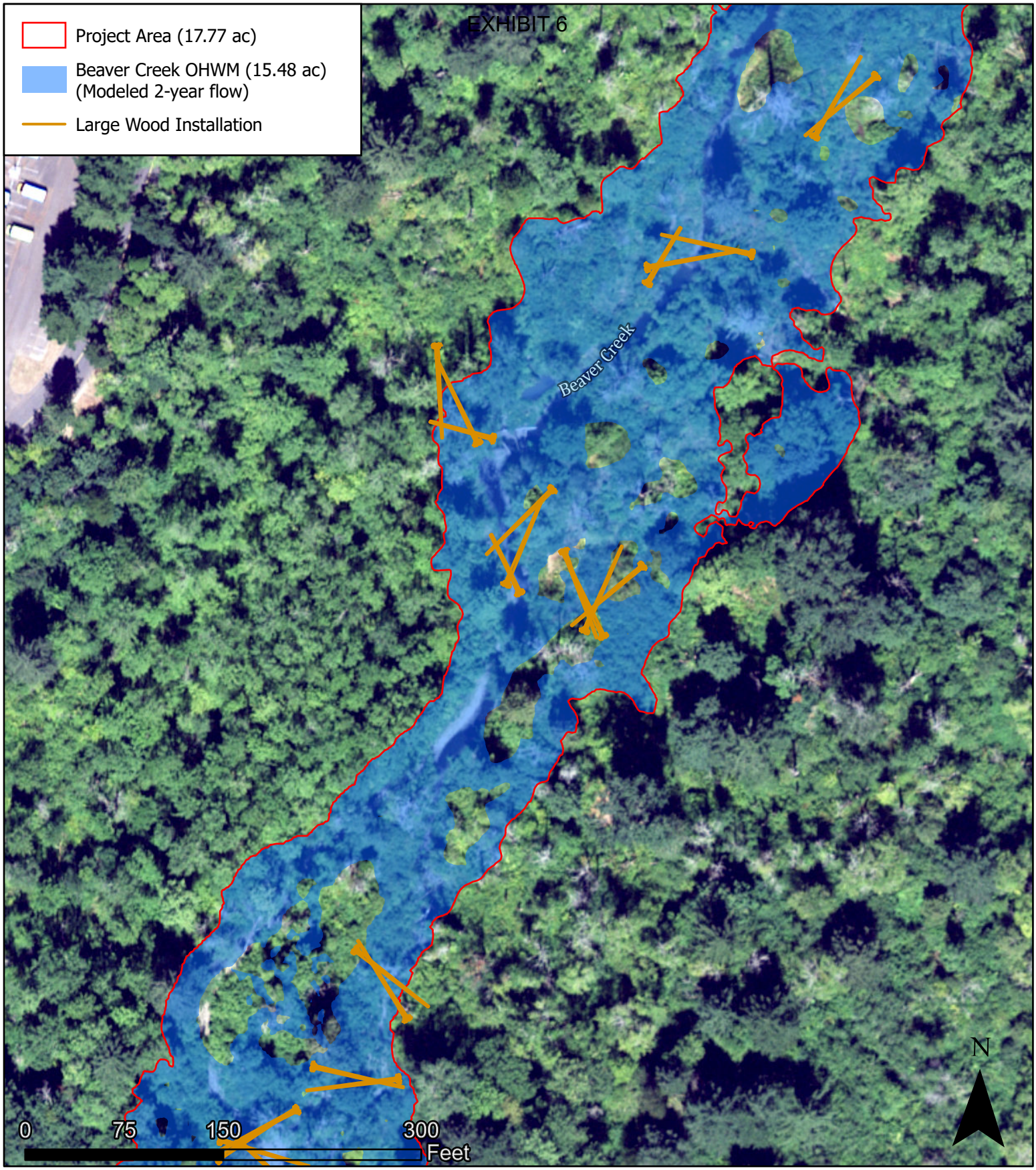

Date: 3/30/2023
Data Source: AECOM, 2022
USDA NAIP, 2020

Figure 5b. Site Plan

Beaver Creek Restoration Joint Permit Application

CASCADE ENVIRONMENTAL GROUP

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Date: 3/30/2023
Data Source: AECOM, 2022
USDA NAIP, 2020

Figure 5c. Site Plan

Beaver Creek Restoration Joint Permit Application

CASCADE ENVIRONMENTAL GROUP

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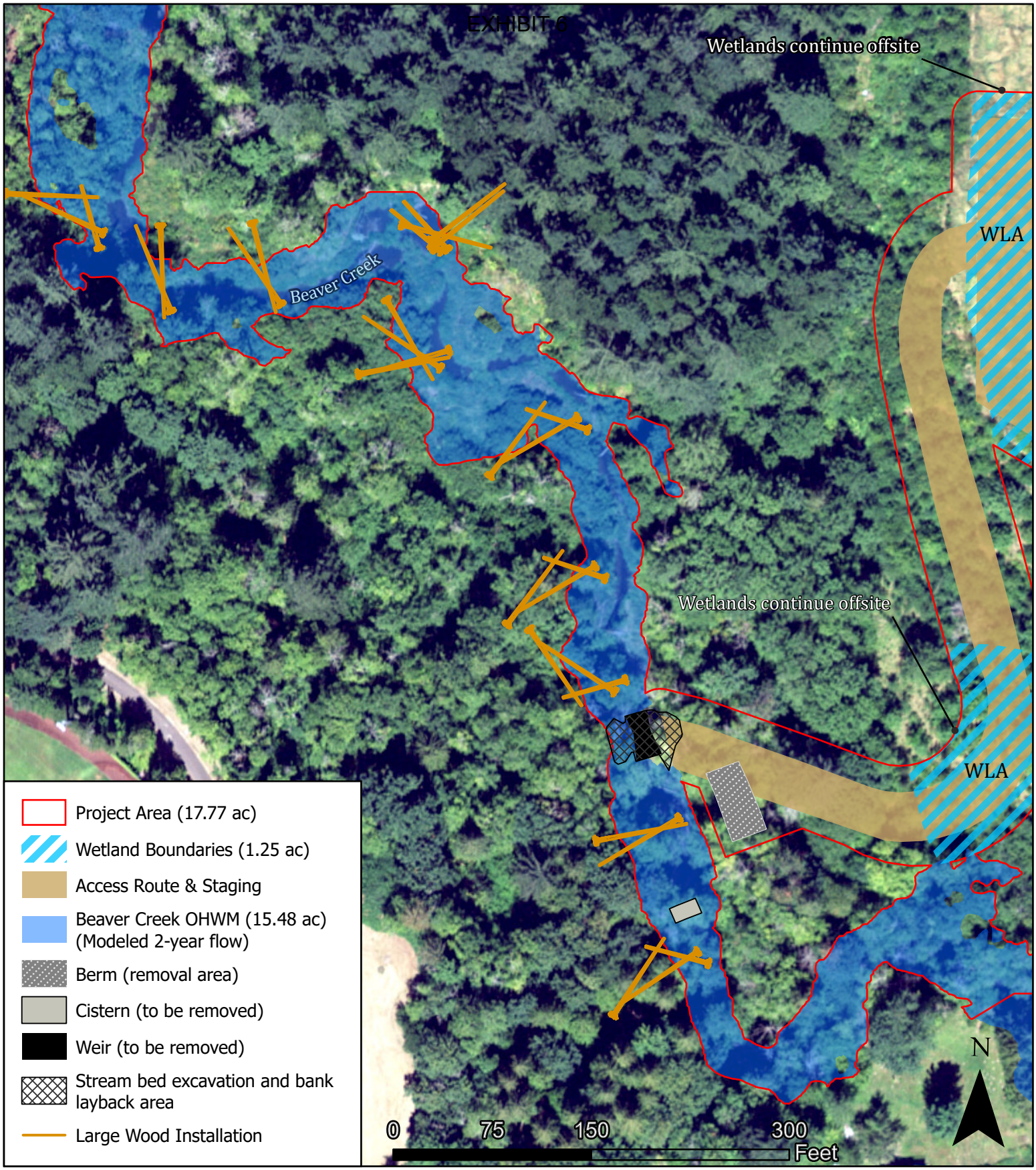
EXHIBIT 6



Date: 3/31/2023
Data Source: AECOM, 2022
USDA NAIP, 2020

Figure 5d. Site Plan

Beaver Creek Restoration Joint Permit Application

CASCADE ENVIRONMENTAL GROUP

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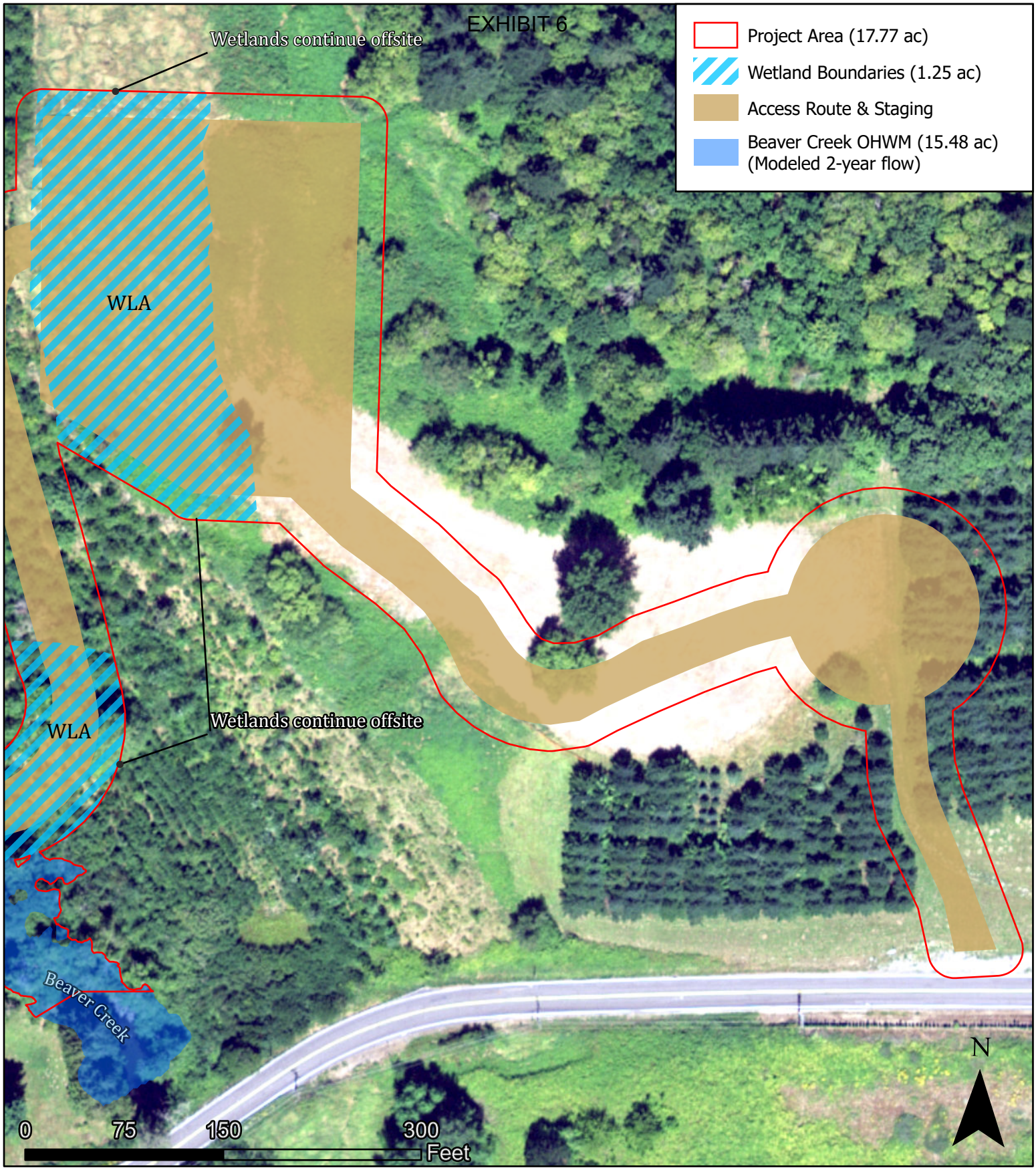

Date: 3/31/2023
Data Source: AECOM, 2022
USDA NAIP, 2020

Figure 5e. Site Plan

Beaver Creek Restoration Joint Permit Application

CASCADE ENVIRONMENTAL GROUP

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Attachment 1. South Beaver Creek Natural Area Restoration Project Design Plans

EXHIBIT 6

Attachment 2. Beaver Creek Restoration - Wetland and Other Waters Assessment

November 2021

EXHIBIT 6

CASCADE ENVIRONMENTAL GROUP

To: **Brian Vaughn, Oregon Metro**

From: **Brent Haddaway, Cascade Environmental Group**

Subject: **Beaver Creek Restoration - Wetland and Other Waters Assessment**

Date: **March 22, 2023**

This memo has been prepared to provide a determination of the location and extent of existing wetlands and other waters within Metro's Beaver Creek Restoration Project and a Wetland and Stream Functions Assessment to support the permitting of this voluntary restoration project.

Wetlands and Other Waters Determination

The Beaver Creek Restoration Project is within properties owned by Metro and Mount Hood Community College (Determination Area) located in the City of Troutdale, Multnomah County, Oregon (Figure 1) regulated under the Clean Water Act (CWA) by the U.S. Army Corps of Engineers (Corps) and under the Removal-Fill Law by the Oregon Department of State Lands (DSL).

Metro is the permit applicant, and in partnership with Mount Hood Community College, proposes to use the site for restoration of the South Beaver Creek Natural Area stream and wetlands. Metro's project goals for the site are to:

1. Increase habitat functions by installing large wood material that provides habitat structure to create pools and channel complexity and removing concrete weir constriction and laying back banks at that location.
2. Improve floodplain connectivity; large wood will engage adjacent floodplain areas through improved channel complexity and structure.

This memo identifies all wetlands and waters that occur within the Beaver Creek Restoration Project construction areas. This memo supports construction permitting for a voluntary restoration project.

Site Description

The Determination Area consists of a 17.77-acre portion of two tax lot parcels (00300 and 00700) owned by Metro, and two parcels (00400 and 01900), owned by Mount Hood Community College (map number 1S3E01; Figure 2). The Determination Area is south of SE Stark St and north of Cochran Road in Troutdale, Multnomah County, Oregon (Figure 1). The project's legal description is Section 1, Township 1S, Range 3E.

The Metro properties in the Determination Area are zoned Open Space, the Mount Hood Community College parcels containing the staging and access areas is zoned Industrial.

The Determination Area includes the limits of all potential construction disturbance which is the extent of the modeled 2-year flow inundation boundary for Beaver Creek, the construction staging areas and access routes for construction equipment, and a stormwater outfall area where repairs will be made. The Determination Area includes the Beaver Creek stream corridor, a mature forested riparian area along Beaver Creek, and a mix of mowed fields and upland forests in the staging and access areas. The forested riparian area extends the length of Beaver Creek in the Determination Area, occurring in a canyon that becomes broader to the north, as the creek approaches Stark Street. The creek corridor is vegetated with Douglas fir (*Pseudotsuga menziesii*, FACU), bigleaf maple (*Acer macrophyllum*, FACU), red alder (*Alnus rubra*, FAC), red elderberry (*Sambucus racemosa*, FACU), and other common forest species. The access and staging areas include mature Douglas fir forest and open fields of creeping bentgrass (*Agrostis stolonifera*, FAC), velvet grass (*Holcus lanatus*, FAC), black medic (*Medicago lupulina*, FACU), white clover (*Trifolium repens*, FAC); an area covered exclusively in reed canarygrass (*Phalaris arundinacea*, FACW) occurs at the top of the canyon slope. A stormwater outfall is located west of Beaver Creek, at the northern end of the Determination Area. The outfall consists of a 10-inch concrete pipe that discharges to the canyon slope, causing erosion that has undermined the lower pipe segments – pieces of decayed pipe are laying on the slope in the eroded soils.

Beaver Creek enters the Determination Area through a 59-foot span bridge under SE Cochran Road that was installed in 2019, and leaves the site through a 40-foot culvert under SE Stark Street, which was installed in 2017. Two concrete structures are located in Beaver Creek near the location where land-based construction equipment will access the creek: a weir and a cistern. The weir constricts Beaver Creek flows, causing pools to form above and below it; the cistern does not affect flows in the creek, other than causing localized scour. An earthen berm is located on either side of the weir, and extends upstream of the weir location on the east side of Beaver Creek, extending beyond the Determination Area boundary. The weir and cistern are shown on Figure 6b.

Kelly Creek, a tributary to Beaver Creek, enters the Determination Area from the west; the lowest portion of Kelly Creek that falls within the 2-year flow extent of Beaver Creek is included in the Determination Area. Elevation on site ranges from 198 to 256 feet in the North American Vertical Datum of 1988 (NAVD88), with the site generally sloping downward towards the North.

The Determination Area falls entirely within the Beaver Creek-Sandy River watershed (Hydrologic Unit Code [HUC]# 1700800010703), and is situated within Willamette Valley Portland/Vancouver Basin Environmental Protection Agency (EPA) Level III ecoregion, which falls within the Western Cordillera EPA Level II ecoregion (EPA 2011). The Western Cordillera is a region of high, rugged, mostly forested mountains with wide, open valleys. Lower elevations of this region are commonly grass or shrub-covered and mid elevations are mostly forested. Precipitation in this region is greater than in adjacent regions. Grazing, the leading land use in the valleys and lower elevations of the Western Cordillera, has had a major impact on streams. The Willamette Valley Portland/Vancouver Basin is composed of undulating terraces and floodplains with numerous wetlands, oxbow lakes, and ponds. Historically this region supported oak

savanna and prairies in well drained areas, and Douglas fir and Oregon ash (*Fraxinus latifolia*, FACW) elsewhere (Thorsen et al. 2003).

Methods

This section describes the methods used to determine the extent of wetlands and waters within the Determination Area. As part of the methodology, both office and onsite methods were used.

Office Methods

Prior to conducting fieldwork, biologists reviewed the following available data and information:

- U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI)
- Local Wetland Inventory (LWI): City of Gresham and Shapiro and Associates Inc., 2004
- Aerial photos: Oregon Statewide Inventory Program (OSIP) – Oregon Imagery Framework Representation Team, 2020
- USDA (U. S. Department of Agriculture) NRCS Soil Survey of Multnomah County, Oregon
- Multnomah County Tax Maps (Figure 2)

National Wetlands Inventory/Local Wetland Inventory

NWI wetlands are generally confined to within the Beaver Creek 2-year flow inundation boundary that was developed using hydraulic modeling to define the Determination Area along Beaver Creek (Figure 3). Gresham LWI shows three wetland polygons occurring both within, and extending beyond, the Determination Area boundary on the east side of the creek near the Kelly Creek confluence. The Gresham LWI shows less total wetland area than the NWI in the Determination Area.

No wetlands or stream features are shown within the staging and access areas for either NWI or LWI.

USDA/NRCS Soil Survey

Soil survey maps produced by the NRCS Soil Survey for Multnomah County show four soil series mapped within the Determination Area: Quatama loam, 3 to 8 percent slope, Aloha silt loam, 3 to 8 percent slopes, Haplumbrepts, very steep, and Wapato silt loam. Of these, Wapato silt loam is the only hydric soil, which occurs along the Beaver Creek alignment. (Figure 4).

Quatama Loam, 3 to 8 percent slope (Soil Map Unit 37B): This very deep, moderately well drained soil forms on terraces and rises formed in Missoula Flood deposits. This soil supports production of berries, row crops and orchards, and native vegetation community consists of Douglas-fir, western redcedar (*Thuja plicata*, FAC), Oregon white oak (*Quercus garryana*, FACU), Oregon grape (*Mahonia nervosa*, FACU), and grasses. This soil is nonhydric.

Aloha Silt Loam, 3 to 8 percent slopes (Soil Map Unit 1B): This very deep, somewhat poorly drained soil forms on terraces in Missoula Flood deposits. This soil supports orchard crops, berries and grain production. Where not altered, native vegetation in this soil typically includes Douglas fir, Oregon white oak, Oregon grape, western hazel (*Corylus cornuta*, FACU), and red alder. This soil is predominantly nonhydric.

Wapato Silt Loam (Soil Map Unit 55): This soil is deep, poorly drained and formed in loamy mixed alluvium on floodplains. They are used for hay or pasture, and the native vegetation consists of red alder, Oregon ash, black cottonwood (*Populus balsamifera*, FAC), willow (*Salix* spp.), wild rose (*Rosa* spp.) and sedges. This is a hydric soil.

Haplumbrepts (Soil Map Unit 20F): This very steep, well drained, soil forms on steep slopes in foothill areas. The soils support Douglas fir and red alder forests where not altered. This soil is predominantly nonhydric.

Site-Specific Methods

Reconnaissance of the site was conducted using standard wetland delineation techniques in the construction access and staging areas, and field review of the modeled 2-year flow extent to be applied as the Ordinary High Water Mark (OHWM) for Beaver Creek. A 2020 aerial photo of the Determination Area is provided as Figure 5, ground level photographs were also taken throughout the site to convey Determination Area conditions (Appendix A).

Construction access and staging areas: These areas, located on the southern end of the Determination Area were surveyed according to methodology described in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region Version 2.0 (Corps 2010), the 1987 Corps of Engineers Wetland Delineation Manual (Environmental Laboratory 1987), and OAR 141-090 et seq. Wetland and upland data plots were taken at wetland boundaries, and where changes in vegetation community occurred.

Fieldwork was performed on July 7, 2022, by Cascade wetland biologists Tammy Stout and Brent Haddaway. The Determination Area includes all areas being used for access and staging, and an additional buffer of approximately 20 feet. The Determination Area was pre-loaded into a handheld Trimble GPS to identify its limits in the field. Biologists walked the limits of the Determination Area, focusing investigations where wetland vegetation was present and in landscape positions more likely to support wetlands. Where wetland communities were present, paired data plots and the boundary of the community were recorded. Wetland delineation data sheets are provided in Appendix B.

Wetlands boundaries were determined based on the presence or absence of wetland indicators. Plant indicator status was determined using the 2020 National Wetland Plant List (U.S. Army Corps of Engineers 2020), soil colors were evaluated using a Munsell soil color chart (Gretag Macbeth 2000). No wetland hydrology indicators were found in the wetland data plots due to the fieldwork occurring during the dry season, so methods for *site visits during the dry season* described on page 117 of the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region Version 2.0 were applied. The location data were collected using a handheld Trimble Geo7X Global Positioning System (GPS).

Determining the Ordinary High Water Mark for restoration areas: The OHWM for Beaver Creek was established using a modeled 2-year flow elevation developed for the project design, and then wetland biologists field-inspected the 2-year flow elevation to confirm the model results include all areas with OHWM field indicators included in Corps Regulatory Guidance Letter No. 05-05 and DSL guidance. The

modeled boundary was loaded into the handheld GPS unit, allowing biologists to locate the modeled boundary in the field and confirm its accuracy. Photos were taken of a biologist standing at the OHWM near each of the 3 reach boundaries identified on construction plans to provide a representative sample of the different creek geomorphic conditions within the Determination Area. The project was divided into three reaches during initial design process based on dominant geomorphic conditions; sampling OHWM field indicators at these locations covers the range of geomorphic conditions within the Determination Area. These locations are shown on Figure 6a-6c as "PPT – OHWM." Fieldwork to confirm Beaver Creek OHWM conditions was conducted on February 14, 2023, by biologists Brent Haddaway and Olivia Morgan, accompanied by the design engineer and project geomorphologist. Field indictors observed included natural line impressed upon the bank, shelving, wracking, bed and banks, destruction of terrestrial plant community, sediment sorting and deposition indicators that were all present within the limits of the modeled OHWM boundary. The modeled OHWM was confirmed by the field investigation and documented with photo points illustrating OHWM and field indicators for each reach: Reach 1 (Photo Point 8); Reach 2 (Photo Point 10); Reach 3 (Photo Point 14). The construction footprint for Beaver Creek is generally defined by the OHWM, where all restoration work will occur, but also extends above the OHWM polygon to include a stormwater outfall repair at the northern end of the Determination Area.

The stormwater outfall construction footprint: The stormwater outfall construction footprint was determined based on the area needed to repair the outfall. The outfall area was inspected for presence of indicators of OHWM or wetland conditions during the July 7, 2022, site visit; no indicators were observed. Photo points 15 and 16were taken of the outfall condition and included in the Appendix A, Site Photographs.

Description of All Wetlands and Other Non-Wetland Waters

One wetland and one water were identified within the Determination Area boundaries and are shown in Figures 6a-6c; onsite wetlands total 1.25 acres and waters total 15.48 acres. Wetland sample plot data sheets are included in Appendix B. Site photographs of wetland areas are included in Appendix A.

Wetlands

Wetland A

Wetland A is a palustrine forested/emergent, slope wetland that originates in the project staging area, and extends off site to the south, and then crosses the Determination Area again where the steep valley slopes transition to the Beaver Creek floodplain. In total, 1.25 acres of Wetland A occurs within the Determination Area. Vegetation includes native forested species such as red alder, Oregon ash, twinberry (*Lonicera involucrata*, FAC), and Nootka rose (*Rosa nutkana*, FAC), Armenian blackberry (*Rubus armeniacus*, FAC), spotted jewelweed (*Impatiens capensis*, FACW), largeleaf avens (*Geum macrophyllum*, FAC), and trailing buttercup (*Ranunculus repens*, FAC) where the wetland crosses the Determination Area at the slope toe; palustrine emergent wetland areas at the top of slope are dominated by reed canarygrass. Vegetation met the dominance test; soils are 10YR 4/2 and 10YR 4/1 with redoximorphic features, and met by the Depleted Matrix indicator (F3). No hydrology indicators were observed, but were assumed to be present following the regional supplement guidance.

Uplands

Uplands within the Determination Area include forested areas dominated by Douglas fir, bitter cherry (*Prunus emarginata,* FACU), and sword fern (*Polystichum munitum,* FACU) along the slope transition to the Beaver Creek floodplain, and along the margins of the Determination Area on the terrace above the slope. Uplands on the terrace between Cochran Road and the forested slope are mostly vegetated by common grass and weed species such as creeping bentgrass, white clover, ryegrass (*Lolium perenne,* FAC), and black medic.

The stormwater outfall area located at the north end of the Determination Area has experienced soil erosion and undercutting of some of the culvert pipe segments. This area is a V-shaped channel with no discernable bed and bank, sediment sorting, or other OHWM indicators. Photo points 15 and 16 in Appendix A shown the condition of the outfall area.

Other Waters

Onsite waters include Beaver Creek and a segment of Kelly Creek at its confluence with Beaver Creek. In total, the area below OHWM is 15.48 acres. Photo points 8, 10, and 14 show specific features at each of the hydrologic reach limits used in project design. The OHWM boundary was developed using a modeled 2-year flood extent, and field-verified to assure all areas with field indicators were included in the modeled boundary.

Deviation from NWI and LWI

NWI and LWI mapping in this area shows Beaver Creek in the correct general location, and associated wetlands within the 2-year flow limits, but does not include the slope wetland (Wetland A) identified in this memo.

Mapping Method

Sample plots, OHWM, and wetland boundary points were recorded in the field using TerraSync software on a Trimble Geo7X hand-held GPS unit. GPS data collected were post-processed with GPS Pathfinder Office software resulting in sub-meter positional accuracy. GPS survey data were exported to a GIS format (ESRI shapefile) and mapped in ArcGIS Pro 2.9 desktop software.

Wetlands and Other Waters Determination Results and Conclusions

Cascade Environmental Group, LLC, identified one wetland with 1.25 acres occurring within the Determination Area, and one water, Beaver Creek (15.48 acres), within the Determination Area. All wetlands and other water are likely jurisdictional features regulated by the Corps and DSL.

Wetland and Stream Functions Assessment

This section describes the functions assessment for both wetlands and streams to support the Beaver Creek Restoration project permitting. The Beaver Creek Restoration project is a voluntary restoration project that includes removal of fill material from the floodplain of Beaver Creek, and the placement of large wood material in the stream channel. This assessment is a qualitative narrative provided in two parts:

- Slope wetlands located in the construction access and staging areas are assessed using definitions described in Oregon Rapid Wetland Assessment Protocol (ORWAP);
- Beaver Creek, and riverine wetlands associated with Beaver Creek are assessed using the Stream Function Assessment Method (SFAM). The OHW polygon developed for Beaver Creek construction permitting was developed by a modeled two-year flow water surface area, field validated, that encompasses small wetlands associated with the creek's primary floodplain.

The descriptions of functions are based on a site visit conducted on July 7, 2022, during which access routes (where wetland vegetation will be cleared) and the Beaver Creek channel were reviewed, and from review of the project design drawings and basis of design narrative.

Slope Wetlands: Wetlands will be temporarily impacted to facilitate access to the construction area and for construction staging. Wetlands occurring in the access and staging areas are slope Hydrogeomorphic (HGM) classification, and include palustrine forested and palustrine emergent Cowardin classifications. Dominant forest vegetation includes red alder, Oregon ash, twinberry, Nootka rose, Armenian blackberry, spotted jewelweed, largeleaf avens, and trailing buttercup. palustrine emergent wetland areas are dominated by reed canarygrass. Impacts to wetland areas will be limited to vegetation clearing, and placing of temporary fill material to provide access and staging; impacted wetlands will be seeded and planted with native species to minimize impacts.

Wetland Functions Description

Water storage and delay: Assessed wetlands are slope HGM class, discharging groundwater from upslope areas. Vegetation clearing will have nominal effect on this function.

Sediment retention and stabilization: The wetlands provide nominal sediment retention, assessed slope wetlands will not receive floodwaters or runoff from upslope areas as these are vegetated. The slopes are stable and vegetation is expected to reestablish quickly following construction because root masses will be left intact for construction staging and access.

Phosphorus retention: Upslope areas are generally native or naturalized vegetation, likely not provided significant phosphorous to wetland areas. Retention of phosphorous via sediment is also nominal as described in previous function.

Nitrate removal and retention: Similar to phosphorus, upslope natural conditions do not likely export significant nitrate into wetland areas. Nitrate removal and retention are likely minimal due to the wetland being a source of groundwater discharge and upslope areas being vegetated by native or naturalized vegetation.

Anadromous fish habitat: Assessed wetlands are slope HGM class, occurring above the 2-year flood return interval elevations, and do not provide direct habitat for fish.

Resident fish habitat: Assessed wetlands are slope HGM class, occurring above the 2-year flood return interval elevations, and do not provide direct habitat for fish.

Amphibian and reptile habitat: The wetlands lack pools that can support amphibian breeding or turtle habitat. Assessed wetlands, along with riparian forests, likely provide dispersal habitat support for amphibian and reptiles.

Waterbird nesting and feeding habitat: The assessed wetlands include both dense forest and reed canarygrass monoculture vegetation. Wetlands appear to be seasonally saturated, and do not include evidence of surface water inundation being present for extended periods; the assessed wetlands do not provide suitable habitat for waterbirds.

Aquatic invertebrate habitat: Assessed wetlands do not include any indicators of ponding, and therefore likely provide nominal aquatic invertebrate habitat.

Native plant diversity: The assessed wetlands and surrounding uplands support second growth forest consisting of mature red alder and black cottonwood, with native shrub understory. PEM wetland areas are dominated by reed canarygrass. Rare plants are unlikely to be present.

Pollinator habitat: Assessed wetland areas support native species under a forest canopy, or a reed canarygrass monoculture. The native plant species within the wetlands provide common food sources for native pollinators, and some plants may be hosts for larval insect species as well.

Songbird, raptor, and mammal habitat: The assessed wetlands likely provide habitat for common native species, but do not provide distinct habitat types (open water, snags) from the surrounding uplands. Wetland impacts are limited to vegetation clearing; impact areas will be replanted and cleared trees and shrubs will be allowed to regrow from existing root systems.

Water cooling: Groundwater discharge provided by the slope will wetland will not be affected by temporary vegetation clearing. Vegetation removal will have temporary, nominal impact on water cooling as surrounding forest canopy will remain adjacent to the access corridor.

Organic matter export: The assessed wetlands support deciduous trees and shrubs, as well as dense reed canarygrass that export organic matter. The temporary vegetation clearing will affect those functions, but the surrounding riparian uplands will continue to provide organic matter to Beaver Creek. Impacts to this function will be temporary due to revegetation efforts.

Carbon sequestration: Assessed wetlands include forested and emergent vegetation that will be cleared for construction access and staging; best practices will be applied to minimize removal of trees and to leave root systems intact to allow for rapid regrowth. Soils and hydrologic processes will be undisturbed.

Public use and recognition: No formal trails are located within the assessed wetland areas, and no signs of human access were observed. Members of the public likely use nearby uplands for dog walking or similar activities.

Stream Functions Description

FUNCTIONAL GROUP	SPECIFIC FUNCTIONS	EXISTING CONDITIONS	POST CONSTRUCTION
Hydrologic	**Surface water storage (SWS)**	This reach of Beaver Creek lacks large wood and associated channel complexity. The creek is also incised in portions of the project area; storage is limited to the creek channel in much of the project reach.	Adding large wood material will create pools through impounding surface water and encouraging local scour. Plantings will provide wood recruitment sources over longer time horizons. Removing the concrete weir and berm will increase floodplain connectivity.
	Sub/surface transfer (SST)	The lack of channel complexity from incision and lack of large wood limits sub/surface water transfer.	Increasing large wood material will provide greater stream cross section and depth variation, increasing opportunities for hyporheic exchange.
	Flow variation (FV)	Flow variation is characterized as "flashy" due to urbanization in the contributing basin, and limited channel complexity. Summer low flows are a limiting factor for salmonid use, and erosion and turbidity also impact spawning habitat quality.	Large wood will increase baseflows through hyporheic exchange and floodplain development. Larger channel area will also provide greater capacity during higher flow periods. Removing the weir will allow full conveyance within the primary channel.
Geomorphic	**Sediment continuity (SC)**	Urbanization, including recent culvert replacement under SE Stark Street, and lack of channel roughness contribute to erosion and downcutting. The downcutting causes accumulations of gravel deposits above the active floodplain or to be transported through the confined channel.	Large wood placement will facilitate stream structure development, with pools and local scour forming around placed logs. Sediment will distribute more evenly throughout project reach overall. Woody plantings will provide bank stability and sediment trapping functions. Removing weir will eliminate flow constriction that creates artificial pools in the primary channel.
	Substrate mobility (SM)	Erosion and turbidity are existing limitations to salmon habitat, due to urban watershed conditions and simplified channel structure.	Large wood placement will create pools and local scour, collecting and mobilizing sediment at rates that can maintain good habitat conditions and contribute to improved water quality. Woody plantings will provide additional woody material to the system to support functions over time.
Biological	**Maintain biodiversity (MB)**	Simple stream channel structure limits capacity of Beaver Creek to support salmonids and other native fish. Fish transport, refugia, spawning, and rearing are all affected by lack of pools and suitable substrate due to erosion. Invasive species are present, and number of vegetation species limited by lack of complex structure.	Large wood material placement will create a more complex channel with diverse habitats and capacity. Stream flow velocities will decrease during high flow events, and increase during low water periods, allowing improved habitat and migration capacity for aquatic species. Increased pools and channel structure will also support greater number of hydrologic regimes to support greater plant diversity.

FUNCTIONAL GROUP	SPECIFIC FUNCTIONS	EXISTING CONDITIONS	POST CONSTRUCTION
	Create and maintain habitat (CMH)	Simple stream channel structure limits capacity of Beaver Creek to support salmonids and other native fish and aquatic species. Fish transport, refugia, spawning, and rearing are all affected by lack of pools and suitable substrate due to erosion. Wetland and riparian area in 2-year floodplain include woody and reed canarygrass communities within the project reach; upland forest is present throughout the project vicinity.	Large wood material placement will create a more complex channel with diverse habitats and capacity. Stream flow velocities will decrease during high flow events, and increase during low water periods, allowing improved habitat and migration capacity for aquatic species.
	Sustain trophic structure (STS)	The existing stream channel has simple structure and exists in an urbanized watershed. Water temperatures are high, hydrologic conditions are "flashy," and waters are turbid. Aquatic connectivity diminished by high flood velocities and low summer flows. Vegetative structure includes reed canarygrass and woody plants adjacent to the stream channel, and mature forests in upland areas further upslope.	Large wood placement will improve stream structure and moderate flows that will improve aquatic access. Woody plantings will improve vegetation in project reach to increase nutritional sources and connectivity to adjacent habitats.
Water Quality	**Nutrient cycling (NC)**	Habitat for fish and aquatic organisms are degraded by flashy hydrologic conditions, lack of in-stream structure, and high temperatures and turbidity.	Large wood placement will address fish habitat, hydrologic condition, and water quality by creating pools and local scour and increasing hyporheic connectivity. Salmonids have access to the stream reach to use improved habitat.
	Chemical regulation (CR)	The project area is located in an urbanized watershed, water contains contaminants, particularly during times of high runoff after prolonged dry weather. The existing stream reach has little structure, allowing chemicals to pass through without treatment from wetlands.	Large wood placement will create pools that trap sediment and allow wetlands to form, and reduce water velocities to provide chemical treatment.
	Thermal regulation (TR)	The project reach of Beaver Creek has a simplified channel and lacks shade in many areas. Hydrologic conditions are "flashy" with limited opportunity to shade and reduce stream temperatures. Temperature is a limiting factor for salmon habitat.	Large wood placement is designed to occur in areas of existing shade to prohibit pooling of water in areas with direct sun exposure during summer months. Placed wood will create pools that increase hyporheic exchange and woody plantings are being installed to directly improve thermal regulation.

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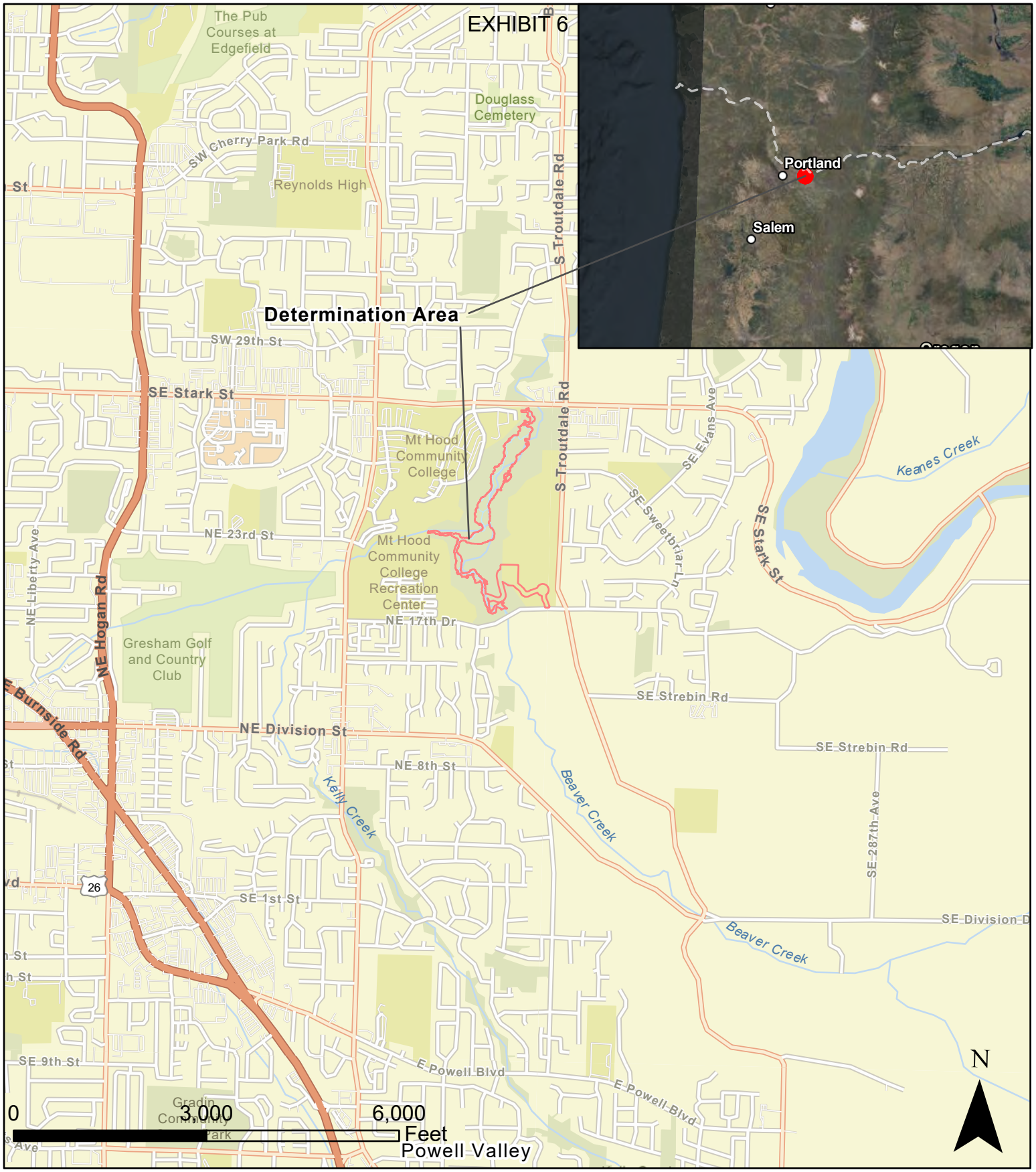

Date: 3/20/2023
Data Source: ESRI, 2020

Figure 1. Location

Beaver Creek Restoration Wetland and Waters Determination

CASCADE ENVIRONMENTAL GROUP

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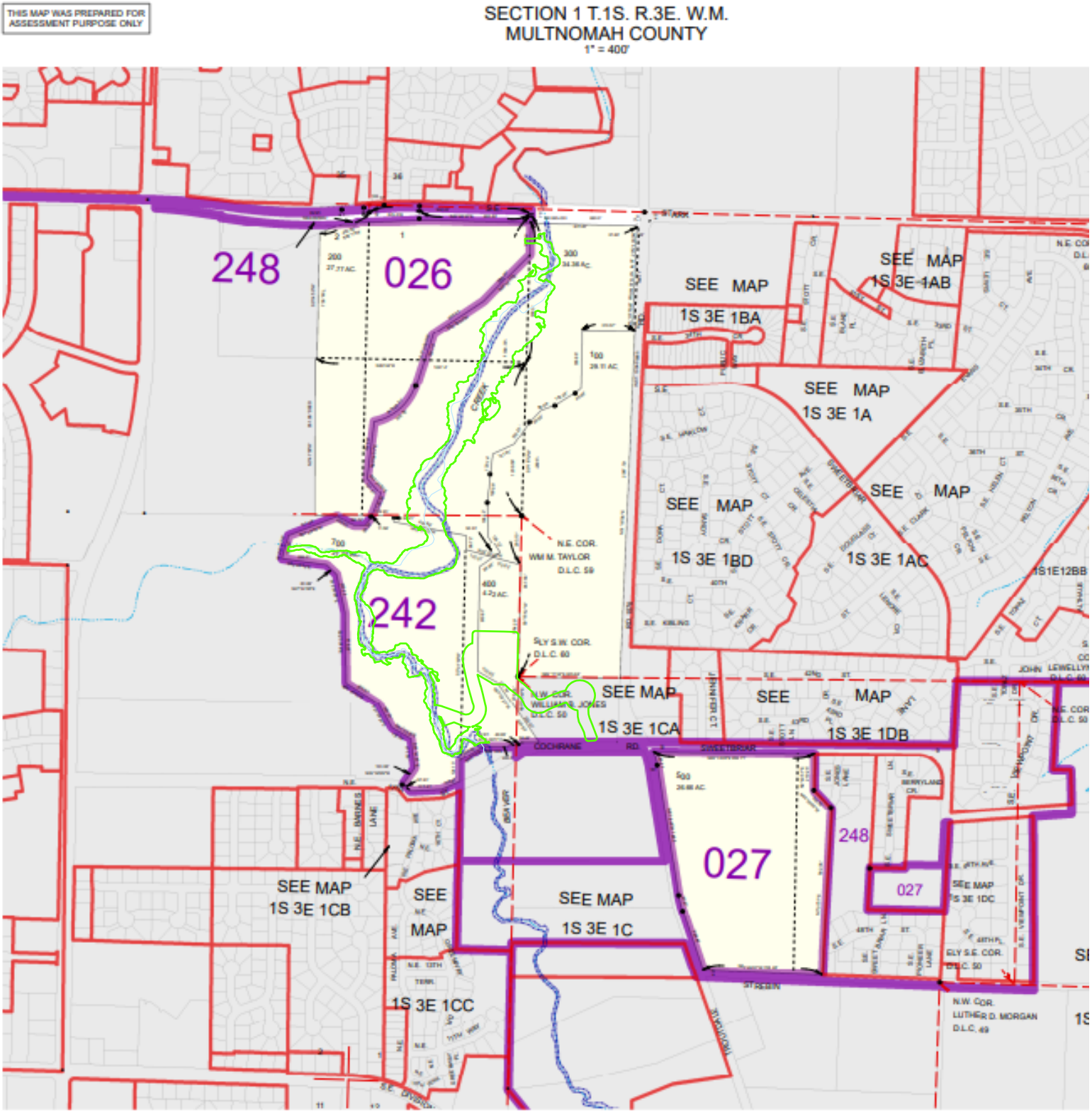
EXHIBIT 6

Determination Area Boundary (17.77 ac)

Beaver Creek Centerline



Date: 3/20/2023
Data Source: ORMAP

Figure 2. Multnomah County Tax Map: 1S3E01

Beaver Creek Restoration Wetland and Waters Determination

CASCADE ENVIRONMENTAL GROUP

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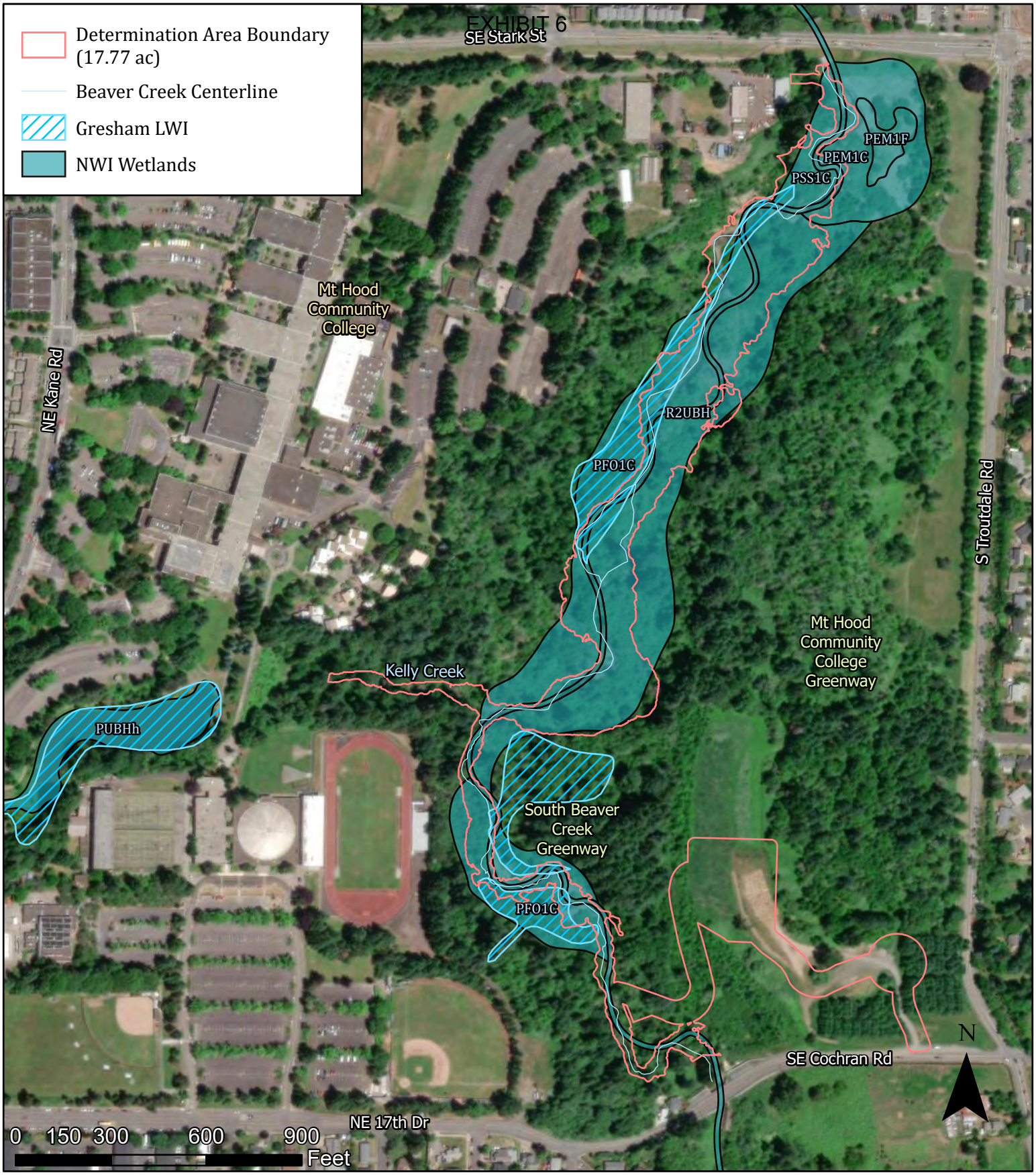

Date: 3/20/2023

Data Source: OSIP, 2017; USFWS 2018; OR DSL 2022; AECOM 2022

Figure 3. National and Local Wetland Inventories

Beaver Creek Restoration Wetland and Waters Determination

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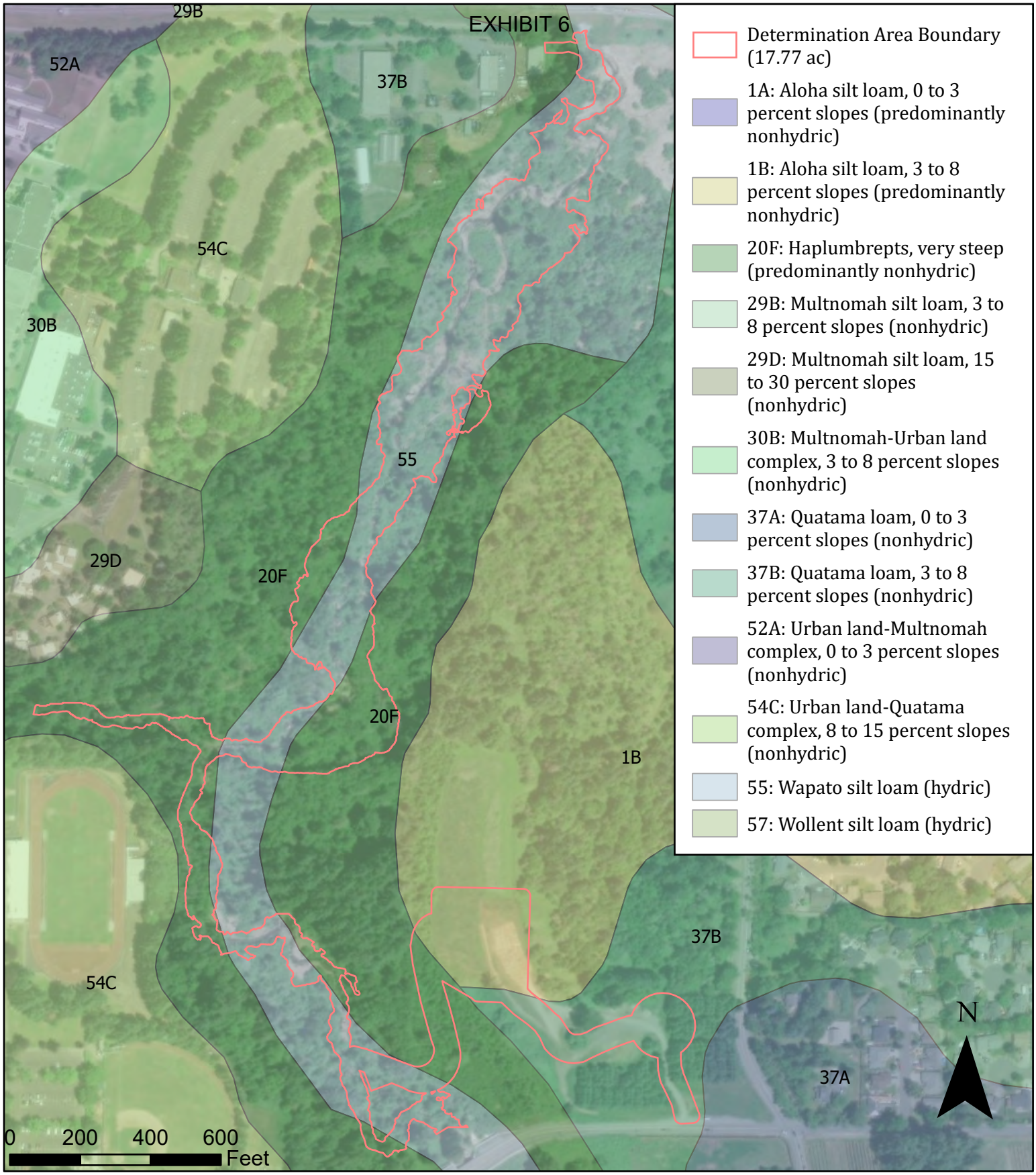

Date: 3/20/2023

Data Source: OSIP, 2017; NRCS, 2020

Figure 4. USDA-NRCS Soil Survey Map

Beaver Creek Restoration Wetland and Waters Determination

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Date: 3/20/2023
Data Source: USDA NAIP, 2020

Figure 5. Recent Aerial (2020)

Beaver Creek Restoration Wetland and Waters Determination

CASCADE ENVIRONMENTAL GROUP

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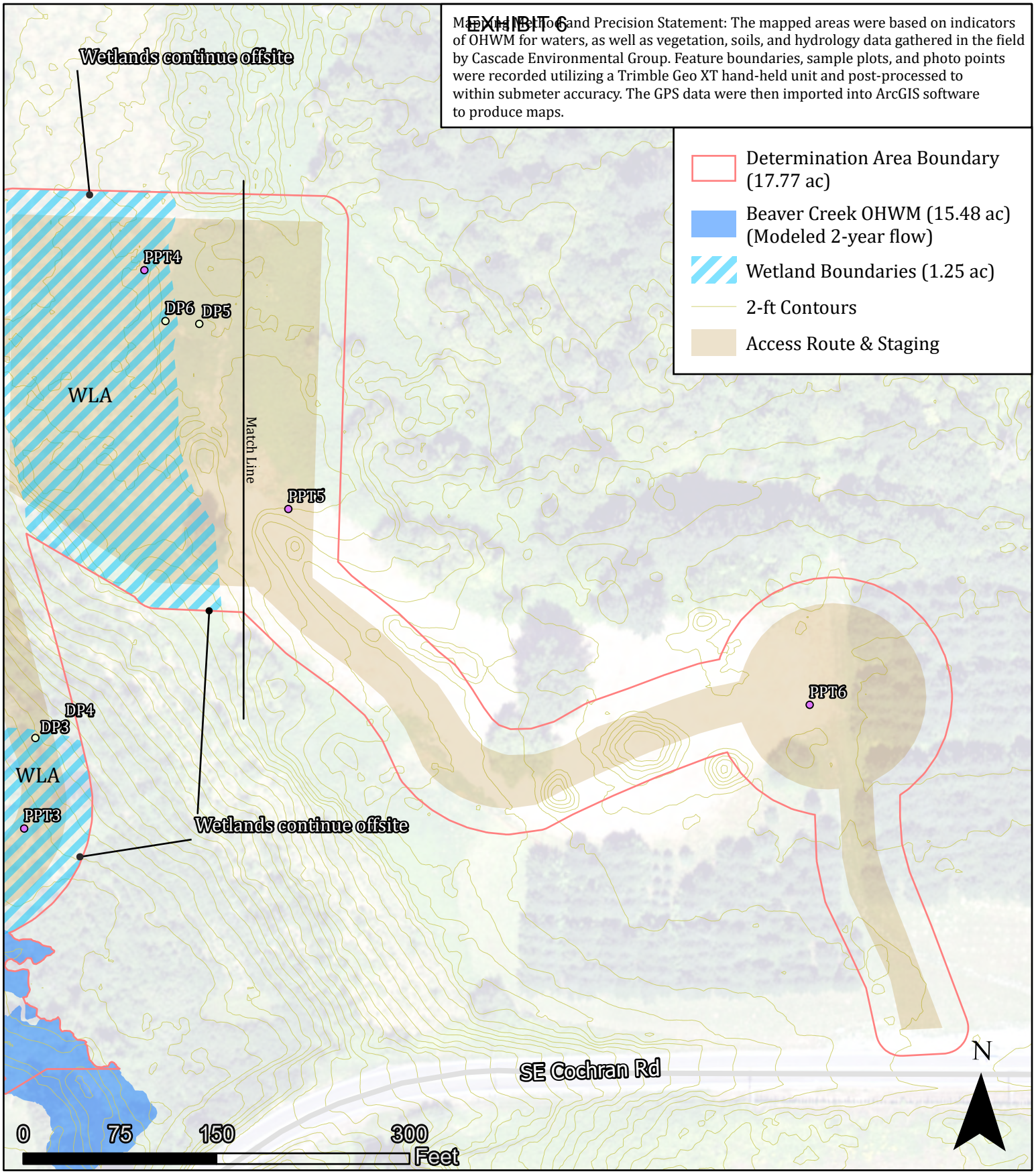

Date: 3/20/2023
Data Source: AECOM, 2022
USDA NAIP, 2020

Figure 6a. Wetlands & Other Waters Boundaries

Beaver Creek Restoration Wetland and Waters Determination

CASCADE ENVIRONMENTAL GROUP

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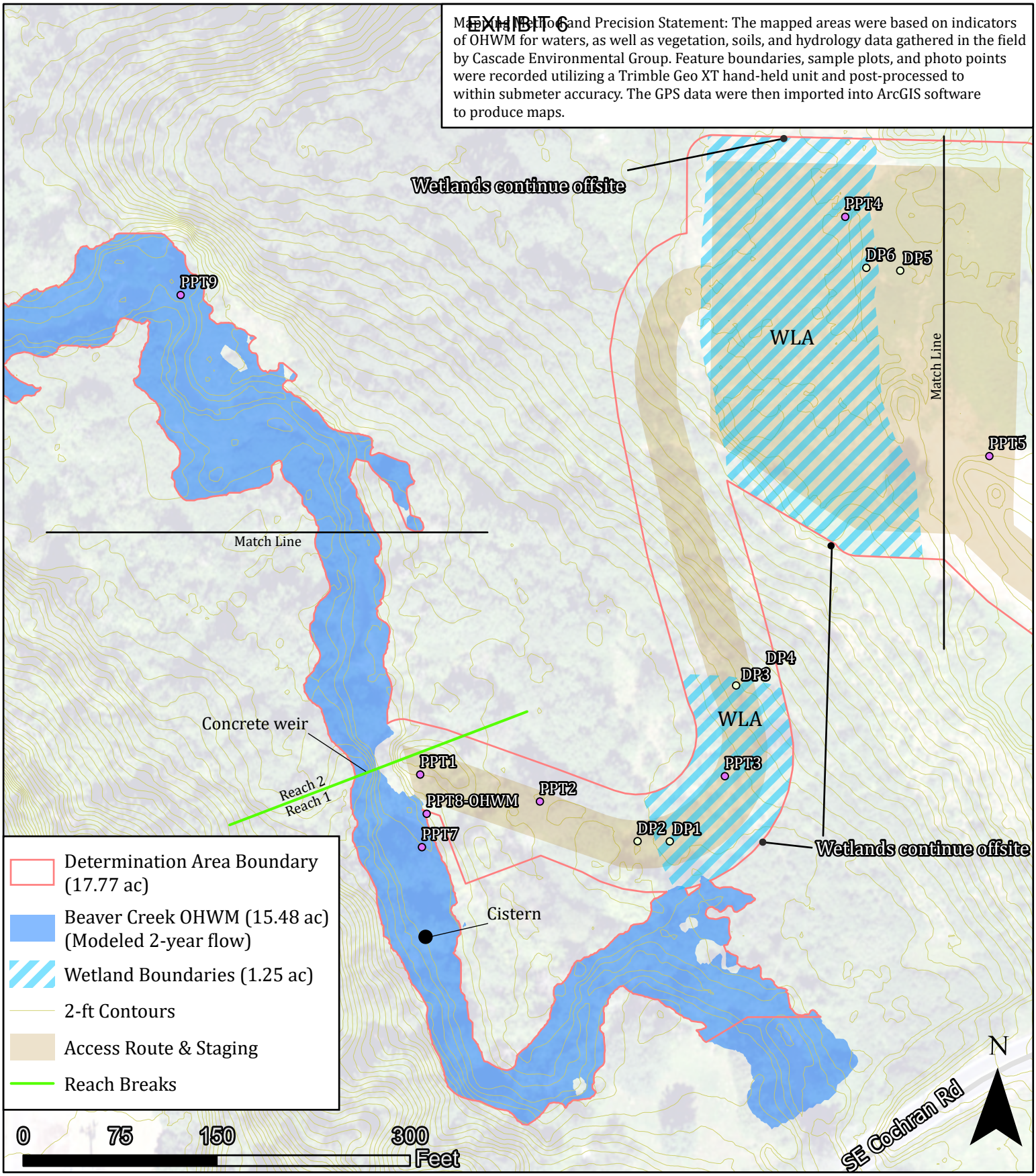
EXHIBIT 6

Mapping Method and Precision Statement: The mapped areas were based on indicators of OHWM for waters, as well as vegetation, soils, and hydrology data gathered in the field by Cascade Environmental Group. Feature boundaries, sample plots, and photo points were recorded utilizing a Trimble Geo XT hand-held unit and post-processed to within submeter accuracy. The GPS data were then imported into ArcGIS software to produce maps.



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Data Source: AECOM, 2022
USDA NAIP, 2020

Figure 6b. Wetlands & Other Waters Boundaries

Beaver Creek Restoration Wetland and Waters Determination

CASCADE ENVIRONMENTAL GROUP

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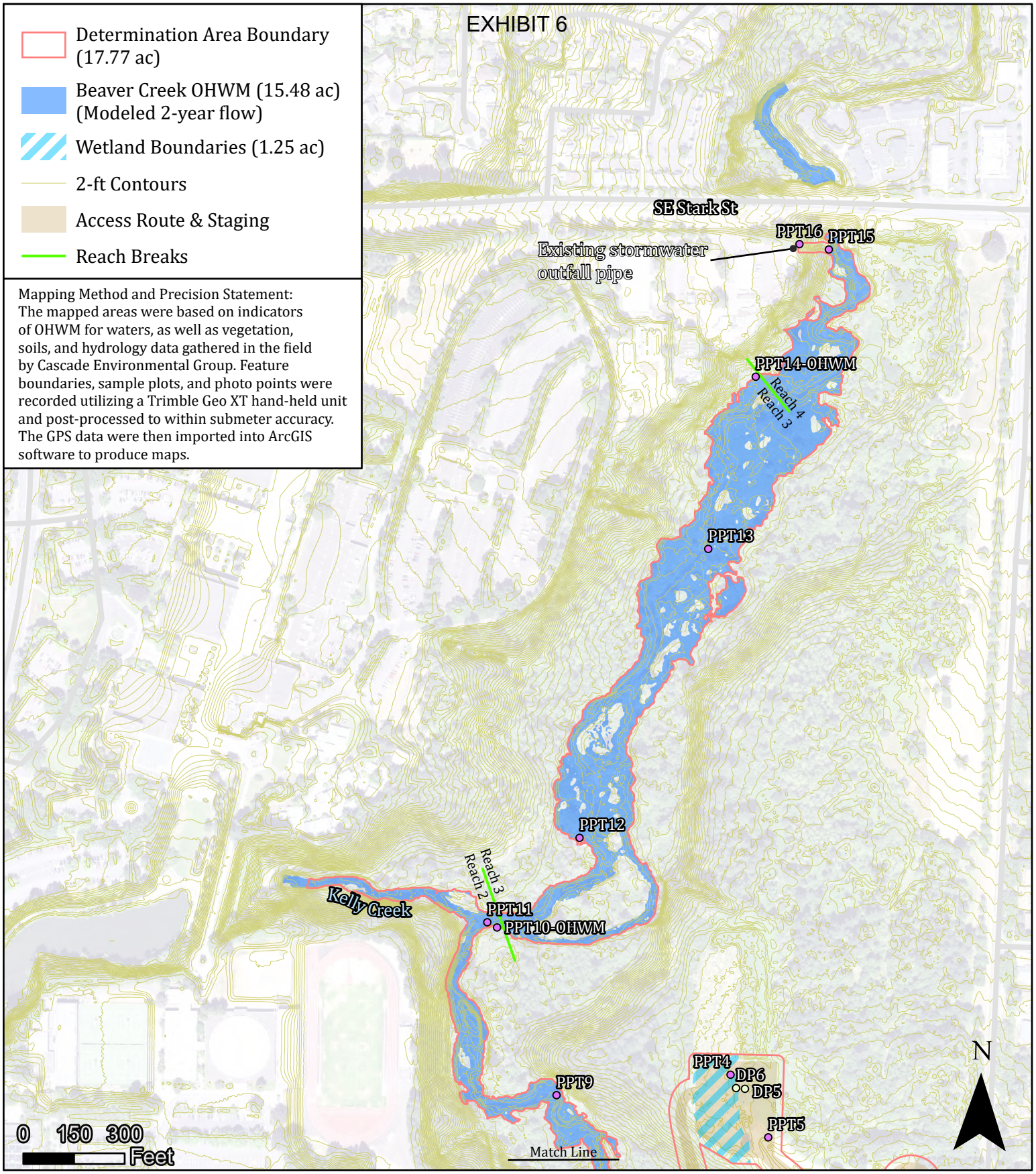

Date: 3/20/2023
Data Source: AECOM, 2022
USDA NAIP, 2020

Figure 6c. Wetlands & Other Waters Boundaries

Beaver Creek Restoration Wetland and Waters Determination

CASCADE ENVIRONMENTAL GROUP

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Appendix A. Site Photographs

Photo point 1. Photo 1. Uplands at weir location.

Photo point 1. Photo 2. Upland at weir location

Photo point 2. Photo 1. Access route, in uplands, looking east.

Photo point 2. Photo 2. Access route, in uplands, looking north.

Photo point 2. Photo 3. Access route, in uplands, looking south.

Photo point 2. Photo 4. Access route, in uplands, looking west towards Beaver Cr riparian area.

Photo point 3. Photo 1. Wetland A, in access route, looking north.

Photo point 3. Photo 2. Wetland A, in access route, looking east.

Photo point 3. Photo 3. Wetland A, in access route, looking south.

Photo point 3. Photo 4. Wetland A, in access route, looking west.

Photo point 4. Photo 1. Looking north through Wetland A.

Photo point 4. Photo 2. Looking east, from within Wetland A.

Photo point 4. Photo 3. Looking south near boundary of Wetland A.

Photo point 4. Photo 4. Looking west towards Wetland A and top of the forested canyon.

Photo point 5. Photo 1. Looking east at staging area.

Photo point 5. Photo 2. Looking north at staging area.

Photo point 5. Photo 3. Looking south at staging area.

Photo point 5. Photo 4. Looking west at staging area and Wetland A.

Photo point 6. Photo 1. Looking north in staging area.

Photo point 6. Photo 2. Looking east in staging area.

Photo point 6. Photo 3. Looking west in staging area.

Photo point 6. Photo 4. Looking south in staging area.

Photo point 7. Photo 1. Looking north, 320°, downstream at weir and earthen berm.

Photo point 7. Photo 2. Looking east, 50°, at bank of Beaver Cr.

Photo point 7. Photo 3. Looking upstream, 140°.

Photo point 7. Photo 4. Looking west, 230°, at Beaver Cr. bank.

Photo point 8. Photo 1. Biologist standing on modeled OHWM at the Reach 1 and 2 boundary, above evidence of wracking, bed and bank, and natural line impressed on the bank indicators.

Photo point 9. Photo 1. Looking south, upstream, at 167°.

Photo point 9. Photo 2. Looking north, 15°, in beaver pond.

Photo point 9. Photo 3. Looking southeast, 240°, backwatered from beaver dam.

Photo point 10. Photo 1. Biologist standing at modeled OHW at the Reach 2 and 3 boundary, above areas of scour, bed and bank, and shelving indicators.

Photo point 11. Photo 1. Looking south, upstream, 200° at Reach 2/3 boundary.

Photo point 11. Photo 2. Looking west, 290°, up Kelly Cr.

Photo point 11. Photo 3. Looking east, 80°, downstream at Kelly Cr. confluence.

Photo point 12. Photo 1. Looking south, 200°, upstream.

Photo point 12. Photo 2. Looking north, 10°, downstream.

Photo point 13. Photo 1. Looking north, 350°, at debris jam.

Photo point 13. Photo 2. Looking southeast, 220° upstream.

Photo point 14. Photo 1. Biologist standing at modeled OHW line at the Reach 3 and 4 boundary above destruction of terrestrial plant community, sediment sorting and deposition indicators.

Photo point 15. Photo 1. Base of outfall gully. Outfall lacks bed and bank or other field indicators of OHWM.

Photo point 16. Photo 1. Top of stormwater outfall gully, facing downslope at old culvert segments that have become disconnected due to undercutting of soil

Photo point 16. Photo 2. Top of stormwater outfall gully, facing west and upslope.

Appendix B. Wetland Delineation Data Sheets

EXHIBIT 6

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Beaver Cr Restoration City/County: Troutdale/Multnomah Sampling Date: 7/7/2022
Applicant/Owner: Metro/Mt Hood Comm College State: OR Sampling Point: DP 1
Investigator(s): Haddaway/Stout Section, Township, Range: Section 1, T 1S, R3E, WM
Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): 3
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45° 30' 40.82" N Long: 122° 23' 28.84" W Datum: NAD 83
Soil Map Unit Name: Haplubrepts, very steep NWI Classification: UPL
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No	**Is the Sampled Area within a Wetland?** **Yes X No**
Hydric Soil Present?	Yes X No	
Wetland Hydrology Present?	Yes X No	

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status?
1. *Alnus rubra*	30	Y	FAC
2.			
3.			
4.			
Total Cover:	30		
Shrub Stratum			
1. *Fraxinus latifolia*	15	Y	FACW
2. *Physocarpus captitatus*	5		FACU
3. *Rosa nutkana*	10	Y	FAC
4. *Lonicera involucrata*	25	Y	FAC
5.			
Total Cover:	55		
Herb Stratum			
1. *Impatiens capensis*	40	Y	FACW
2. *Ranuculus repens*	15	Y	FAC
3. *Geum macrophyllum*	5	N	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
Total Cover:	60		
Woody Vine Stratum			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust 0

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: **6** (A)
Total Number of Dominant Species Across All Strata: **6** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:
OBL species	x1 =	**0**
FACW species	x2 =	**0**
FAC species	x3 =	**0**
FACU species	x4 =	**0**
UPL species	x5 =	**0**
Column Totals: **0** (A)		**0** (B)

Prevalence Index = B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:
____ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation1 (Provide supporting
____ data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

SOIL

EXHIBIT 6

Sampling Point: 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10 YR 3/2	100					Loam	
4-7	10 YR 4/2	70	10 YR 3/2	30	C	M	loam	
7-11	10 YR 4/1	85	5 YR 4/3	10	C	M	silt loam	
			10 YR 5/1	5	D	M	silt loam	
11-16	10 YR 4/2	70	10 YR 4/1	20	D	M	silt loam	
			5 YR 4/3	10	C	M	silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Muck Mineral (S1)
- ___ Sandy gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? **Yes X** **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Wetland was visited during the dry season, has met vegetation and soils indicators, and no hydrologic modifications have occurred. Wetland hydrology is assumed per methods on pg 117 of the regional supplement.

EXHIBIT 6

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Beaver Cr Restoration City/County: Troutdale/Multnomah Sampling Date: 7/7/2022
Applicant/Owner: Metro/Mt Hood Comm College State: OR Sampling Point: DP 2
Investigator(s): Haddaway/Stout Section, Township, Range: Section 1, T 1S, R3E, WM
Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): 3
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45° 30' 40.82" N Long: 122° 23' 28.84" W Datum:
Soil Map Unit Name: Haplubrepts, very steep NWI Classification: UPL
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks)
Are Vegetation , Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" Present? Yes X No
Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes No X	**Is the Sampled Area within a Wetland?** **Yes** **No X**
Hydric Soil Present?	Yes No X	
Wetland Hydrology Present?	Yes No X	

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status?
1. *Betula pendula*	5	Y	FACU
2.			
3.			
4.			
Total Cover:	5		
Shrub Stratum			
1. *Prunus emarginata*	60	Y	FACU
2. *Ilex aquifolium*	45	Y	FACU
3.			
4.			
5.			
Total Cover:	105		
Herb Stratum			
1. *Polystichum munitum*	65	Y	FACU
2. *Ranunculus repens*	35	Y	FAC
3. *Impatiens capensis*	20	Y	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
Total Cover:	120		
Woody Vine Stratum			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust 0

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)
Total Number of Dominant Species Across All Strata: **6** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **17%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:
OBL species	x1 =	**0**
FACW species **20**	x2 =	**40**
FAC species **35**	x3 =	**105**
FACU species **175**	x4 =	**700**
UPL species	x5 =	**0**
Column Totals: **230** (A)		**845** (B)

Prevalence Index = B/A = **3.7**

Hydrophytic Vegetation Indicators:
1 - Rapid Test for Hydrophytic Vegetation
2 - Dominance Test is >50%
3 - Prevalence Index is ≤3.0[1]
4 - Morphological Adaptation1 (Provide supporting data in Remarks or on a separate sheet)
5 - Wetland Non-Vascular Plants[1]
Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** **No** X

Remarks:

SOIL

EXHIBIT 6

Sampling Point: 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10 YR 3/2	100					loam	
6-16	10 YR 4/2	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Muck Mineral (S1)
- ___ Sandy gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

EXHIBIT 6

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Beaver Cr Restoration City/County: Troutdale/Multnomah Sampling Date: 7/7/2022
Applicant/Owner: Metro/Mt Hood Comm College State: OR Sampling Point: DP 3
Investigator(s): Haddaway/Stout Section, Township, Range: Section 1, T 1S, R3E, WM
Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): 5
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45° 30' 40.82" N Long: 122° 23' 28.84" W Datum: NAD 83
Soil Map Unit Name: Haplubrepts, very steep NWI Classification: UPL
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes X** **No ____**
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status?
1. *Alnus rubra*	80	Y	FAC
2. *Populus balsamifera*	20	Y	FAC
3. *Populus tremuloides*	10		FACU
4.			
Total Cover:	110		
Shrub Stratum			
1. *Spirea douglasii*	25	Y	FACW
2. *Physocarpus capitatus*	2	Y	FACW
3. *Rosa nutkana*	5	Y	FAC
4.			
5.			
Total Cover:	32		
Herb Stratum			
1. *Epilobium ciliatum*	5	Y	FACW
2. *Ranunculus repens*	15	Y	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
Total Cover:	20		
Woody Vine Stratum			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 40 % Cover of Biotic Crust 0

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: **7** (A)
Total Number of Dominant Species Across All Strata: **7** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:
OBL species	x1 =	**0**
FACW species	x2 =	**0**
FAC species	x3 =	**0**
FACU species	x4 =	**0**
UPL species	x5 =	**0**
Column Totals: **0** (A)		**0** (B)

Prevalence Index = B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:
____ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation1 (Provide supporting
____ data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

SOIL

EXHIBIT 6

Sampling Point: 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10 YR 3/1	100					loam	
5-7	10 YR 3/2	90	7.5 YR 4/3	5	C	M	loam	
			10 YR 4/1	5	D	M	loam	
7-16	10 YR 3/1	85	10 YR 4/4	10	C	M	loam	
			10 YR 5/1	5	D	M	loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Muck Mineral (S1)
- ___ Sandy gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? **Yes X** **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:Wetland was visited during the dry season, has met vegetation and soils indicators, and no hydrologic modifications have occurred. Wetland hydrology is assumed per methods on pg 117 of the regional supplement.

EXHIBIT 6

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Beaver Cr Restoration City/County: Troutdale/Multnomah Sampling Date: 7/7/2022
Applicant/Owner: Metro/Mt Hood Comm College State: OR Sampling Point: DP 4
Investigator(s): Haddaway/Stout Section, Township, Range: Section 1, T 1S, R3E, WM
Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): 5
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45° 30' 40.82" N Long: 122° 23' 28.84" W Datum: NAD 83
Soil Map Unit Name: Haplubrepts, very steep NWI Classification: UPL
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?** **Yes** ____ **No X**
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes ____ No X	

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status?
1. *Pseudotsuga menzesii*	20	Y	FACU
2. *Alnus rubra*	50	Y	FAC
3. *Populus tremuloides*	30	Y	FACU
4. *Prunus emarginata*	20	Y	FACU
Total Cover:	120		
Shrub Stratum			
1. *Rubus parviflorus*	10	Y	FACU
2.			
3.			
4.			
5.			
Total Cover:	10		
Herb Stratum			
1. *Ranuculus repens*	25	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
Total Cover:	25		
Woody Vine Stratum			
1.			
2.			
Total Cover:	0		
% Bare Ground in Herb Stratum 0	% Cover of Biotic Crust 0		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)
Total Number of Dominant Species Across All Strata: **6** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **33%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:
OBL species	x1 =	**0**
FACW species	x2 =	**0**
FAC species	x3 =	**0**
FACU species	x4 =	**0**
UPL species	x5 =	**0**
Column Totals: **0** (A)		**0** (B)

Prevalence Index = B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:
____ 1 - Rapid Test for Hydrophytic Vegetation
____ 2 - Dominance Test is >50%
3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation1 (Provide supporting
____ data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks:

SOIL EXHIBIT 6 Sampling Point: 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10 YR 3/2	100					loam	
10-16	10 YR 4/2	75	10 YR 3/2	25			loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____
Depth (inches): _____

Hydric Soil Present? **Yes** ____ **No** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): _____
Water table Present? Yes ____ No ____ Depth (inches): _____
Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): _____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

EXHIBIT 6

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Beaver Cr Restoration City/County: Troutdale/Multnomah Sampling Date: 7/7/2022
Applicant/Owner: Metro/Mt Hood Comm College State: OR Sampling Point: DP 5
Investigator(s): Haddaway/Stout Section, Township, Range: Section 1, T 1S, R3E, WM
Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): 0
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45° 30' 40.82" N Long: 122° 23' 28.84" W Datum: NAD 83
Soil Map Unit Name: Haplubrepts, very steep NWI Classification: UPL
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____
Hydric Soil Present? Yes ____ No X
Wetland Hydrology Present? Yes ____ No X

Is the Sampled Area within a Wetland? **Yes** ____ **No X**

Remarks: Hydrophytic vegetation criteria met for dominance, but not prevelance. Vegetation composed of common weedy species and not necessarily indicative of wetland conditions. Soils have been (semi) recently disturbed. Plot located on level ground on terrace.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status?
1.			
2.			
3.			
4.			
Total Cover:	0		
Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	0		
Herb Stratum			
1. *Loliume perenne*	40	Y	FAC
2. *Trifolim repens*	10		FAC
3. *Sonchus asper*	20	Y	FACU
4. *Medicago lupulina*	10		FACU
5. *Agrostis stolonifera*	40	Y	FAC
6.			
7.			
8.			
9.			
10.			
11.			
Total Cover:	120		
Woody Vine Stratum			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust 0

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)
Total Number of Dominant Species Across All Strata: **3** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **67%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:
OBL species	x1 =	**0**
FACW species	x2 =	**0**
FAC species **90**	x3 =	**270**
FACU species **30**	x4 =	**120**
UPL species	x5 =	**0**
Column Totals: **120** (A)		**390** (B)

Prevalence Index = B/A = **3.3**

Hydrophytic Vegetation Indicators:
____ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
____ 3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation1 (Provide supporting data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:Dominance test met, prevalence not met

SOIL

EXHIBIT 6

Sampling Point: 5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10 YR 3/3	20					loam	
		80					gravel	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Muck Mineral (S1)
- ___ Sandy gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: rock, compaction

Depth (inches): 4"

Hydric Soil Present? **Yes** ___ **No** X

Remarks: Soil compacted with equipment tracks

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? **Yes** ___ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

EXHIBIT 6

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Beaver Cr Restoration City/County: Troutdale/Multnomah Sampling Date: 7/7/2022
Applicant/Owner: Metro/Mt Hood Comm College State: OR Sampling Point: DP 6
Investigator(s): Haddaway/Stout Section, Township, Range: Section 1, T 1S, R3E, WM
Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): concave Slope (%): 1
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45° 30' 40.82" N Long: 122° 23' 28.84" W Datum: NAD 83
Soil Map Unit Name: Haplubrepts, very steep NWI Classification: UPL
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes X No ____**
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status?
1.			
2.			
3.			
4.			
Total Cover:	0		
Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	0		
Herb Stratum			
1. *Phalaris arundinaceae*	90	Y	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
Total Cover:	90		
Woody Vine Stratum			
1. *Rubus armeniacus*	20	Y	FAC
2.			
Total Cover:	20		

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust 0

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)
Total Number of Dominant Species Across All Strata: **2** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:
OBL species	x1 =	**0**
FACW species	x2 =	**0**
FAC species	x3 =	**0**
FACU species	x4 =	**0**
UPL species	x5 =	**0**
Column Totals: **0** (A)		**0** (B)

Prevalence Index = B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:
____ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation1 (Provide supporting
____ data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

SOIL

EXHIBIT 6

Sampling Point: 6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10 YR 3/2	100					loam	
2-8	10 YR 4/2	90	5 YR 4/3	10	C	M	loam	
8-16	10 YR 4/2	75%	10 YR 4/1	15	D	M	loam	
			5 YR 4/3	10	C	M	loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____
Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
X FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): ____
Water table Present? Yes ____ No ____ Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): ____

Wetland Hydrology Present? **Yes X** **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:Wetland was visited during the dry season, has met vegetation and soils indicators, and no hydrologic modifications have occurred. Wetland hydrology is assumed per methods on pg 117 of the regional supplement.

EXHIBIT 6

Attachment 3. South Beaver Creek Natural Area Restoration Project Existing Conditions Report

November 2021

EXHIBIT 6

EXHIBIT 6

South Beaver Creek Natural Area Restoration Project

Existing Conditions Report

Project number: 60648606

May 2021

Prepared for:

Metro
600 NE Grand Ave.
Portland, OR 97232-2736
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Prepared by:

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With support from:

Northwest Watersheds LLC

and

Cascade Environmental Group

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Appendices

1. Introduction

The South Beaver Creek Natural Area is a 62-acre site bordered by Mount Hood Community College (MHCC) on the west and southeast, SE Cochran Road to the south, SE Stark Street to the north, and S Troutdale Road to the east (Figure 1). The site includes a highly productive reach of Beaver Creek, the confluence of Beaver and Kelly Creeks, wetland terraces, seasonal side channels, beaver dams, and upland riparian forest areas. The stream is located within a valley that has steep canyon walls, particularly along the west side of the site.

Metro purchased the site from MHCC using money from the 1995 natural areas bond measure. The steep slopes and wetlands along the stream made the canyon unsuitable for farming and, as such, it has remained in a relatively natural state while surrounding lands were converted for agriculture at the turn of the past century, and later urbanized over the past several decades. The section of Beaver Creek located within the South Beaver Creek Natural Area provides some of the best potential salmon spawning and rearing habitat in the watershed due to its low gradient, seasonal flows, in-stream habitat conditions, intact riparian corridor, and accessible off-channel refuge habitat. Despite this, the area has been affected by surrounding urban land uses, including increased impervious areas associated with the steady growth of Troutdale and water withdrawals upstream in agricultural areas. These effects have altered stream flows, water temperatures, and aquatic habitat quality (e.g., reduced wood recruitment, increased turbidity and sedimentation).

For several decades, numerous stakeholders have been actively involved in planning and enacting enhancements to the site in an effort to improve habitat conditions for fish and wildlife, with the primary focus being salmon recovery (Herrera 2014; Metro and Herrera 2014; Sandy River Basin Working Group 2007; Multnomah County n.d.). Within the last 5 years, three large fish passage improvement projects were completed. Undersized culverts at the upstream (SE Cochran Road) and downstream (SE Stark Street) ends of the site were replaced. The Stark Street culverts were replaced with a much larger arch culvert in 2017 and the Cochran Road culvert was replaced with a new bridge structure in 2019. In addition, the existing fish passage structure was improved below the Troutdale Road culvert in 2018. In response to these culvert replacements, Beaver Creek has been migrating through its floodplain as it adjusts to the changes in hydrologic conditions. This is particularly evident at the downstream/north end of the South Beaver Creek Natural Area.

At Metro's direction, this report has been prepared to focus on existing conditions that affect in-stream fish habitat enhancements at the South Beaver Creek Natural Area. This report will be updated with a complementary restoration plan set being developed based upon the existing conditions and associated restoration concepts described in this report. Metro is seeking a cost-effective means of improving salmon habitat conditions within the natural area. To achieve this goal, this report:

- Identifies the factors that currently limit salmon migration, spawning, and rearing;
- Provides restoration goals and objectives based on these limiting factors;
- Describes existing natural, physical, and hydrologic conditions; and
- Recommends specific restoration strategies.

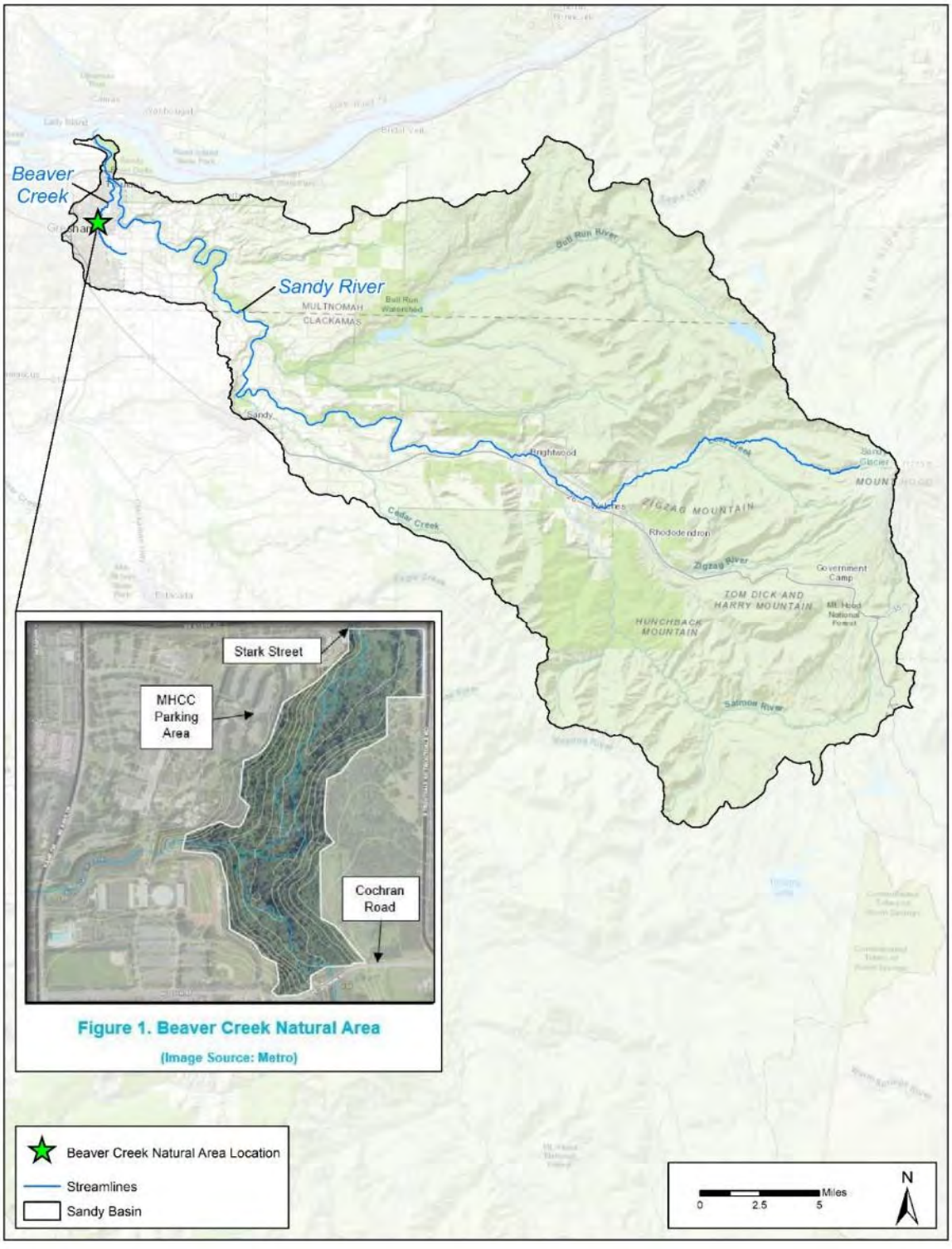

Figure 1. Beaver Creek Natural Area

Metro has complementary vegetation enhancement activities planned for the South Beaver Creek Natural Area, which are not described in this report; however, those enhancements will benefit the aquatic habitat restoration concepts proposed herein.

2. Limiting Factors

Based on a combination of literature and data review and limited on-site assessment, the following factors are currently limiting the success of native fisheries in the South Beaver Creek Natural Area located between Stark Street and Cochran Road. Despite these threats, the watershed is known to support a variety of native fishes and invertebrates, and opportunities such as large wood placement exist to protect and restore portions of the watershed to benefit native fish species and the ecological community. It should be noted that fish passage obstructions used to be the primary limiting factor but that has changed due to recent passage improvements at the Troutdale, Stark, and Cochran Road crossings:

- **Low summer flows.** Low summer flows are the most limiting factor in the Beaver Creek watershed. Agricultural, residential, and urban development have altered runoff patterns by increasing surface runoff in the winter and reducing base flows in summer. Only pools, beaver ponds, and some glides are capable of supporting juvenile salmonids through the summer.
- **High summer water temperatures.** Summer stream temperatures rise to levels that exceed the preferred range for salmonids, which further reduces the number of juveniles that remain in the watershed. Improved riparian shading in exposed areas of the stream may provide improved temperatures for salmonids.
- **Low fall flows.** Seasonal low flows extend into the fall until sufficient rains have occurred and this coincides with peak spawning and migration for coho and Chinook salmon. Further, early reduction of flows in the spring may prevent successful rearing of Chinook smolts by mid-May.
- **Lack of winter high-flow refugia.** Lack of winter high-flow refugia is the most critical limiting factor for juvenile coho because they require flow refugia (either main or off-channel areas) to escape flashy flood flows during the winter.
- **Insufficient stream cover and complexity.** Insufficient stream cover and complexity significantly impacts rearing for all juvenile salmonids. Very few accumulations of large wood material are present in the project reach and the watershed. Large wood material provides shading, hiding places for salmonids, and habitat for prey species. Large wood placement will address other limiting factors as well, such as improving water temperatures and providing flow refugia.
- **Contaminated runoff.** Pre-spawning mortality of coho salmon in urban streams has been documented in urban streams and may be attributed to heavy metals as well as a tire residue (6PPD-quinone) discharged from stormwater runoff (Tian et al. 2021). Most of the watershed is in agricultural, residential, and urban development, so the first large runoff event each fall is likely to transport contaminants that have accumulated in the watershed into the stream. The City of Gresham has begun testing for 6PPD-quinone in its stormwater system.

- **Lack of pools.** Many reaches of Beaver Creek within the project area are geomorphic plane bed streams. The limited presence of woody material accumulation in the plane bed stretches has resulted in a reduction of pool frequency and quality.
- **Erosion/turbidity.** Although spawning substrate quality is generally good in the watershed, the project reach is subject to erosion, which provides a source of sediment into the stream that can reduce the quality of spawning and egg incubation habitat and also decrease rearing productivity. Culvert replacements at both the upstream and downstream extent of the project reach have temporarily impacted the balance of Beaver Creek. The Cochran Road culvert replacement allows higher flows through the reach. The Stark Street replacement removed a channel invert control structure and allows for the passage of high flows. Although these projects have restored the natural flow regime and improved sediment and large wood transport, they have resulted in increased stream bank and bed erosion. Erosion and sediment discharge to the stream will continue until the system stabilizes.
- **Poaching.** Poaching and harassment of adult salmonids in a small stream is likely to be a constant problem in an urban area. This is likely to be an increasing concern due to houselessness in the region. Several temporary encampments were observed in the project reach during the March 2021 site visit.

3. Goals and Objectives

The following restoration project goals and objectives were developed based upon discussions with Metro project staff, literature review, watershed plans, and an understanding of the site-specific limiting factors for native salmonid fisheries. These goals and objectives are consistent with, and tier from, the Sandy Basin Aquatic Habitat Restoration Strategy for Beaver Creek (Sandy River Basin Working Group 2007).

3.1 Goals

Proposed restoration investment will focus on achieving improved stream ecological functions and floodplain connectivity to benefit native resident and anadromous fish populations, per the goals identified in the Sandy Basin Aquatic Habitat Restoration Strategy. These include the following Tier 2, 3, and 4 actions that are applicable to the South Beaver Creek Natural Area:

- Restore long-term processes for improved water quality (Tier 2)
- Restore long-term processes via riparian vegetation enhancements (Tier 3)
- Restore short-term processes associated with in-stream habitat (Tier 4)

Riparian habitat restoration (Tier 3) actions are being addressed by Metro through a separate effort. Conceptual restoration strategies described in this plan will focus on the following elements, which are assumed to provide the greatest functional enhancement relative to effort and cost expended: removal of weirs and in-stream structures, placement of single pieces and complex jams of large wood, enhancement of floodplain function, and improved energy dissipation for existing stormwater outfalls along the west side of Beaver Creek.

3.2 Objectives

Objective 1. Improve and enhance in-stream habitat conditions, habitat complexity, and stream functions beneficial to native fish species.

Large woody debris (LWD) should be designed to provide habitat and function in relation to identified limiting factors (Section 2). Wood should be placed so that it provides enhanced habitat complexity, shade, and water depth. The placement of LWD should create hydraulic "roughness" in areas where LWD is limited. The LWD should be stable during most typical flows so that it may create, protect, and shade pools.

Objective 2. Provide benefits to sensitive fish populations through a wide range of flows—from low-flow water depths and refuge through flood refugia via off-channel connections.

Wood should be placed so that it is stable during high flows, and so that it provides enhanced water depth during both summer and winter flows. The placement of wood should provide aquatic habitat refuge for salmonids up to the 2-year flow event via pools and increased water depths during low-flow periods. If flows exceed the 2-year high-flow event, woody debris should help direct flows into side channels and floodplain areas that provide velocity refugia for juvenile fish.

Objective 3. Avoid increases in stream temperature.

The placement of woody debris will create, maintain, or improve pools to stratify water temperatures through increased depth and shading. Wood placement should avoid the creation of pools that are exposed to direct sunlight throughout the day in the summertime, particularly areas with direct southern exposure. Log placement should be focused in areas with existing tall, shade-providing trees so that pools receive shade from existing vegetation, topography, or the LWD itself.

Objective 4. Minimize rapid bank erosion that results in pulses of high in-stream turbidity, which are harmful for resident and migratory fish species.

The placement of LWD should be evaluated based on hydraulic model results to avoid creating hydraulic conditions that would exacerbate areas of rapid bank erosion. Due to the recent replacement of the Stark Street culvert, the stream channel is adjusting to changes in hydraulic conditions and is meandering to accommodate current flow conditions. Due to these active processes, it is not advised that LWD be placed within the lowest reach. Streambank stability via vegetation enhancement is encouraged (e.g., willow staking), although this is work being done under a separate contract with Metro.

Objective 5. Remove in-stream artificial constrictions (concrete weir).

One concrete weir structure was observed between the two upper-most stream reaches. This structure presents a hydraulic and fish passage constraint and should be removed to restore the channel migration zone through this area.

Objective 6. Stabilize stormwater outfall(s) that drain the MCDD parking areas.

One stormwater outfall was noted just upstream of the Stark Street stream crossing. It drains stormwater runoff to the creek through a steep, incised and erosive channel. To reduce erosion

and sedimentation delivery into Beaver Creek, energy dissipation should be added to the channel via large rock.

4. Existing Conditions

Beaver Creek is a low elevation watershed that drains a total area of about 13.5 square miles within Gresham and Troutdale, in Multnomah County, Oregon (DiLeone 2011). The creek is over 23 miles long and is the lowermost tributary to the Sandy River (Figure 1). The Beaver Creek watershed has been substantially developed in the last half century for urban and agricultural uses. The South Beaver Creek Natural Area encompasses a riparian conservation zone 0.7 mile in length. The natural area is owned and managed by Metro and lies below to the MHCC. Above the Natural Area, the creek mainly flows through agricultural and rural residential uses upstream to the headwaters. The watershed has two major tributaries: Kelly Creek (within the study reach) and Arrow Creek, farther upstream. The MHCC dam on Kelly Creek completely blocks fish passage approximately 660 feet upstream from the confluence with Beaver Creek. The following subsections provide a summary of existing conditions based on literature review, limited field assessment, and modelling.

4.1 Geomorphology

4.1.1 General Overview

The main stem of the South Beaver Creek Natural Area Restoration project reach is 6,325 feet in length, extending from SE Cochran Road downstream to SE Stark Street. Undersized culverts at both ends of the project reach have recently been replaced with larger openings to provide improved fish passage, and the new, larger openings resulted in changed hydrology for the project reach. Both historical culverts restricted natural stream flows, particularly during high-flow events, resulting in flow attenuation upstream of the culverts and reducing sediment transport capacity of the stream. The Stark Street culvert also provided stream elevation control for the Beaver Creek invert. With the Stark Street replacement, high flows are conveyed through the culvert without attenuation or backing flows up at the inlet.

Using the Beaver Creek stream profile from the Multnomah County Flood Insurance Study (FEMA 2019), the slope of the Beaver Creek is estimated as:

- SE Stark to Kelly Creek confluence, the slope is 0.009 feet/foot
- From Kelly Creek to the Concrete Weir, the slope is 0.006 feet/foot
- From the Concrete Weir to SE Cochran Road, the slope is 0.009 feet/foot

Based on the Montgomery-Buffington Stream Classification, developed for Pacific Northwest streams, the Beaver Creek project reach would fall within the Pool-Riffle and Plane-Bed Geomorphic Stream Types (Table 1).

Table 1. South Beaver Creek Geomorphic Classifications

Stream Type	Bed Material	Slope	Pool Spacing (channel widths)	Dominant Roughness Elements	Dominant Sediment Sources
Pool-Riffle	Gravel	0.001<S<0.02	5 to 7	Bedforms (bars/pools), grains, large woody debris, sinuosity, banks	Fluvial, bank failure, inactive channel, debris flows
Plane-Bed	Gravel, Cobble	0.01<S<0.03	None	Grains, banks	Fluvial, bank failure, debris flows

Source: Montgomery-Buffington 1993

4.1.2 Stream Sediment

The recent high-flow event in Beaver Creek provided evidence of the sediment transport capacity of the stream. Through the project reach, evidence of gravel bar aggradation and stream bank erosion are present. The streambed composition varies with the hydraulic conditions of the reach and includes bedrock, sand, gravel, and cobbles.

Figure 2 illustrates how localized hydraulic characteristics result in sediment transport (erosion and deposition). In the photo, large material (approximately 6-inch-diameter cobble) was deposited during the recent high-flow events. The woody material shown on the right edge of the photo protected the right bank of the channel from the high-flow energy so no large bed material was transported to this area, allowing smaller sand material to deposit in the less turbulent area.

Figure 2. Sediment deposition in Beaver Creek, upstream of the Stark Street Culvert

The recent SE Cochran Road culvert replacement project included streambed material placement at the crossing. It is assumed that the placed bed material was sized to represent sediment transport capacity of Beaver Creek. Table 2 provides the streambed gradation for the reconstruction of the new Beaver Creek section at the SE Cochran Road crossing. The D50 for the streambed mix suggests a size range from Coarse to Fine Cobble material. This is consistent with stream substrates observed throughout the project reach.

Table 2. Beaver Creek Streambed Gradation at SE Cochran Crossing

Roughened Channel Mix				
	% Passing	Size Range (ft)	Classification[1]	Estimated Velocity for Erosion (fps) [2]
D100	16	1.38 – 3.45	Boulder	20.3 – 29.2
D84	34	0.55 – 1.38	Small Boulder	13.1 – 20.3
D50	34	0.17 – 0.55	Cobble	9.2 – 13.1
D16	9	0.007 – 0.17	Pebble	2.0 – 9.2
D7	7		Sand - Silt	< 2.0

Key: fps = feet per second; ft = feet
Source: Multnomah County 2019
Notes:[1] Wentworth 1922; [2] Interpolated from Hjulström Curve (1939)

4.1.3 Channel Complexity

In general, the project reach of Beaver Creek provides some sections of good channel complexity composed of woody material accumulations and accessible side channels. This is particularly true in the reach downstream of the Kelly Creek confluence. However, in-stream wood is significantly lacking in size and quantity throughout the project reach, relative to a more pristine, natural stream reach. Upstream of Kelly Creek, Beaver Creek has confined reaches due to berms and a concrete weir. Near the Stark Street culvert crossing, the recent natural channel corrections resulting from the culvert replacement are forcing the channel to evolve. Increased meandering has reduced the stream gradient, which will help reduce flows and channel incision. Fresh bank sloughing observed at bends in the creek provides evidence of recent erosion. Immediately upstream of the culvert, the lowering of the stream channel and bank erosion are in the process of creating a new floodplain terrace.

4.1.4 Site Investigation Specific Findings

A site investigation of the Beaver Creek project reach was conducted on March 2, 2021. Prior to the site visit, Beaver Creek experienced a series of high-flow events (Figure 3). Based on the flood frequency analysis (FFA) of the US Geological Survey (USGS) flow gage (see Section 4.2.2), the recorded Beaver Creek flows exceeded the 1.2-year event (440 cubic feet per second [cfs]).

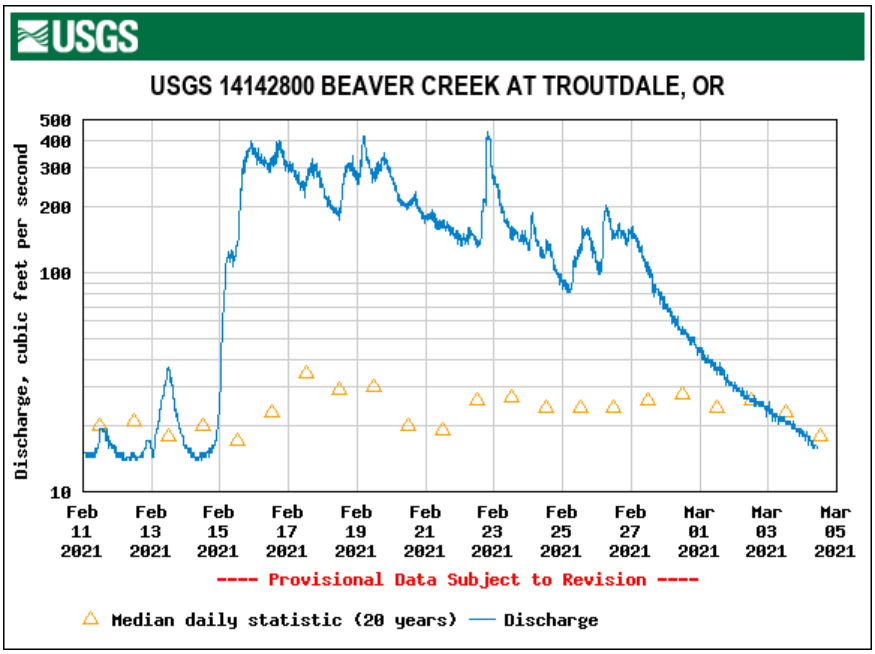

Figure 3. Beaver Creek flow hydrograph
Source: USGS 2021

To facilitate on-site assessment, South Beaver Creek was divided into four distinct survey sub-reaches (ranging from upstream to downstream) based on stream characteristics identified in the field:

- Reach 1–SE Cochran Road to Concrete Weir
- Reach 2–Concrete Weir to Kelly Creek Confluence
- Reach 3–Kelly Creek Confluence to Approximately 900 feet Upstream of SE Stark Street
- Reach 4– Historical SE Stark Street Culvert Backwater Area (Stark Street Culvert to Approximately 900 feet Upstream)

Figure 4 identifies the individual sub-reaches, and each reach is described below.

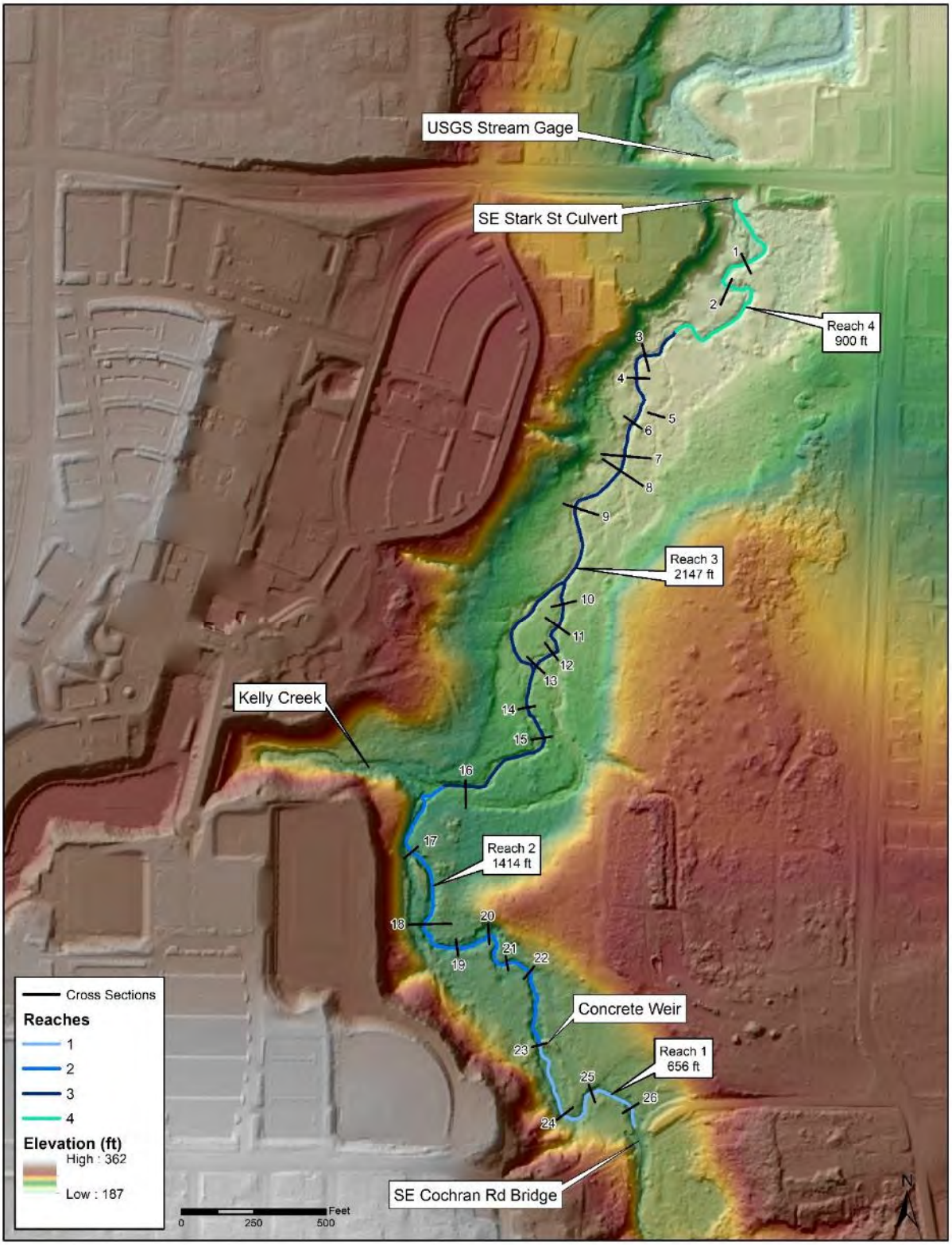

Figure 4. Beaver Creek stream reaches
Source: GeoTerra 2019

Reach 1 – SE Cochran Road to Concrete Weir

Reach 1 stretches approximately 650 feet from the bridge at SE Cochran Road downstream to a concrete weir. The Cochran Road culvert was recently replaced with a bridge (Figure 5). Historically, the culvert acted as a flow control during high-flow events, attenuating flows entering this reach. According to the Beaver Creek Flood Insurance Study (FEMA 2019), the attenuation from the historical culvert flow restriction of the 10-year high-flow event reduced estimated flows from 992 cfs to 329 cfs. The flow attenuation of the culvert during lower flows is not documented, but flow attenuation during more recurring high-flows event was likely impacted.

Figure 5. SE Cochran Road Bridge (looking upstream)

With the new bridge structure, Beaver Creek now experiences a new flow regime throughout Reaches 1-4, with the greatest impacts likely in Reaches 1 and 2. Flow impacts from the bridge structure are less significant downstream of the Kelly Creek confluence, because Kelly Creek contributes a relatively large percentage of the total flow to Beaver Creek. The impacts of the culvert replacement are evident at and downstream of the new bridge structure. As shown in Figure 5, streambed material was placed at the project site when the Cochran Road Bridge was constructed, and some bank erosion has occurred. It is assumed that the placed boulders were sized to represent the D100 sediment size for Beaver Creek. It is not known if the visible erosion has been on-going or was the result of the recent high-flow event. In either scenario, the eroded material has contributed to gravel and cobble bars downstream of the site (Figure 6).

Figure 6. Recently deposited cobbles and gravels

Downstream of the SE Cochran Road bridge, the creek meanders along private property (Figure 7). It appears the recent high flows have deposited cobbles at the inside of the meander, and bank erosion on the outside of the bend is continuing. The tree shown in the center of the photo with the leaning trunk and vertical upper section suggests the streambank at that location has been stable for a few years. Continued bank erosion along the right bank of the creek will

lead to localized bank failures, adding woody debris to this reach which will be helpful because large wood material is currently very limited.

Figure 7. Recently deposited cobbles and gravels upstream of weir

The concrete weir at the downstream extent of Reach 1 was a flash board dam used to create a pond upstream. There is a containment berm along the eastern side of the creek while the natural terrain confines the western banks. The flash boards are no longer used, but the weir is a flow constriction during high-flow events.

The backwater effect of the weir constriction is not known at this time, but the vegetated cobble island shown in Figure 7 suggests the weir provides enough flow capacity to initiate the movement of cobble from upstream, then at some flow rate, ponding develops, resulting in the deposition of larger material. The vegetation on the island is bent over, suggesting recent flows overtopped the island but the flow regime did not result in deposition of cobbles from upstream or erosion of the material comprising the island.

Reach 2 – Concrete Weir to Kelly Creek Confluence

Reach 2 includes the concrete weir structure shown in Figure 8 and extends approximately 1,400 feet to the confluence with Kelly Creek. Beaver Creek in this reach becomes more complex than Reach 1. This section of Beaver Creek has an established floodplain, and there are multiple natural wood debris accumulations within the upper part of the reach.

Figure 8. Culvert weir (looking upstream)

The concrete weir structure has a concrete apron extending out to the edge of the wingwalls. During low-flow periods, the concrete apron likely creates a fish passage barrier due to low-flow depths. With the current upstream channel flow paths, the stream flow entering the weir is skewed, and flow is directed to the west bank.

As the flow passes the concrete apron of the weir, the energy is released creating a large scour pool (Figure 9). Due to the current skewed flow path at the weir, cobbles and gravel have deposited during high-flow events and pushed the creek to the west. Vegetation in the cobble area suggests the creek has been in the current alignment at least long enough for grass to become established in the area. Some of the vegetation appears to be recently covered, likely from the recent high-flow event. As the gravel island upstream of the concrete weir changes, the flow direction will change, resulting in changes to the configuration of the scour pool.

Figure 9. Scour pool downstream of the concrete weir

Downstream of the scour pool, the creek enters a reach with accessible floodplains and some woody debris accumulations. Figure 10 shows the debris line from the recent high-flow event at the top of the western bank. Throughout Reach 2, there is evidence of flows across the floodplain, including flattened grass and debris lines. Also shown in the photo is a creek-spanning log jam. However, many of the existing log jams in this reach are only submerged during high flows so do not interact with average or low-flow conditions. The riparian community some potential for future LWD recruitment, but it is not great in terms of tree size or quantity.

Figure 10. Looking downstream at flood terrace and in-stream wood

This Beaver Creek reach includes a short series of meanders where the tree canopy opens and the floodplain is dominated by reed canarygrass (*Phalaris arundinaceae*). Figure 11 depicts the floodplain upstream of a channel-spanning log. As shown in the photo, looking upstream, the floodplain is dominated by reed canarygrass.

Figure 11. Active floodplain at channel spanning log

Immediately downstream of the log shown in Figure 12, Beaver Creek is eroding a steep bank. It appears the bank erosion has caused a tree to fall into the creek. Due to the vegetation growing on the tree and accumulated material, the tree has been there for more than this season. The tree appears to be a hard point, maintaining flows in the main channel.

Figure 12. Bank erosion at confined meander (lateral beaver dam shown on left)

Between the location of the meanders and the Kelly Creek confluence, where Beaver Creek is adjacent to the football field, the creek flows through a confined reach with berms on both sides. As shown in Figure 13, the stream reach has very little channel complexity and little woody material. Salmonid use of this pooled portion of the reach is likely limited to rearing, although there is limited refugia to escape high winter flows. It is likely that, during high-flow events, the energy in this reach can transport most of the wood and bedload material that enters from upstream.

Figure 13. Confined reach of Beaver Creek below football field

Reach 3 – Kelly Creek Confluence to Approximately 900 Upstream of SE Stark Street

Reach 3 is the longest of the defined reaches at approximately 2,150 feet and provides the best salmonid spawning and rearing habitat of any of the project reaches. Current conditions of this reach are relatively complex, with multiple side channels, active floodplains, and more woody debris accumulation than other reaches. However, the amount of available LWD is far less than one would expect in a healthy, natural system, and many of the accumulations do not interact with all flow levels. The riparian community does present good potential for future LWD recruitment, but LWD placement will provide immediate increases in cover/complexity until that occurs. The multiple side channels are evident in Figure 4. Flows from Kelly Creek contribute to increased flow volumes downstream of the confluence. Due to the Kelly Creek reservoir, the contributing flows tend to have higher water temperatures than the upstream reach of Beaver Creek during the summer months (City of Gresham 2021).

The lower reach of Kelly Creek, shown in Figure 14, has a dam/reservoir approximately 660 feet upstream of the confluence. The creek reach between the dam and Beaver Creek has a relatively steep gradient with large substrate material (mostly cobble/boulder) and does not contain a large percentage of fine material within the streambed. The impact of the dam on sediment transport and flows was not assessed as part of this project. The Kelly Creek reach has a dense tree canopy, restricting the potential to place woody material from the air. The mixed riparian community does provide strong potential for future LWD recruitment.

Figure 14. Kelly Creek above confluence with Beaver Creek

As shown in Figure 4, there is topographic evidence of a channel east of the current Beaver Creek alignment. From the alignment with Kelly Creek, the side channel might have been active due to flows from Kelly Creek. Site investigation revealed a large fallen tree along the bank at the head of the channel. It is not known if the tree initiated the abandonment of the channel, if the flows from Kelly Creek have been altered by the dam to reduce high flows from the creek, or if natural channel migration forced the creek to occupy the current channel.

Approximately 750 feet downstream of the Kelly Creek, a relatively large apex log jam has formed, activating two channels. The apex jam (Figure 15) has the greatest accumulation along the eastern side channel. Flow pattern within the wood structure suggests the eastern channel may be the preferred flow path during low-flow conditions. The hydraulic complexity associated with the structure and recruitment/loss of key log material can alter the flow paths at any given time.

Figure 15. Apex log jam downstream of Kelly Creek

There are multiple other side active side channels in the area (Figure 16). Immediately upstream of the apex jam, an opening in the eastern bank allows flow into a side channel. During the site visit, the side channel appeared to be at a lower elevation than the main channel of Beaver Creek.

Figure 16. Active side channel bypassing apex log jam

The lower half of Reach 3 of Beaver Creek is a series of pool-riffle stream sections with multiple side channel bifurcation/confluence points. Figure 17 illustrates one of the locations where Beaver Creek connects with a side channel. During higher flow conditions, the flows from Beaver Creek and the side channel freely exchange. The photo also indicates a well-established floodplain with wood material along the banks and within the channels.

The presence of the apex jam split the flow in the creek approximately equally. Figure 18 shows the confluence of the two channels at the downstream end of the island. Visual estimation of the flows suggests an approximately 50/50 split in flows.

Figure 17. Beaver Creek and high-flow side channel confluence

Figure 18. Confluence of split channels in Reach 3

Reach 4 – Historical SE Stark Street Culvert Backwater Area (Stark Street Culvert to Approximately 900 Feet Upstream)

The culvert at SE Stark Street was replaced in 2017. Prior to the replacement, the culvert restricted flows during high-flow events, creating a backwater condition in the creek. Based on Federal Emergency Management Agency (FEMA) water surface profiles, the backwater condition for the 10-year event extended upstream approximately 500 feet (FEMA 2019). For the 100-year event, the backwater extended approximately 800 feet.

The replacement of the undersized culvert with the natural bottom culvert shown in Figure 19 has initiated geomorphic change within Reach 4. The streambed material placed in the channel during the replacement project has been transported from the inlet. It appears some of the material has accumulated closer to the outlet and perhaps transported farther downstream.

Figure 19. New SE Stark Street culvert

The combination of the increased stream energy due to the larger culvert and perhaps the increased high flows in the stream due to the SE Cochran Road project has resulted in stream channel incision (downcutting) at the culvert, causing stream corrections upstream of the culvert.

The two aerial photos below (Figure 20) illustrate the geomorphic change that has occurred in less than 2 years. The channel lowering through the culvert results in an energy level too high for the reach, so to correct itself the stream is in the process of stabilizing and reducing its gradient by creating meanders within the floodplain.

Pre-Culvert Replacement (05/22/2017)

Post-Culvert Replacement (05/08/2019)

Figure 20. Stream correction upstream of SE Stark Street culvert

Figure 21, looking upstream from the crown of the SE Stark Street culvert, provides a good view of the dynamic activity occurring in the area. The channel migration eroded the banks, causing the large tree to fall into the creek. Due to the channel incision, the recent high flows did not reach the floodplain. It is likely the current floodplain will not be inundated except for extreme high-flow events.

As the geomorphic evolution continues in this reach, the stream will find a preferred flow path, and a floodplain will become established in the current wide channel. With the potential of increased flows due to the SE Cochran culvert replacement, additional new channel dynamics may have initiated.

Figure 21. Recent channel migration upstream of Stark Street culvert

Along with the lowering of the main creek channel, local drainage tributaries have also started to incise (Figure 22). Although these are not currently providing good habitat, as the banks collapse and the channels widen, the drainage tributaries will provide good off-channel refugia during high-flow events.

This reach does provide good substrate for salmonid spawning. Although it does provide some undercut banks and wood to support rearing fish, the amount of woody material is very limited and the riparian community is young and will take some time to become established. Due to the current lack of canopy cover, it is likely that water temperatures become too warm in this reach to support rearing salmonids from spring to fall.

Figure 22. Incised banks on small drainage tributary in floodplain

4.2 Hydrology & Hydraulics

A two-dimensional Hydrologic Engineering Center-River Analysis System (HEC-RAS), version 5.0.7, hydraulic model extending from SE Cochran Road to approximately 500 feet downstream of SE Stark Street was developed in order to understand existing conditions and estimate depths and velocities for various flow regimes. The model will be used to support the conceptual design and placement of large wood material.

4.2.1 Terrain

The data used for the model, provided by Metro, was 3-foot Light Detection and Ranging (LiDAR) data captured on August 20, 2019 (GeoTerra 2019). According to USGS stream gage 14142800 (USGS 2021), located downstream of SE Stark Street, average flow in Beaver Creek on that day was 0.63 cfs. LiDAR typically does not penetrate water, so bathymetry is sometimes carved into LiDAR for hydraulic modeling. However, because flows were so low on the day the LiDAR was captured, the LiDAR was used in the model as-is, without attempting to carve in additional bathymetry. This could mean that some modeled depths are slightly high and, thus, conservative, but not very substantially.

4.2.2 Hydrology

FFA for USGS stream gage 14142800 (USGS 2021) was conducted using Hydrologic Engineering Center-Statistical Software Package (HEC-SSP), version 2.2, following the USGS Bulletin 17C Expected Moments Algorithm (USGS 2019). Peak flow data for the stream gage is available from 2000 to 2019.

Following the methodology from the Multnomah County Flood Insurance Study (FEMA 2019), 60 percent of flows were entered into the upstream boundary condition of Beaver Creek, and 40 percent of flows were entered into the upstream boundary condition of Kelly Creek. Table 3 shows the results of the FFA, which are the flows used in the HEC-RAS model.

It should be noted that these flows are higher than the FEMA effective flows obtained during the Flood Insurance Study because this study was conducted before the SE Cochran Road bridge replacement. The FEMA effective 100-year flow is 1,038 cfs.

Table 3. Annual Exceedance Probability Flows for Beaver Creek

Annual Exceedance Probability (%)	Return Period (Years)	Flow (cfs)
50	2	621
20	5	887
10	10	1,089
4	25	1,376
2	50	1,614
1	100	1,873

Flow duration curves were also developed from the daily flow data for USGS stream gage 14142800. The 50 percent flow duration curve value is representative of median flow. The annual 50 percent flow duration curve value (based on all daily data) was modeled in addition to the 2-year to 100-year flows, as representative of typical low flow (Table 4). This value (8.4 cfs) is close to the 50 percent flow duration curve value of quarter 2 (April to June) (7.4 cfs), during a critical rearing period for juvenile Chinook, coho, and steelhead in Beaver Creek.

Table 4. 50 Percent Flow Duration Curve Values

Quarter	Period	Flow (cfs)
1	Jan – Mar	26.9
2	Apr – Jun	7.4
3	Jul – Sep	0.7
4	Oct - Dec	14.2
Annual		8.4

Between water years 2011 and 2020, the average annual flow in Beaver Creek was between 14 and 34 cfs. There are high flows with substantial variation in winter (winter mean daily flow 26-70 cfs, peak 172-750 cfs) (USGS 2021). Climate change could potentially increase intensity of winter storms, causing more flooding and more frequent flashy events, and thus winter flow refugia will be even more important in the future.

Flows gradually decline through spring and summer to a low-flow period in late summer and early fall (summer mean daily flow 1-7 cfs) (USGS 2021). During low-flow periods, the stream becomes intermittent upstream of SE Division Drive, with disconnected residual pools (WFC 2011). Climate change will likely exacerbate issues related to low summer flows, as higher summer air temperatures and decreased rainfall will likely increase evapotranspiration and decrease flows.

This will, in turn, increase water temperature, because lower flows will heat more rapidly. Potentially lower summer flows and higher water temperatures will negatively impact the potential for fish habitat and migration (Chang et al. 2010; Dalton et al. 2013; Watts et al. 2016).

4.2.3 Roughness Coefficients

Land use was digitized from the National Land Cover Dataset and orthoimagery. Manning's n roughness coefficient values were assigned to each land use based on published values (Chow 1959) and engineering judgement (Table 5). The main channels of Beaver Creek and Kelly Creek were assigned one stream channel land use type. The overbanks were assigned as reed canarygrass and woody wetland.

Table 5. Manning's n Values

Land Use	Manning's n Value	Location
Developed, High Intensity	0.15	Downstream of SE Stark St.
Grass	0.04	Upstream of SE Stark St.
Reed Canarygrass	0.1	Overbanks of Beaver Creek, near SE Stark St.
Road	0.013	SE Stark St.
Stream Channel	0.04	Main channel of Beaver Creek and Kelly Creek
Woody Wetland	0.12	Overbanks of Beaver Creek and Kelly Creek

4.2.4 Model Set-Up

Steady-state conditions for the flows listed in Table 3, along with the annual 50 percent flow duration curve value listed in Table 4, were simulated using the unsteady flow regime, by ramping inflows up to the desired values over the course of 2 hours, and then running the model for a total of up to 9 hours.

The model used the full momentum wave equation set. The initial time step was selected as 1 second, with adaptive adjustments made based on a maximum Courant number of 1. The possible time steps varied from 0.06 and 4 seconds.

A cell size of 3 feet was used for the Beaver Creek and Kelly Creek main channels and is shown by the 3-foot refinement region in Figure 23. A cell size of 6 feet was used for the overbanks and downstream of SE Stark Street. The SE Stark Street culvert was coded in as a 150-foot-long semi-circular culvert, with a rise of 20.33 feet.

Breaklines were placed along the banks of Beaver Creek and Kelly Creek, and the banks of other side channels, to ensure the model captured these high ground areas. A normal depth downstream boundary condition was set to a friction slope of 0.004, estimated from the slope of the terrain. Figure 23 shows the model domain and boundary conditions.

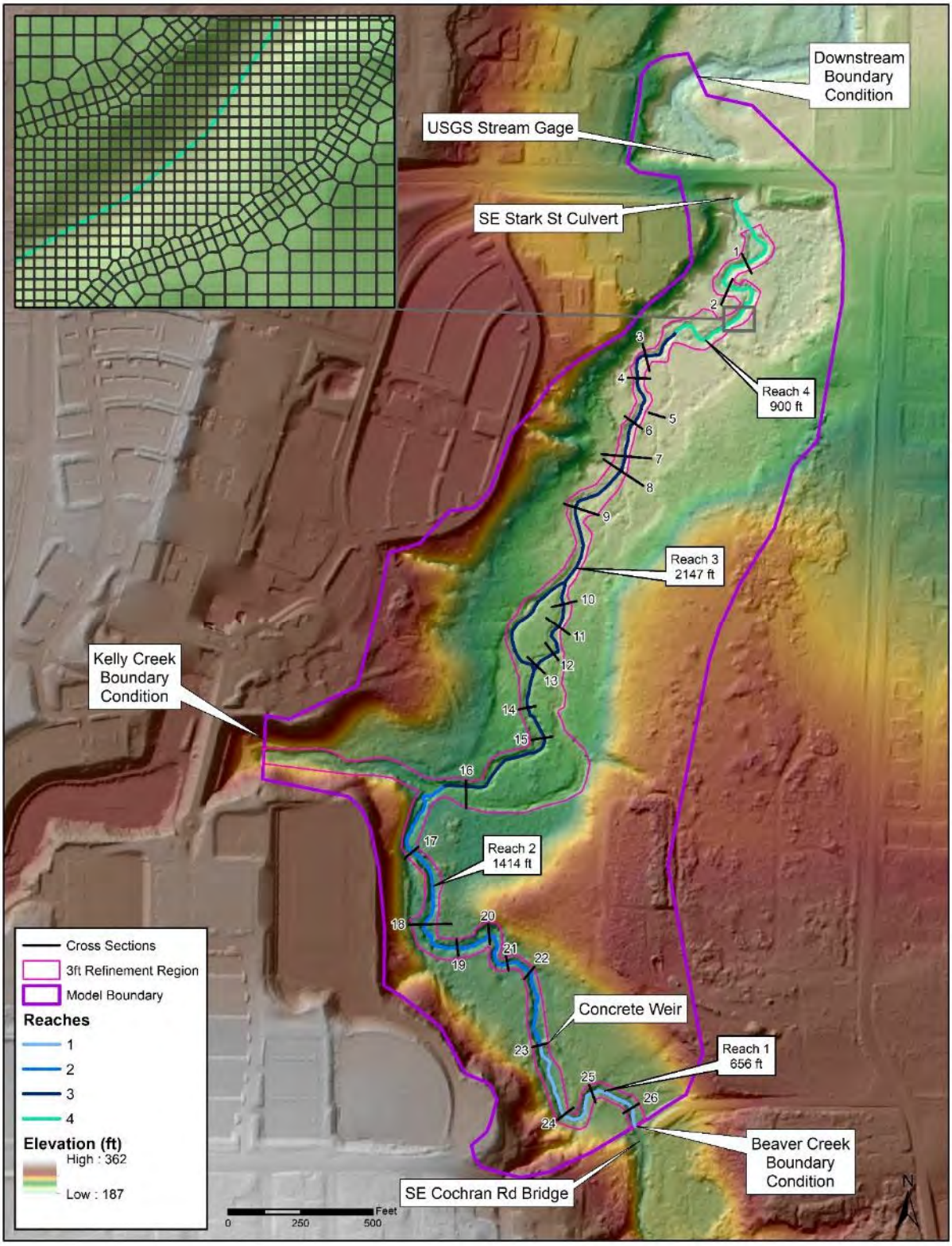

Figure 23. Hydraulic model domain

4.2.5 Calibration

The hydraulic model was calibrated with support of the HEC-RAS model used for the no-rise analysis for the SE Stark Street culvert replacement (WEST 2018). The FEMA 100-year flow water surface elevation was compared between the two models at cross section 2324 of the no-rise model, just upstream of cross section 1, for various channel Manning's n values. A channel Manning's n value of 0.04 provided the closest match of water surface elevation to the no-rise model, with results to within 0.5 feet.

On March 2, 2021, the day of the site investigation of Beaver Creek, recorded USGS flows were 22 cfs (USGS 2021). This flow was modeled, and results were visually comparable to site conditions, with flows remaining within the main channel mainstem, no floodplain inundation, and some side channels also having flows.

4.2.6 Hydraulic Model Results

Table 6 provides HEC-RAS model results for the channel maximum, left bank, and right bank depths and velocities for the cross sections shown in Figure 23, for the 2-year to the 100-year flow events. Conditional formatting (red as high, green as low) was added to the table to highlight the highest velocities at every cross section. Empty cells indicate the flow did not reach the banks. Appendix A includes figures of inundation extent, depth, velocity, and water surface elevation for the 2-year and 100-year flow events.

There are a number of cross sections where lower flow events produce the highest velocity, such as cross section 1 in Reach 4, with a maximum modeled velocity of 12.3 feet per second (fps), produced during 10-year flow event. The reason this lower flow event produces higher velocities is because all flow is concentrated in the main channel. At these cross sections, for higher flows, banks are overtopped, the floodplain is inundated, and maximum velocities are not as high.

The maximum modeled velocity in Reach 3 is 11.5 fps at cross section 16, just downstream of the confluence with Kelly Creek. Also, just downstream of cross section 16, there is a major side channel on the right bank that, according to the model, becomes activated at approximately the 1.2-year flow (440 cfs). The maximum modeled velocity in Reach 2 is 7.3 fps, just upstream of Kelly Creek. In Reach 1, the maximum modeled velocity is over 10 fps at the concrete weir. These model results will help inform the design and placement of LWD.

Based on Table 2, the estimated minimum velocity required to lift and transport the D50 is 9.2 fps, which is only exceeded at cross sections 1, 6, 16, and 23 for the modeled flows. Pebbles, the D16 grain size, will begin to mobilize at 2 fps, which is exceeded by the 2-year modeled flow at all main channel cross sections. However, it should be noted that the stream is still actively adjusting to the new bridge and culvert openings and, therefore, restoration is more focused on in-stream habitat improvements and less focused on bank stability and scour protection.

Table 6. HEC-RAS Model Depth and Velocity Results Table

Reach	XS		Channel Max							Left Bank						Right Bank						Field Notes
			100-yr	50-yr	25-yr	10-yr	5-yr	2-yr	50% Flow Duration	100-yr	50-yr	25-yr	10-yr	5-yr	2-yr	100-yr	50-yr	25-yr	10-yr	5-yr	2-yr	
4	1	Depth	6.5	5.8	5.2	4.6	4.1	3.4	0.4	0.9	0.2					0.3	0.2					siltstones
		Velocity	11.1	11.8	12.2	12.3	11.9	10.9	2.8	1.5	0.7					4.2	3.3					
	2	Depth	7.8	7.5	7.1	6.5	6.0	4.8	0.4	3.1	2.8	2.4	1.9	1.4	0.5	4.0	3.6	3.2	2.6	2.0	0.8	old channel confluence
		Velocity	5.3	5.8	6.3	6.7	6.9	6.7	2.8	3.3	3.3	3.2	3.0	2.8	2.5	5.0	5.0	5.0	4.7	4.1	1.9	
3	3	Depth	7.1	6.8	6.5	6.2	5.9	5.4	1.2	1.4	1.1	0.9	0.5	0.3		1.3	1.0	0.8	0.4	0.2	0.1	
		Velocity	6.1	6.0	5.9	5.7	5.5	5.2	0.7	2.9	2.5	2.2	1.6	1.0		1.9	1.7	1.5	1.3	1.1	0.6	
	4	Depth	5.9	5.6	5.4	5.0	4.8	4.3	0.7	1.5	1.3	1.0	0.7	0.4		2.3	2.1	1.9	1.6	1.3	0.9	FEMA XS P
		Velocity	8.0	7.8	7.7	7.6	7.6	7.5	2.3	2.2	2.1	1.8	1.4	1.0		2.4	2.2	2.0	1.8	1.7	1.5	
	5	Depth	3.7	3.4	3.2	2.8	2.6	2.2		2.9	2.7	2.4	2.1	1.8	1.4	1.8	1.6	1.3	1.0	0.7	0.3	beaver dam side channel
		Velocity	2.2	2.4	2.2	2.0	1.9	1.6		2.3	2.2	2.1	1.9	1.7	1.4	2.3	2.1	1.9	1.6	1.4	0.9	
	6	Depth	6.1	5.8	5.6	5.3	5.0	4.6	0.9	1.1	0.9	0.7	0.3	0.1		0.1						
		Velocity	9.5	9.1	8.8	8.3	7.9	7.2	1.2	0.8	0.6	0.5	0.3	0.1		0.6						
	7	Depth	6.2	5.9	5.6	5.1	4.8	4.2	0.7	3.7	3.4	3.1	2.7	2.3	1.7	2.4	2.1	1.8	1.3	0.9	0.3	douglas fir rt TOB
		Velocity	7.5	7.4	7.4	7.3	7.4	7.6	2.2	2.6	2.4	2.2	2.0	1.8	1.4	3.4	3.2	3.0	2.6	2.3	1.6	
	8	Depth	6.8	6.5	6.2	5.8	5.5	5.0	0.9	4.5	4.2	3.9	3.5	3.2	2.7	3.9	3.6	3.4	3.0	2.7	2.2	side channel outlet
		Velocity	6.4	6.2	6.0	5.8	5.6	5.3	2.3	3.9	3.7	3.5	3.2	2.9	2.5	2.3	2.2	2.1	2.0	1.9	1.8	
	9	Depth	5.8	5.5	5.3	4.9	4.6	4.1	1.6	1.7	1.5	1.2	0.8	0.5	0.1	2.9	2.6	2.4	2.0	1.7	1.4	wide cobble bar
		Velocity	7.6	7.5	7.2	6.8	6.4	5.5	0.2	0.5	0.4	0.3	0.1	0.1	0.03	1.3	1.1	0.8	0.5	0.3	0.2	
	10	Depth	5.4	5.1	4.8	4.3	3.9	3.3	0.5	3.3	3.0	2.6	2.1	1.7	1.1	2.7	2.4	2.1	1.6	1.2	0.6	side east channel pool
		Velocity	7.2	7.2	7.2	7.1	7.0	6.2	1.5	1.8	1.6	1.4	1.1	0.9	0.7	3.7	3.4	3.1	2.8	2.5	1.9	
	11	Depth	5.8	5.5	5.2	4.7	4.3	3.6	0.5	2.7	2.4	2.0	1.6	1.1	0.4	1.7	1.4	1.1	0.6	0.2		east channel pool
		Velocity	8.1	8.1	8.0	8.0	7.8	7.3	1.7	5.9	5.8	5.5	5.1	4.5	2.3	1.7	1.5	1.3	0.6	0.2		

Reach	XS		Channel Max							Left Bank						Right Bank						Field Notes
			100-yr	50-yr	25-yr	10-yr	5-yr	2-yr	50% Flow Duration	100-yr	50-yr	25-yr	10-yr	5-yr	2-yr	100-yr	50-yr	25-yr	10-yr	5-yr	2-yr	
2	12	Depth	6.0	5.8	5.5	5.2	4.8	4.1	0.6	3.9	3.7	3.4	3.1	2.7	2.0	4.6	4.4	4.1	3.7	3.4	2.7	east channel pool, heavy canopy
		Velocity	3.7	3.6	3.6	3.6	3.9	4.8	2.1	3.6	3.5	3.5	3.5	3.5	3.3	8.6	7.7	6.7	5.1	3.6	1.1	
	13	Depth	5.1	4.8	4.6	4.3	4.0	3.7	0.8	4.2	4.0	3.7	3.4	3.2	2.8	0.8	0.6	0.3	0.02			E-W channel split, existing apex jam; LiDAR does not capture log jam
		Velocity	2.2	2.2	2.2	2.2	2.2	2.3	1.0	2.2	2.2	2.2	2.1	2.1	1.9	1.4	1.0	0.6	0.2			
	14	Depth	5.3	5.2	5.1	4.9	4.8	4.5	1.2	3.1	3.0	2.9	2.7	2.5	2.2	0.7	0.5	0.4	0.3	0.2	0.01	run
		Velocity	8.9	8.8	8.6	8.3	8.1	7.6	1.3	7.3	7.3	7.2	7.0	6.8	6.4	2.1	1.9	1.7	1.4	1.1	0.5	
	15	Depth	6.3	6.1	5.9	5.7	5.5	5.1	1.1	4.5	4.4	4.3	4.1	3.9	3.5	1.2	1.1	1.0	0.7	0.6	0.1	pool, cobble bar, open canopy
		Velocity	7.6	7.3	6.9	6.3	5.9	5.0	1.1	7.0	6.8	6.6	6.2	5.7	4.8	2.3	2.0	1.6	1.1	0.6	0.0	
	16	Depth	6.4	6.2	5.9	5.5	5.1	4.6	0.8	1.4	1.1	0.8	0.4			2.1	1.8	1.5	1.1	0.8	0.4	old main channel
		Velocity	11.5	11.1	10.7	10.1	9.4	8.5	1.4	6.9	6.1	5.1	3.7			4.9	4.7	4.5	4.2	3.9	2.9	
	17	Depth	6.9	6.6	6.2	5.6	5.1	4.4	0.6	3.3	2.9	2.6	2.0	1.5	0.8	1.9	1.6	1.2	0.7	0.2		west dry side channel outlet
		Velocity	7.3	7.1	6.9	6.4	6.0	5.2	1.2	2.4	2.3	2.2	2.2	2.2	1.9	3.7	3.3	2.7	1.9	1.0		
	18	Depth	8.0	7.6	7.2	6.6	6.1	5.4	1.3	3.4	3.0	2.6	2.0	1.5	0.8	4.1	3.7	3.3	2.6	2.2	1.5	meander run
		Velocity	4.6	4.6	4.6	4.6	4.6	4.1	0.4	2.0	1.5	1.0	0.4	0.1	0.1	2.1	2.1	2.1	2.3	2.4	2.0	
	19	Depth	7.8	7.4	7.0	6.4	5.9	5.1	0.8	3.5	3.1	2.7	2.0	1.5	0.8	6.3	5.9	5.5	4.9	4.5	3.7	
		Velocity	4.7	4.8	5.0	5.2	5.1	4.9	1.8	2.4	2.5	2.6	2.5	2.3	1.9	4.2	4.1	4.1	4.2	4.1	3.9	
	20	Depth	8.4	8.0	7.6	7.0	6.5	5.6	1.1	5.7	5.3	4.9	4.3	3.8	3.0	5.6	5.2	4.9	4.3	3.8	2.9	FEMA XS W, deep pool, channel spanning log
		Velocity	3.7	3.9	4.1	4.3	4.2	4.0	0.5	3.6	3.4	2.8	1.1	0.3	0.6	1.3	1.4	1.5	1.7	2.0	2.5	

Reach	XS		Channel Max							Left Bank						Right Bank						Field Notes
			100-yr	50-yr	25-yr	10-yr	5-yr	2-yr	50% Flow Duration	100-yr	50-yr	25-yr	10-yr	5-yr	2-yr	100-yr	50-yr	25-yr	10-yr	5-yr	2-yr	
1	21	Depth	8.0	7.7	7.4	7.0	6.6	5.8	1.2	4.7	4.5	4.1	3.7	3.3	2.5	2.9	2.6	2.3	1.8	1.4	0.7	deep meander
		Velocity	5.0	4.9	4.8	4.6	4.5	4.2	0.8	1.1	1.1	1.0	0.9	0.8	0.6	4.8	4.6	4.5	4.2	3.8	2.9	
	22	Depth	8.2	7.9	7.6	7.1	6.7	6.0	1.5	3.2	2.9	2.6	2.1	1.7	1.1	3.3	3.1	2.7	2.3	1.9	1.2	winter steelhead spawn gravel
		Velocity	5.8	5.5	5.3	5.0	4.8	4.2	0.5	5.5	5.2	4.9	4.6	4.2	3.4	1.6	1.5	1.5	1.4	1.4	1.3	
	23	Depth	6.8	6.5	6.1	5.6	5.3	4.6	0.6													rt top of weir
		Velocity	10.1	9.8	9.4	8.6	7.6	6.5	1.3													
	24	Depth	6.6	6.2	5.7	5.1	4.5	3.6	0.3							2.9	2.5	2.0	1.3	0.8		flag private property upstream
		Velocity	5.9	6.2	6.5	6.8	6.8	6.7	2.4							2.3	2.1	1.9	1.4	1.3		
	25	Depth	7.0	6.7	6.3	5.8	5.3	4.5	0.8	2.4	2.1	1.7	1.2	0.7	0.02	3.4	3.1	2.7	2.2	1.7	0.8	pool downstream of bridge
		Velocity	5.4	5.4	5.4	5.4	5.3	4.9	0.9	0.9	0.8	0.7	0.7	0.7	0.2	2.9	2.9	2.9	2.7	2.6	1.7	
	26	Depth	9.4	9.2	8.9	8.4	7.9	7.2	3.1	2.4	2.2	1.9	1.5	1.0	0.2	4.9	4.6	4.3	3.9	3.4	2.6	FEMA XS rt TOB
		Velocity	5.5	4.9	4.2	3.9	3.6	3.1	0.2	2.7	2.2	1.4	0.6	0.4	0.3	0.5	0.5	0.9	1.7	1.3	0.2	

4.3 Soils

The site consists primarily of two dominant soil types. The Natural Resource Conservation Service maps *Haplumbrepts, very steep soils* along the valley walls and *Wapato silt loam* soil throughout the floodplain terraces along Beaver Creek (NRCS 2021). Both soils are characterized as silt loam soils. *Haplumbrepts* are derived from colluvium parent material and are fairly well drained. Wapato silt loam is characterized as a hydric soil found in floodplains. It is very poorly drained and is derived from recent alluvium. The following is the typical soil profile for Wapato silt loam:

- 0 to 18 inches: silt loam (topsoil)
- 18 to 45 inches: silt loam (subsoil)
- H3 - 45 to 60 inches: very gravelly sandy clay loam (weathered parent material)

A variety of other minor soil components are present within the site, but Wapato silt loam would be the soil series affected by any in-stream restoration work.

4.4 Vegetation Resources

The natural area contains a predominantly native tree canopy and shrub understory. Dominant trees include red alder (*Alnus rubra*), western redcedar (*Thuja plicata*), and Douglas fir (*Pseudotsuga menziesii*). Understory vegetation includes willows (*Salix* spp.) and red-osier dogwood (*Cornus sericea*) in wetlands and along streambanks. The southern portion of the natural area is forested, while the northern end is a mixture of herbaceous and shrub communities associated with a large wetland area located southeast of the Stark Street stream crossing. Vegetation within the wetland is dominated by non-native reed canarygrass and Himalayan blackberry (*Rubus armeniacus*). The blackberry grows along the periphery of the wetland and extends up the valley slopes as a dominant understory species.

Several mature alders along the west side of Beaver Creek below its confluence with Kelly Creek are dying. While this creates ecologically beneficial snags, under planting with more drought-tolerant species would benefit this habitat to maintain shade and habitat complexity.

4.5 Fish Resources

Beaver Creek, within the natural area, provides spawning, rearing, and migration habitat for Endangered Species Act (ESA)-listed fall Chinook salmon, coho salmon, and winter steelhead, as well as various native and non-native fish species (StreamNet 2021; WFC 2011) (Table 7). Despite the water quality issues common in rural and urban streams (e.g., sediment and temperature), Beaver Creek supports a surprising number of fishes compared to other urban streams in the Portland metro area (ODFW 2003). The proximity to the Sandy River may play a role in the diversity of fishes in the stream. Anadromous fish may be found throughout the study area, including the lower 660 feet of Kelly Creek up to the MHCC reservoir (which blocks fish passage). Short life history summaries of the target fish species are provided below. Additional information on specific habitat requirements for these species is provided in Appendix B.

Table 7. ESA-Listed and Sensitive Fish Species in the Study Area

Fish Species	DPS/ESU[1]	ESA Listing Status[2]		CH/EFH in Study Area?[3]	Habitat Use Type[4]
		Federal	State		
Fall Chinook salmon *(Oncorhynchus tshawytscha)*	Lower Columbia River ESU	T	SC	CH/EFH	S/R/M
Coho salmon *(Oncorhynchus kisutch)*	Lower Columbia River ESU	T	E	CH/EFH	S/R/M
Winter steelhead (*Oncorhynchus mykiss*)	Lower Columbia River DPS	T	SC	CH	S/R/M
Coastal cutthroat trout *(Oncorhynchus clarkii clarkii)*	NA	SOC	S	NA	U
Pacific lamprey (*Entosphenus tridentatus*)	NA	SOC	S	NA	YR

Notes:
[1] DPS= Distinct Population Segment; ESU= Evolutionarily Significant Unit
[2] E= Endangered; T = Threatened; S= Sensitive; SC= Sensitive-Critical; SOC = Species of Concern
[3] EFH= Essential Fish Habitat; CH= Critical Habitat
[4] S = Spawning, R = Rearing, M = Migration, U = Unknown, YR = Year-round
Sources: ORBIC 2019; StreamNet 2021; WFC 2011

4.5.1 Chinook Salmon (*Oncorhynchus tshawytscha*)

Chinook salmon in Beaver Creek consist of fall-run fish from the ESA-listed Lower Columbia River Evolutionarily Significant Unit (ESU). Adults migrate upstream in the fall to spawn in large, main channels. Because they require deeper depths for spawning than other salmonids, they do not penetrate as far upstream to spawn as coho and steelhead. As such, Chinook spawning is generally limited to Beaver Creek up to the Kelly Creek confluence (StreamNet 2021; ODFW and MHCC 2021). Low flows in Beaver Creek above the confluence and the high gradient in Kelly Creek likely preclude spawning for Chinook (Cramer et al. 2012; StreamNet 2021). Upon emergence of juveniles in early spring, fry tend to migrate downstream to rear in the Sandy and Columbia Rivers where they reach smolt size (≥ 80 millimeters) and emigrate to sea during mid-May to mid-June in their first year of life. No juvenile Chinook would be expected to remain in Beaver Creek after mid-June. No juvenile Chinook were captured during the 2010 Beaver Creek fish survey (Table 8).

Table 8. 2011-2020 Salmon Spawning Survey Results within the South Beaver Creek Natural Area

Year	Reach								
	Beaver Cr. (Troutdale Rd. to Kelly Cr.)			Beaver Cr. (Kelly Cr. to Cochran Rd.)			Kelly Cr.		
	Fish Species/Counts[1,2]								
	Fall CHK	CO	Redds	Fall CHK	CO	Redds	Fall CHK	CO	Redds
2011	0	1	-	0	0	-	-	-	-
2012	7	10	-	0	1	-	-	-	-

Year	Reach								
	Beaver Cr. (Troutdale Rd. to Kelly Cr.)			Beaver Cr. (Kelly Cr. to Cochran Rd.)			Kelly Cr.		
	Fish Species/Counts[1,2]								
	Fall CHK	CO	Redds	Fall CHK	CO	Redds	Fall CHK	CO	Redds
2013	0	2	-	0	0	-	-	-	-
2014	0	1	-	0	0	-	-	-	-
2015	6	12	-	1	0	-	-	-	-
2016	0	2	-	0	0	-	-	-	-
2017	5[3]	2	12	0	0	0	0	0	0
2018[4]	4	7	8	0	0	0	0	0	0
2019	0	4	2	0	1	0	0	0	0
2020	17	2	25	0	3	3	0	0	0

Notes: (-) = Not surveyed; CHK= Chinook; CO= coho

[1]Fish counts include combined live/dead fish and redds during surveys performed by MHCC and ODFW.

[2]Surveys generally performed from October through December, although surveys could not be conducted during periods of inclement weather and high stream flows.

[3]First fall Chinook observed upstream of Stark Street since surveys began in 2011.

[4]One pre-spawn winter steelhead was observed during a spawning survey performed on January 2, 2019.

Source: ODFW and MHCC 2021 unpublished Beaver Creek spawning survey results (2011-2020)

Fall Chinook were never historically abundant in Beaver Creek due to low flows during fall spawning and high spring temperatures, which require juveniles to reach smolting size by late May (Cramer et al. 2012). Despite these factors, Beaver Creek has been able to consistently support a fall Chinook population in recent years. Fall spawning surveys have been conducted within the study area by MHCC and the Oregon Department of Fish and Wildlife (ODFW) over the past 10 years (2011-2020) (Table 8). All Chinook salmon spawners were found in Beaver Creek between Troutdale Road and the Kelly Creek confluence. No spawners were found in Kelly Creek. Stream water withdrawals and climate change will continue to exert pressure on adult Chinook salmon, as they are highly dependent on adequate fall flow conditions.

4.5.2 Coho Salmon (*Oncorhynchus kisutch*)

Coho salmon in Beaver Creek are part of the ESA-listed Lower Columbia River ESU. Adults may spawn in both main and side channels during the fall where water depths are sufficient. Juveniles may rear in Beaver Creek or downstream waterbodies for a full year before outmigrating to the ocean during the following spring. Juveniles tend to rear in perennial sections of Beaver Creek, Sandy River, or Columbia River (usually pools) that provide cool water temperatures and suitable cover/complexity. Coho have a strong tendency to seek off-channel and protected habitats during winter; the area required for winter habitat is often the factor limiting their carrying capacity (Nickelson 1998). Juveniles redistribute in fall to find suitable refuge habitat for overwintering such as low velocity pools, alcoves, off-channel areas, beaver ponds, or upstream tributaries.

Coho adults may spawn in main and side channels of Beaver Creek and lower Kelly Creek, as well as farther upstream reaches (Apalategui 2014; ODFW and MHCC 2021; StreamNet 2021).

Most coho spawners in the study area were observed in Beaver Creek from Troutdale Road upstream to the Kelly Creek confluence (Table 8). Only two spawners were found between Kelly Creek and Cochran Road. It was not surprising that few spawners were found upstream of Kelly Creek because the reach up to the weir does not provide good cobbles/gravels for spawning. More suitable spawning habitat is present between the weir and Cochran Road. No coho spawners have been recently observed in Kelly Creek (Table 8).

4.5.3 Winter Steelhead (*Oncorhynchus mykiss*)

Winter steelhead in Beaver Creek are part of the ESA-listed Lower Columbia River Distinct Population Segment. Adults spawn in main and side channels in late winter and early spring. Juveniles emerge in late spring to early summer and typically rear in freshwater for one or two summers before outmigrating in the spring. Unlike coho, steelhead do not seek off-channel habitat for winter. They tend to prefer interstices of gravel/cobble substrates with cover for rearing. Therefore, summer rearing habitat usually determines the carrying capacity for steelhead, in contrast to the usual winter habitat limitation for coho (Cramer et al. 2012). Many likely move out of Beaver Creek and into the Sandy River by early summer due to warm temperatures, low flows, and lack of cover/complexity.

Adult steelhead may spawn throughout the study area, including in main and side channels of Beaver Creek and lower Kelly Creek, as well as farther upstream reaches of Beaver Creek (StreamNet 2021; ODFW and MHCC 2021). Steelhead spawning surveys are typically not conducted due to winter high-flow conditions. An adult winter steelhead was observed in Beaver Creek, just downstream from the weir, during the site visit on March 2, 2021.

4.5.4 Pacific Lamprey (*Entosphenus tridentatus*)

Pacific lamprey is an eel-like, anadromous fish and Federal Species of Concern (USFWS 2021a). They spawn in gravel substrates in similar areas as winter steelhead. Spawning generally occurs between March and July. After the embryos hatch, the juvenile ammocoetes drift downstream to areas of low velocity and fine substrates where they burrow, grow, and live as filter feeders for 3 to 7 years. They emigrate to the ocean between late fall and spring, where they mature into adults. No Pacific lamprey were captured during the 2010 stream survey. However, because western brook lamprey (*Lampetra richardsonii*) were captured, and numerous ammocoetes were observed during recent fish salvage projects during Beaver Creek fish passage projects, it is likely that they will become more abundant in Beaver Creek as a result of recent passage improvements, availability of suitable habitat, and ongoing habitat enhancement efforts.

4.5.5 Coastal Cutthroat Trout (*Oncorhynchus clarkii clarkii*)

Coastal cutthroat trout is a Federal Species of Concern that has a complex life history. Three general life-history forms of coastal cutthroat trout have been recognized: non-migratory, freshwater-migratory, and saltwater-migratory (anadromous) (USFWS 2021b). Coastal cutthroat trout spend more time in freshwater than most other anadromous salmonids. They prefer deeper pool habitat and cover, such as that formed by woody debris. Cutthroat trout were not documented during 2010 Beaver Creek fish surveys (as described below), but an adult cutthroat was captured in 2019 at the Cochran Road crossing as part of the bridge installation project (Carson 2019). Cutthroat trout typically use smaller headwater streams for spawning and

rearing than other salmonids (Trotter 1989) and typically fare better than other salmonids in urbanized and degraded habitat (Scott et al. 1986). Because an abundant source population is located in the nearby Sandy River, it is likely that recent fish passage improvements and other habitat enhancements will help restore cutthroat trout to the Beaver Creek watershed.

4.5.6 Site-Specific Fish Surveys

Several fish presence and abundance studies have been conducted within the study area and Beaver Creek watershed over the past 10 years. Available information reviewed includes the Wild Fish Conservancy 2011 fish assemblage study, fish salvage during recent fish passage improvement projects, seasonal spawning surveys conducted by the ODFW and MHCC, and outmigrant smolt trapping operated near the mouth of Beaver Creek by the City of Portland.

In 2010-2011, fish surveys were conducted in four separate reaches of Beaver Creek downstream of Division Street and in select locations farther upstream to evaluate potential benefits from future habitat restoration (Appendix C; WFC 2011). The study documented 12 native and 4 non-native fish species. One of the survey reaches ranged from Troutdale to Cochran Road, which encompasses the study area. Within this reach, reticulate sculpin (39%) and speckled dace (27%) were the most abundant species captured, followed by western mosquitofish (23%), coho salmon (4%), and rainbow trout/steelhead (4%) (WFC 2011).

Surveys were primarily conducted during late summer flow conditions with limited surveys performed in headwater tributaries during higher flow periods. The relative lack of salmonids observed in the spring compared to the fall may be due to a lack of suitable high-flow refuge habitats for salmonids to survive high winter flows—a condition that occurs frequently in streams with drastically simplified physical habitat and cover (WFC 2011). Juvenile coho were found up to the Division Street crossing, which is the upper limit of perennial flow. Some juvenile steelhead/rainbow trout were found farther upstream in headwater tributaries. The study concluded that despite intact riparian corridors and beaver dams that provide good rearing habitat, salmon and trout populations are likely reduced relative to their historic abundance. Continued habitat restoration efforts, including improved fish passage and efforts to address degraded water quality and hydrology would likely enhance these populations.

Fish salvage efforts performed during culvert replacement projects at Stark Street (2017) and Cochran Road (2019) also detected several different native and non-native fish species (Appendix C). During construction of the Stark Street culvert, biologists removed over 120 juvenile coho and steelhead, as well as 150 speckled dace, 240 sculpin, and 5 lamprey ammocoetes within the 200-foot reach (Appendix C) (Iwai 2018).

At the Cochran Road site, biologists found a large abundance of non-native, invasive green sunfish (361), compared to only 15 juvenile coho, 3 juvenile rainbow, and 27 lamprey ammocoetes (Appendix C) (Carson 2019). It is possible that these fish were illegally introduced in the upper tributaries of Beaver Creek for mosquito control. Green sunfish compete for habitat and food with juvenile salmonids and thrive in warm stream temperatures. Habitat restoration efforts (riparian plantings and installation of large wood material) that provide shading will help juvenile salmonids compete with non-native fishes like green sunfish.

The Portland Water Bureau has monitored steelhead and coho smolt production in Beaver Creek and throughout the Sandy River Basin since 2009 to guide restoration efforts (PWB

2020). Beaver Creek produces on average 4 percent (and up to 9%) of the juvenile coho among the major tributaries of the Sandy River, and 3 percent of the juvenile steelhead. The stream produces as many fish per stream mile as pristine forested tributaries in the basin. Juvenile coho in Beaver Creek grow to larger sizes than coho in upper tributaries of the Sandy River, which may be due to a more abundant prey base in the lower watershed. Smolt populations vary within basin waterways on a yearly basis. In 2019, low abundances of steelhead were estimated in Beaver Creek compared to previous years (Figure 24). The majority of Beaver Creek coho smolts tend to emigrate from the creek over a very short period of time (few days) in early May (range from March to May), whereas steelhead tend to emigrate slightly earlier. Some coho smolts originating in other Sandy River tributaries have been found to migrate into upstream reaches of Beaver Creek. This phenomenon may also be occurring for steelhead, as evidenced by the multiple smolt size classes observed in the stream (Bohling 2019).

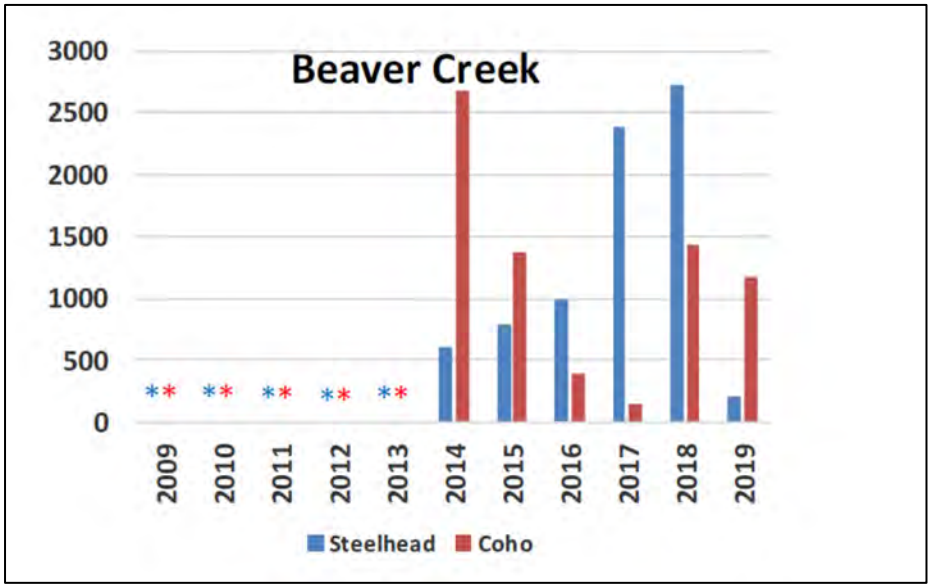

Figure 24. Steelhead and coho smolt population estimates for Beaver Creek (2014-2019)
Source: PWB 2020

4.6 Wildlife Resources

Beaver Creek also supports a diversity of wildlife species, including a still-thriving population of American beaver (*Castor canadensis*). Beaver and avian surveys were conducted in the study reach in spring 2018 (McDonald et al. 2018). Three beaver sites, including a den and dam, were noted in Beaver Creek between Stark Street and the Kelly Creek confluence. During the March 2021 site visit, a former beaver dam was noted in a side channel, and signs of beaver activity (chewed vegetation) were observed throughout this reach. Upstream of the Kelly Creek confluence, an active lateral beaver site and dam were observed during both the 2018 and 2021 surveys near the eroded bank site. Other wildlife that have been recently observed in the watershed include coyote, deer, raccoon, bald eagle, great horned owl, peregrine falcon, and various other bird species (McDonald et al. 2018).

4.7 Habitat Quantity and Quality

Beaver Creek supports habitat for four important salmonid life stages: (1) spawning, (2) spring rearing for outmigrating smolts, (3) summer rearing, and (4) overwintering refuge. A previous study found that the project reach (Stark to Cochran) has the highest suitable area for salmon and steelhead spawning in the watershed and reaches farther upstream also have suitable spawning gravels (Cramer et al. 2012). Recent fish passage improvement projects at Stark Street (2017), Troutdale Road (2018), and Cochran Road (2019) have improved access to about 6 miles of salmon habitat. The new Stark Street culvert and Cochran Road Bridge also allow large wood to pass through, which is an improvement over the old culverts. The Cochran Road Bridge project also created a new stream channel, improved substrate conditions, and installed stormwater swales to remove pollutant loading.

Beaver Creek flow and temperature regimes provide different seasonal use opportunities for salmonids. High temperatures exceeding 18°C (64°F) and low flows near 1 cfs severely restrict salmonid use during summer. The flow and temperature range are suitable for spawning and rearing during late fall through spring in most years but can limit access of anadromous spawners in years of low flow (Cramer et al. 2012). However, juvenile coho salmon may rear in year-round pools in upper area of Beaver Creek where the stream appears dry.

4.7.1 Physical Habitat

The study reach contains riffle-run-pool morphological features that provide quality spawning and rearing habitat for salmonids. With exception of the 500-foot-long stream section upstream of Stark Street, the reach transects an intact forested riparian zone. The reach between Stark Street and Kelly Creek confluence provides the best spawning and rearing habitat due to the high percentage of gravel/cobble substrates and riparian shading. Spawning and rearing habitat is more limited upstream of the Kelly Creek confluence due to the lack of suitable substrate and more channelized pool-dominant morphology.

In 2012, Cramer Fish Sciences estimated potential gains in production of salmon and steelhead that could result from aquatic habitat restoration actions in Beaver Creek (Cramer et al. 2012). The study surveyed habitat features throughout all watershed reaches accessible to anadromous salmonids (from Beaver Creek mouth to 302nd Avenue). Juvenile salmonids strongly avoid depths under 15 centimeters (cm) and show preference for increasing depth up to 100 cm. Although the study reach supports several pools with suitable depth (> 15 cm), deeper pools are more prevalent in the upper portion of the reach (above Kelly Creek). Most riffles are too shallow (< 15 cm) to support rearing salmonids during the low-flow season, although they could be used as habitat by invertebrate prey species.

Cover complexity in most pools (> 60%) was lacking, with only 5 to 10 percent of pools scoring the highest complexity rating in most reaches. At the time of the study, beaver ponds composed a significant portion of the stream reach. Stream temperatures regularly exceeded optimum levels for salmonids, particularly during the summer months (June-September). The study did find that the percentage of fine-grained sediments were low and not adversely impacting egg survival or rearing capacity.

The flow regime is most suited for salmon stocks adapted to upstream migration and spawning after mid-November. Flows in October average under 5 cfs at the stream mouth in over

70 percent of years and can remain that low through November in 20 percent of years. By December, flows are typically sufficient for adult access. The creek supports spring spawning for steelhead, but fry emerge in late spring just as flow and temperature become highly restrictive. As such, opportunities for year-round life histories are substantially limited due to harsh conditions for salmonids during summer (Cramer et al. 2012).

With improved fish passage at Stark Street (which has since been addressed with a new culvert), the model predicted that up to 148 Chinook, 240 coho, and 146 steelhead could be produced (Cramer et al. 2012). Chinook are particularly susceptible to inadequate flows during drought years. These spawner numbers are likely similar to historical abundances in the 1950s, before passage impediments were constructed. Chinook spawning capacity was split between 49 percent in lower Beaver Creek) and 51 percent between Stark and Division Streets. For coho and steelhead, only 24 percent of spawning capacity was below the Troutdale Road crossing and 75 percent was between Stark and Division Streets.

Maximum densities of juvenile salmonids are correlated with availability of preferred habitat features including velocity, depth, cover, and substrate. A study by Johnson et al. (1993) found that juvenile salmonid density in pools may increase up to three-fold as woody debris complexity increases from none to high complexity. Capacity for rearing of juveniles (parr) was greatest in the lower reaches and relatively low in all other reaches for both Chinook and steelhead. This was due to high summer water temperatures and shallow depths in riffles, which provided almost no rearing capacity (Cramer et al. 2012). Increased cover and water depths can improve summer rearing conditions in the study reach for these species.

It was notable that only 36 percent of adult salmon and steelhead production resulted from juveniles that reared exclusively within Beaver Creek, so production was substantially dependent on fish that left the system to rear in the Sandy and Columbia Rivers. In Beaver Creek, 82 percent of adult steelhead, 27 percent of coho, and 24 percent of Chinook were estimated to be produced by juveniles that finished rearing outside the watershed. High temperatures and low cover complexity resulted in a significant percent of rearing capacity lost in each reach compared to optimal conditions. These study results suggest that the addition of LWD and riparian plantings within the study reach would provide cover and lower water temperatures, thus resulting in increased rearing capacity for juvenile salmonids.

4.7.2 Water Quality

Beaver Creek is a low-elevation watershed that encompasses urban and rural areas, has a long history of agricultural land use, and faces pressure from continued development (WFC 2011). Factors that affect stream water quality are documented in the Total Maximum Daily Load (TMDL) for the Sandy River (ODEQ 2005), as well as through on-going monitoring from the Multnomah County Stormwater Program (Multnomah County 2020). These include the following:

- Exceedances of temperature and E. coli bacteria standards
- Stormwater runoff from both agricultural and urban areas
- Sedimentation
- Reduced summer low flows
- Erosion

- Flooding

Additional detrimental ecological impacts include:

- Presence of introduced fish and vegetation species
- Simplified in-stream physical habitat
- Removal of riparian vegetation

Two sites in Beaver Creek are monitored by the county: one site at the boundary of the urban and agricultural land uses and one near the mouth of the stream, where the stream joins the Sandy River. In-stream monitoring results are generally within expected ranges, with exceedances in temperature and E. coli. Macroinvertebrate scores are generally low, which is consistent with previous sampling results (Multnomah County 2020).

The City of Gresham has monitored water quality in lower Kelly Creek for over a decade. In general, water quality is pretty typical for a forested urban stream with some road runoff inputs (City of Gresham 2021). Although there are some concerning trends (increases in zinc and orthophosphorus (which can exacerbate algal growth)), many encouraging trends were noted involving dissolved oxygen and biological oxygen demand, dissolved metals, E. coli, nitrogen, total suspended solids, and turbidity (City of Gresham 2021).

Temperature

Salmon and trout are consistently found at highest densities where stream temperatures in summer are near their physiological optimum of 12 to 16°C (Huff et al. 2005; Ott and Marret 2003; Waite and Carpenter 2000). These studies have shown that salmonids still persisted, but at lower densities, in stream reaches with temperatures above this range. Higher stream temperatures increase metabolic demands of salmonids which require them to seek out higher velocity areas to consume more prey (Cramer et al. 2012). This increases competition with species adapted to warmer water, such as redside shiners and green sunfish, for food resources.

The Sandy River Basin temperature TMDL adheres to the temperature standards approved by the US Environmental Protection Agency in 2004 and 2010 (ODEQ 2005; Oregon Administrative Rule [OAR] 340-041-0028). The temperature standard for the Beaver Creek watershed was established to protect cold-water species such as anadromous salmonids. Although Beaver Creek provides important spawning habitat for salmon and steelhead, the Oregon Department of Environmental Quality has applied the rearing and migration temperature criterion for the watershed (7-day-average-maximum temperature of 18.0 degrees ˚C [64.4 ˚F]); OAR 340-041-0028).

The City of Gresham has collected water temperature data in the Beaver Creek watershed for over a decade (Table 9; Figure 25). Some notable temperature data findings are summarized below:

- In 2018, summer water temperatures in Beaver Creek, upstream of the Kelly Creek confluence, were found to be lower than temperatures downstream of the confluence. Kelly Creek apparently contributes a source of warmer water from the impounded dam.

Water temperatures are likely to cool through the shaded reach before entering the more open lower reach above the Stark Street culvert.

- In 2018, summer water temperatures were measured upstream and downstream of a beaver dam in mainstem Beaver Creek. Water temperatures were found to be higher in the pool above the dam than below it. Because beaver dams are a natural part of the ecosystem and provide good habitat for salmonids, this is likely due to a lack of riparian cover in this reach, rather than effects from solar radiation on the impounded stream.

Table 9. Summary of Water Temperature Data Collected in South Beaver Creek Natural Area from May to October 2016-2020

Stream	Location	Water Temperature				Days Exceeding Standard	
		Date Range	Mean	Min	Max	Total	Average/Yr
Beaver Creek	Upstream of Kelly Creek	May to October 2016-2020	65.7°F (18.7°C)	55.4°F (13.0°C)	76.5°F (24.7°C)	459	92
		Mid-summer (July-August) 2016-2020	69.8°F (21.0°C)	63.1°F (17.3°C)	76.5°F (24.7°C)	302	60
	Downstream of Kelly Creek	May to October 2016-2020	66.9°F (19.4°C)	55.8°F (13.2°C)	80.4°F (26.9°C)	508	102
		Mid-summer (July-August) 2016-2020	71.4°F (21.9°C)	64.0°F (17.8°C)	80.4°F (26.9°C)	306	61
	Upstream of former beaver dam	August to October 2018	67.8°F (19.9°C)	57.6°F (14.2°C)	77.5°F (25.3°C)	50	NA
	Downstream of former beaver dam		65.7°F (18.7°C)	57.6°F (14.2°C)	73.9°F (23.3°C)	40	NA

Note: All temperatures expressed as MWAT (mean weekly average temperature).

Source: City of Gresham 2021 unpublished temperature data (2008-2020)

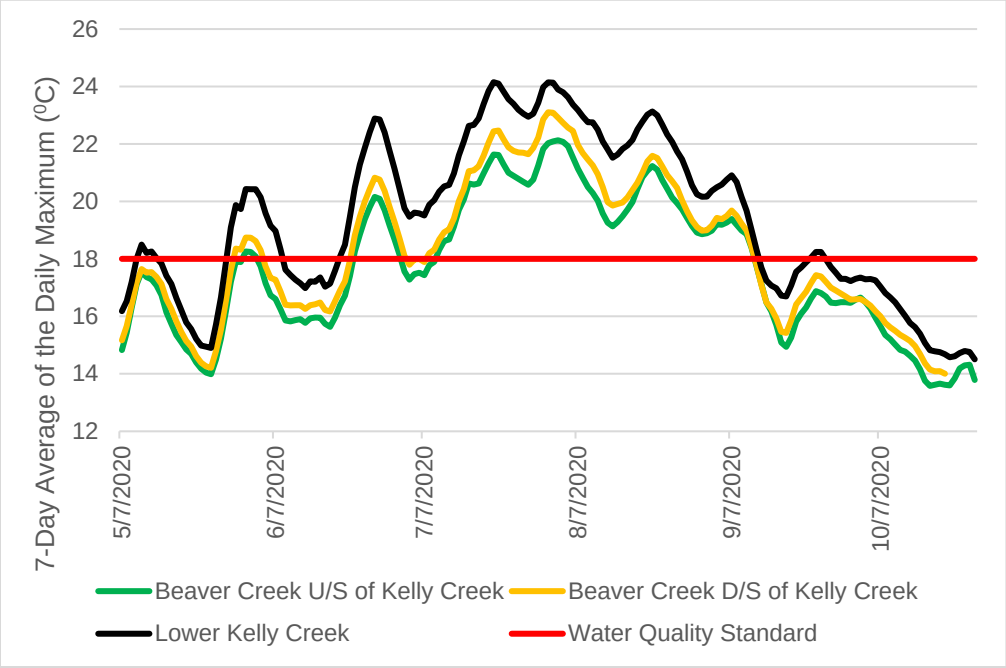

Figure 25. 2020 Water temperatures in project reach

Biotic Integrity

The WFC 2011 study also evaluated Fish Index of Biotic Integrity (FIBI) for Beaver Creek stream reaches. FIBI is a measure of ecological integrity that is based on fish species occurrence and abundance. FIBI considers several metrics, including taxonomic richness, percentage of native vs. non-native species, and abundance of pollution tolerant species. The results suggest that Beaver Creek is experiencing moderate to severe environmental impairment similar to other Portland area streams. The FIBI score in the South Beaver Creek Natural Area project reach had the lowest score of any the surveyed reaches (47; severely impaired). The low scores are not surprising considering the presence of fish barriers (at the time of the study), invasive species, high water temperatures, low flows, water quality issues, and physical habitat constraints in the watershed. Restoration efforts to improve habitat conditions in the watershed are likely to improve future FIBI scores.

Over the past decade, the City of Gresham has collected macroinvertebrate data in the Beaver Creek watershed and evaluated Benthic Index of Biotic Integrity (B-IBI) scores for various streams (City of Gresham 2021). The B-IBI scoring system is a quantitative method for determining and comparing the biological condition of streams. As shown in Figure 26, B-IBI scores for various sites in the study reach are showing encouraging upward trends, although there is some annual variability. Increased LWD in the system is expected to increase macroinvertebrate richness and diversity by providing habitat complexity and improving substrate for invertebrates, which will result in increased food resources for juvenile salmonids.

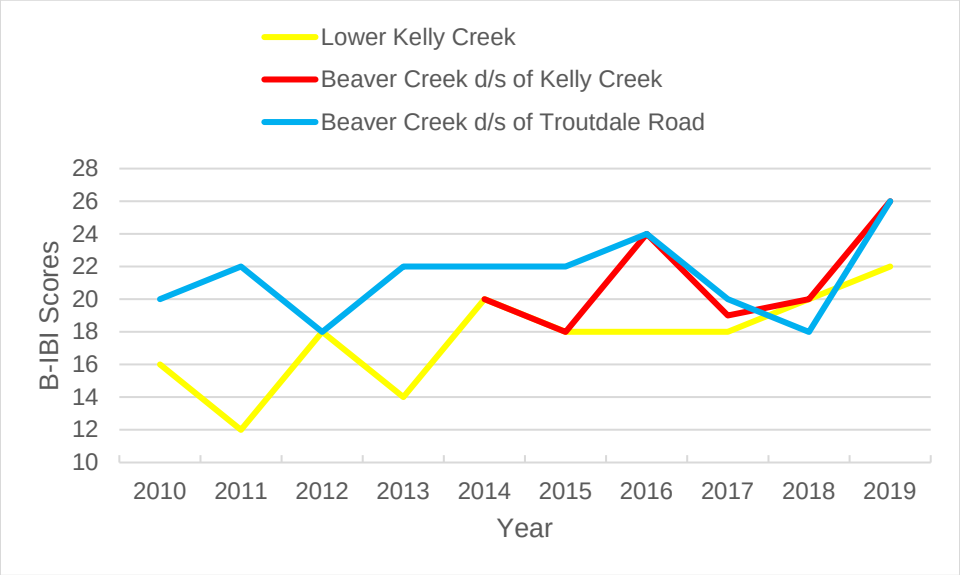

Figure 26. Summary of B-IBI trends in the Beaver Creek watershed
Source: City of Gresham 2021

4.8 Construction Access & Staging

Construction access is possible from both the north (Stark) and south (Cochran) extents of the natural area. However, moving heavy machinery into the area would result in temporary impacts to existing riparian communities and stream habitat immediately after leaving the road embankments. An existing gravel road starting at the south end of the MHCC parking lot offers access to Kelley Creek and passes near the Kelley Creek/Beaver Creek confluence. This road offers construction access to this small area of the project.

In discussions with Metro project staff, the concept of delivering and placing LWD by helicopter has been promoted as a means of completing in-stream habitat enhancement without the need for construction access and associated habitat disturbance. Staging area for woody debris material and an optional helicopter landing site is likely available on MHCC property that contains a disturbed terrace area located east of the Metro property and north of Cochran Road. This site has a secured gravel access driveway entering from Cochran Road.

5. Preliminary Restoration Concept

Metro seeks a restoration approach that allows for judicious public investment in restoration efforts that is commensurate with expected salmonid benefits and regional priorities for salmonid recovery. Because Beaver Creek is a highly productive salmonid system but has impaired rearing habitat relative to other anchor stream and river habitats within the Salmon River basin (per Sandy River Basin Working Group 2007), AECOM has been tasked with assessing restoration actions that limit habitat disturbance and construction costs while meeting key restoration objectives.

Based on the existing conditions and a desire to provide a cost-effective restoration strategy, this restoration plan focuses on LWD placement, removal of an existing weir constriction, and

stormwater outfall energy dissipation. Further, this plan recommends the installation of simple LWD structures that are self-anchoring and that can be placed by helicopter. Helicopter placement has been used recently by Metro, in collaboration with the Portland Water Bureau, to install large wood structures near Oxbow Park. Helicopter placement allows for rapid project completion, minimal habitat disturbance, a small construction crew, and accurate material placement. It is expected that this means of woody debris placement will provide cost-efficient stream habitat benefits for salmon.

While Kelly Creek was evaluated for this report, it was determined that it may be too steep (2-4% gradient) for LWD placement because substrate is relatively large and cannot be easily mobilized to create pools. Prior studies (Cramer et al. 2012) have suggested that LWD placement and gravel enhancement could improve spawning in Kelly Creek and could provide public viewing opportunities. However, this would largely benefit only winter steelhead spawning, thus less overall benefit for the effort. Given the existing dam at the upstream end of the Kelley Creek reach, the benefits do not currently warrant the investment in Kelly Creek enhancements. Therefore, this report focuses on Beaver Creek enhancements for better return on investment.

For this preliminary draft of the Existing Conditions Report, key restoration targets are provided, first by concept, then by stream reach. These concepts will be further refined into a plan set with details that will be provided as an addendum to this report.

5.1 Large Woody Debris Placement

Increased LWD frequency is expected to provide a variety of habitat benefits for adult and juvenile salmonids that directly address limiting factors identified in Section 2 of this report. Large wood provides significant benefits to stream function by improving cover and complexity. Large wood diverts water flow, changes water velocity to trap sediment or create pools, provides cover for juvenile fish, provides habitat for fish prey species, and increases floodplain connectivity and hyporheic flow. When placed correctly, it can provide cover and flow refugia for salmonids during a wide range of flow conditions throughout the year.

Large wood could be used to increase the density of pools, which can subsequently increase redd densities through the addition of pool tail-outs. Research suggests that up to 30x more redds are found in forced pool-riffle channels than plane bed channels (Montgomery et al. 1999). LWD can also create pools that can be used by adults holding in the system until flow conditions are suitable for migration to upstream spawning habitats.

LWD structures can also be placed upstream of pools to block solar radiation, particularly from southern and western exposures (where the sun is hottest). As noted elsewhere in this document, LWD is not recommended within the lowest 500 feet upstream of the Stark Street culvert due to the current channel migrating conditions and the proximity to major roadway infrastructure.

It would also be beneficial to the stream and riparian environment if wood is placed in the floodplain terraces above the streambanks. This addition of wood can improve the habitat of multiple fish and wildlife species, provide refuge habitat during extreme high flows, provide future wood recruitment, and reduce the chances of avulsion or sudden channel shifts following wood falling, or placement, in the stream.

To avoid damage to stream conditions or downstream infrastructure, wood placement should be avoided near high, actively eroding stream banks, where placement would aggravate the erosion. Also, in general, channel-spanning structures would be avoided, as they can create fish passage obstructions and higher risk to downstream infrastructure.

5.2 Reduce Constrictions

The existing concrete weir located between Reaches 1 and 2 should be removed to eliminate a constriction that is altering natural stream function and dynamics. If possible, the weir should be broken into large pieces using a portable jack hammer or roto hammer that can be carted into the site with minimal disturbance. Concrete breakup should occur during the lowest flow conditions during the in-water work window. If possible, the larger pieces of concrete may be air-lifted out by helicopter. Once removed, a supersack of alluvial gravel can be airlifted to the former weir site and dropped in the recess created by weir removal. Gravel placement, in general, is warranted in Reach 2, and this would provide a source for spawning gravels within the reach. Once the concrete side walls of the weir are removed, the dirt behind the concrete will become prone to erosion. Bank layback can reduce erosion via hand digging; however, it is likely that the stream will re-shape the area once some of the concrete weir is removed. Once removed, it is likely that the stream will erode the banks of the narrow construction and reduce the size of the large scour pool downstream, which will facilitate a more natural system.

5.3 Stormwater Outfall Stabilization

The steep stormwater outfall channel along the left bank of Beaver Creek should be stabilized with a combination of plantings and large rock. This is not a Water of the US/State of Oregon; no permits should be required for the placement of energy dissipation rock so long as that rock is placed above the ordinary high water mark for the Sandy River. Details for a simple energy dissipation structure will be provided with the restoration plan set.

5.4 Collaborate with Metro Vegetation Enhancement

Planting riparian trees and shrubs is an important part of the restoration strategy. Plantings will provide added shade, habitat complexity, woody debris recruitment, bank stability, nutrient uptake, organic matter, and benthic invertebrate production. This work is being done under separate contract with Metro and, therefore, not detailed in this plan. However, coordination with the riparian enhancement team will benefit the overall success of the project, as there will be optimal locations for large tree planting (especially in Reach 1 but throughout the entire project reach) that, in combination with LWD placement, will shade pools and optimize stream enhancements.

5.5 Employ Adaptive Management

If, after placing LWD structures, the number of pools and habitat conditions are not developing as intended, or if salmon returns show no increase, Metro may consider the following techniques for additional habitat enhancement:

Beaver Dam Analogs

Adding Beaver Dam Analogs can help channel-forming processes, attract beneficial native beaver, and, in some areas, provide beneficial grade control. The Beaver Dam Analogs are intended to mimic and promote beaver dam activity. Naturally occurring beaver dams were historically present in reach above the Stark Street culvert, and activity is still present in side channels and backwater areas. Beaver dams are an effective and low-tech approach to restore stream channels. They raise the water table, decrease high-flow velocities, provide grade control and sediment accumulation, activate side channels, spread out flows, decrease water temperatures downstream (through release of stratified flows), increase floodplain connectivity, facilitate more riparian vegetation, and support summer base flow support (Bouwes et al. 2016).

Flow Restoration

Water diversion records from Oregon Water Resources Department indicate that water diversion in summer removes at least half of what little flow exists in Beaver Creek during base flows. Purchase or conservation agreements to keep some of this water in-stream during July–September could reduce stream temperatures and improve stream area and depths during this critical season.

Water becomes nearly stagnant in reaches upstream of Cochran Road down to the confluence with Kelly Creek during summer, and temperature records show that water averages about 2°C higher (perhaps more during hot spells) in these reaches than downstream at Kiku Park (Cramer et al. 2012). High stream temperatures were estimated to result in an approximately 60 percent loss of rearing potential in the project reach (Cramer et al. 2012). The magnitude of fish benefits achieved would depend on the location and magnitude of flows that could be restored. Riparian plantings and LWD placement, coupled with flow restoration, will all contribute to reduced water temperatures in the project reach, which will benefit native fish species.

5.6 Design for Climate Change

Climate change will result in warmer water temperatures, flashier flows during winter, and lower flows during spring and summer (EPA 2016). This scenario is especially problematic for Chinook. Although Chinook were not historically abundant in Beaver Creek, there is a small population currently spawning in the project reach. Reduced fall flows will have a more significant effect on them because they spawn earlier in the fall and need deeper water to migrate and spawn than other salmonids. Cover from large wood will help to reduce water temperatures for rearing juvenile Chinook (and other salmonids) but will not increase flows to help spawners. Chinook may be able to adapt by migrating later in the year (Battin et al. 2007), but it would be prudent to investigate the potential for flow augmentation to help offset reduced flows from climate change.

5.7 Reach-Specific Recommendations

Table 10 presents preliminary reach-specific restoration concept recommendations. These concepts will be developed into a plan set with details for discussion with Metro and the stakeholders.

Table 10. Reach-Specific Recommendations

Reach	Recommendations
1	With the stream currently correcting itself due to the culvert replacement, there are a few restoration opportunities in the reach. Streambank erosion is common in this reach because the channel is in the process of stabilization. Channel complexity will continue to improve over time. Woody material can be placed along the banks, using the remaining large boulders as "bracing points." Previous conceptual restoration design plans (Herrera 2014) included very limited large woody debris placement in this reach. This may have been due to stakeholder concerns of wood and debris transport; however, conditions have changed since the upstream and downstream culvert constrictions have replaced with enhanced openings. Dense tree canopy likely limits placement of woody material in the remaining sections of the reach. The placement of smaller "mobile" wood material could create a blockage at the concrete weir, which could create unknown channel corrections if the weir is not removed. Removal of the weir is recommended to remedy this concern.
2	It is recommended that the concrete weir at the upstream extent of Reach 2 be removed if it can be dismantled without the use of heavy machinery (e.g., excavator, bulldozer). If the concrete weir remains in place, a channel could be notched into the flat concrete apron to allow fish passage during low-flow periods. Alternately, a low-flow channel could be built onto the apron by constricting the flow to a narrow channel across the concrete bounded by wood or rock. With the lack of tree canopy near the meanders in Reach 2 (downstream of the weir), the opportunity for the placement of woody material at those locations would create additional in-stream structure. With reed canarygrass dominating the floodplain and streambanks, there is limited complexity along the banks. Additional root wads in the active channel would provide shade and hiding places for salmonids. Due to the tree canopy along confined portions of the reach, the direct placement of woody material via helicopter is not likely an option. There may be the opportunity to place "mobile" wood upstream of the confined reach, with the hope of the wood being transported downstream during higher flow events. The material placed would need to be large with an attached root wad. Multiple single trees could be installed. Woody material would need to be sized such that it would wedge into the channel during high-flow events. It is likely any placed large trees would recruit addition woody material. The placement of wood is intended to create localized deep pools to improve habitat for rearing salmonids. The placed material may also reduce bank erosion during high-flows by dissipating flow energy and spreading flows out into the floodplain terraces.
3	The goal of wood placement within Reach 3 is to increase pool frequency, increase shade, and improve hydraulic connections between the main stem of Beaver Creek and the multiple side channels. Woody material is recommended at existing confluences and bifurcation points. The wood placement would increase the hydraulic disturbances at the location, creating localized scour to promote continued hydraulic connection and fish access to the side channel for a wide range of flow conditions. Wood placement would help protect areas subject to bank erosion and reduce sediment loading to the creek during high water events. Some cedar trees are on the brink of falling in the creek, which will provide future large woody debris. Revegetation efforts should aim to provide seral plantings to replace larger trees that may soon fall into the creek (or control weeds to encourage the growth of existing saplings).
4	The lower reach is currently experiencing channel corrections due to the recent Stark Street culvert replacement project, which is also influenced by the Cochran Road bridge project. For the main channel of Beaver Creek in this reach, placement of woody material is not recommended within 500 feet of the Start Street culvert until the channel stabilizes. In the upper portion of Reach 4, more than 500 feet upstream of the Stark Street culvert, woody placement at locations experiencing stream bank erosion is recommended. Large single logs or

Reach	Recommendations
	multiple logs placed at these locations would limit increased meandering as Beaver Creek moves toward dynamic equilibrium within the reach. Large woody material is proposed for placement within the narrow wetland drainage channels entering Beaver Creek from the eastern floodplain. This wood placement would add cover to the narrow, incised channel and create hydraulic conditions to induce localized erosion and scour holes. This would increase off channel refugia during high-flow events. Stormwater outlet protection is recommended along the lower third of the outfall channel observed upstream of the Stark Street culvert. This steep and incised channel appears to erode during heavy precipitation when the outfall drops parking lot drainage into Beaver Creek. By placing large rock within the channel, erosive flows can be dissipated to reduce erosion and sedimentation.

6. Probable Permits Needed

Table 11 lists probable permits that will be needed for proposed restoration activities. Permitting needs may change as the project design and construction methods are refined.

Table 11. Probable Permits Needed

Relevant Law and/or Regulation	Trigger	Permit, License, Approval, Compliance, or Review	Fee	Preparation Timeframe (Months)	Review Timeframe (Months)
Federal					
Clean Water Act	Work in Waters of the US	Section 404 Authorization (Nationwide Permit)	None	3 months	3-6 months (depending on agency correspondence)
Clean Water Act	Discharges to Waters	Section 401 Water Quality Certification	$985 (assuming Nationwide Permit)	4-7 months	1-2 months after US Army Corps of Engineers approval
ESA	Work affecting listed aquatic and terrestrial species	Section 7 Coordination - Biological Assessment (may be covered under SLOPES restoration programmatic)	N/A	3 months	135 days. Reviewed as part of Clean Water Act Section 404 application review.
Magnuson-Stevens Fishery Conservation and Management Act	Work affecting habitat for managed salmonid species (Chinook and coho salmon)	Section 305	N/A	Simultaneous with ESA	Reviewed as part of Section 404 permitting, summarized above.
National Historic Preservation Act	Work affecting human developments or	Section 106 Coordination	N/A	4-6 months	Reviewed as part of Section 404 permitting, summarized above.

Relevant Law and/or Regulation	Trigger	Permit, License, Approval, Compliance, or Review	Fee	Preparation Timeframe (Months)	Review Timeframe (Months)
	artifacts >50 years in age				
			State		
State Removal-Fill Law	Work in Waters of the state	GA Form for Waterway Restoration	No fee assuming GA & no wetland delineation required	2 months	Time frame and fee will likely be reduced to 45 days for GA
Oregon Department of Environmental Quality	Disturb ≥ 1 acre of land	NPDES Construction Stormwater Permit 1200-C	$981 (new permit application fee) + $1,009 annual fee	2 months	3 months (Only applicable if construction access disturbs > 1 acre)
SHPO	Ground-disturbing activities with potential to impact cultural resources	Archaeological Excavation Permit required for subsurface surveys on public lands	Letter of funding required; may be no actual fee	3 weeks	30 days – this may extend if SHPO or Tribes require additional information.
Oregon Department of Transportation/ Federal Aviation Administration	Helicopter flight plan approval	Approval for flight plan in urban area near airport	Unknown	1 week	30 days (est)
			Municipal		
Troutdale Municipal Code	“development”	Type I land use review	Dependent upon assigned review type.	1 month	2-3 months

Key: ESA = Endangered Species Act; GA = General Authorization; N/A = not applicable; NPDES = National Pollutant Discharge Elimination System; SHPO = State Historic Preservation Office; SLOPES = Standard Local Operating Procedures for Endangered Species

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Appendix A. Hydraulic Modeling Results

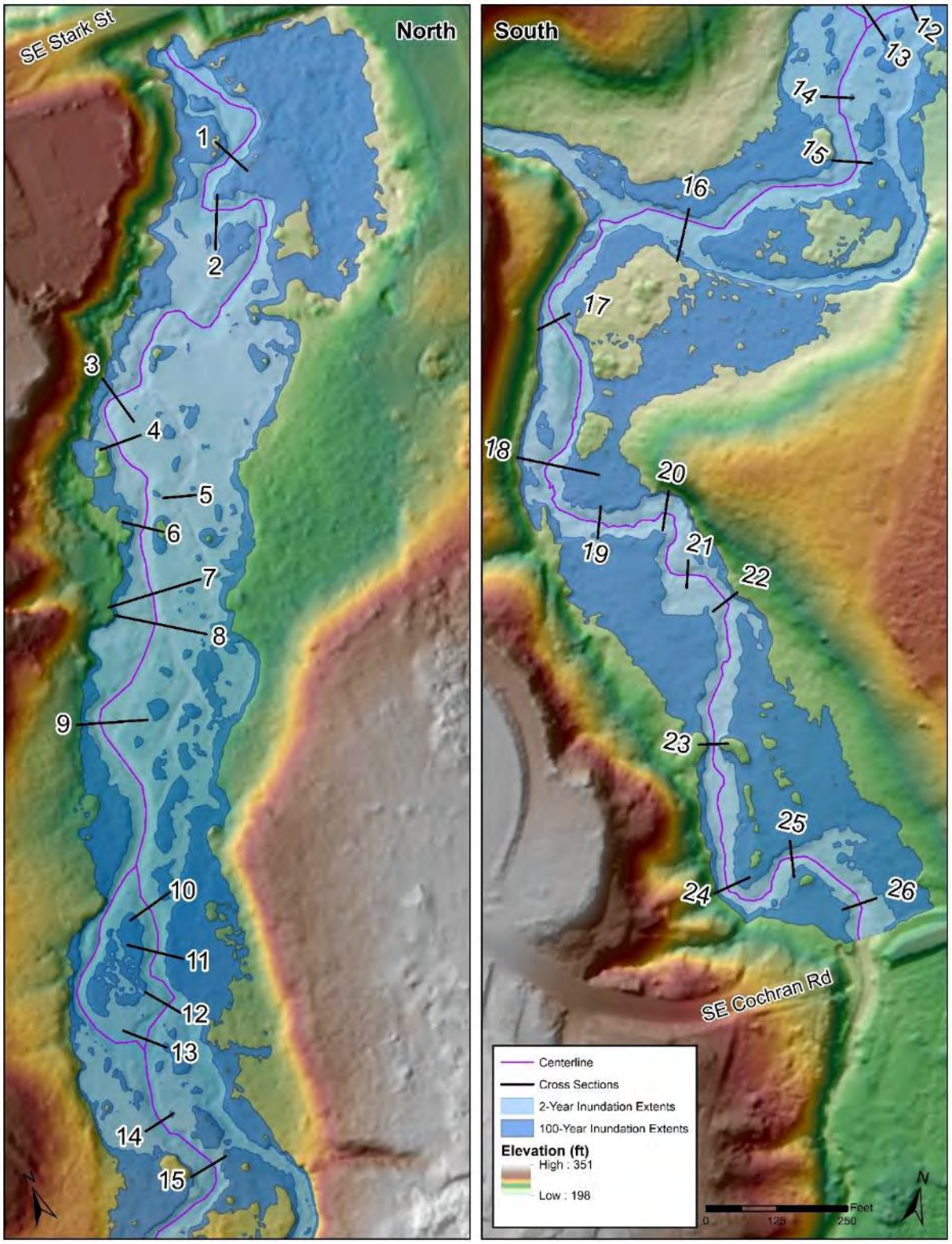

Figure A-1. 2-Year and 100-Year Inundation Extents

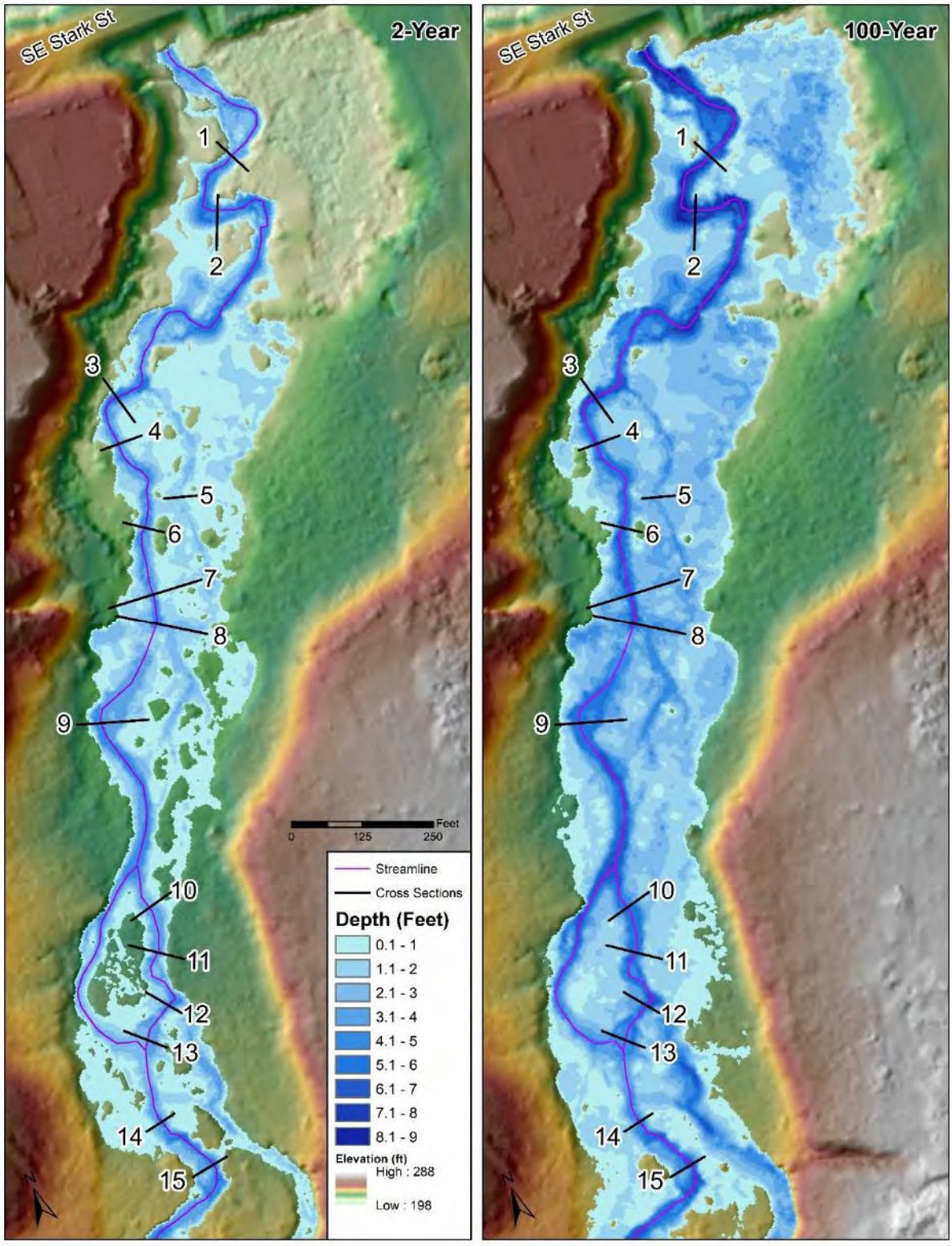

Figure A-2. 2-Year and 100-Year Depth (North)

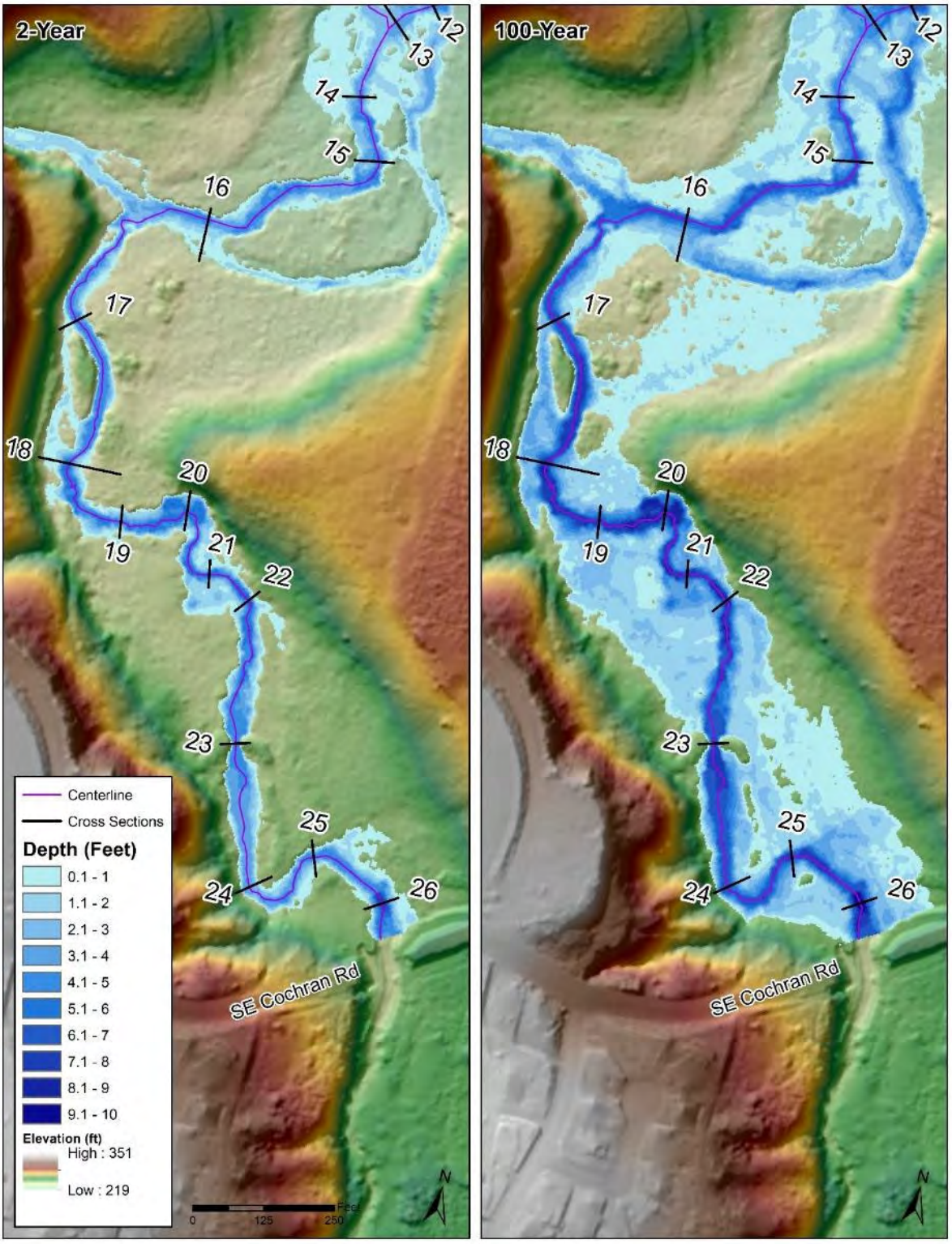

Figure A-3. 2-Year and 100-Year Depth (South)

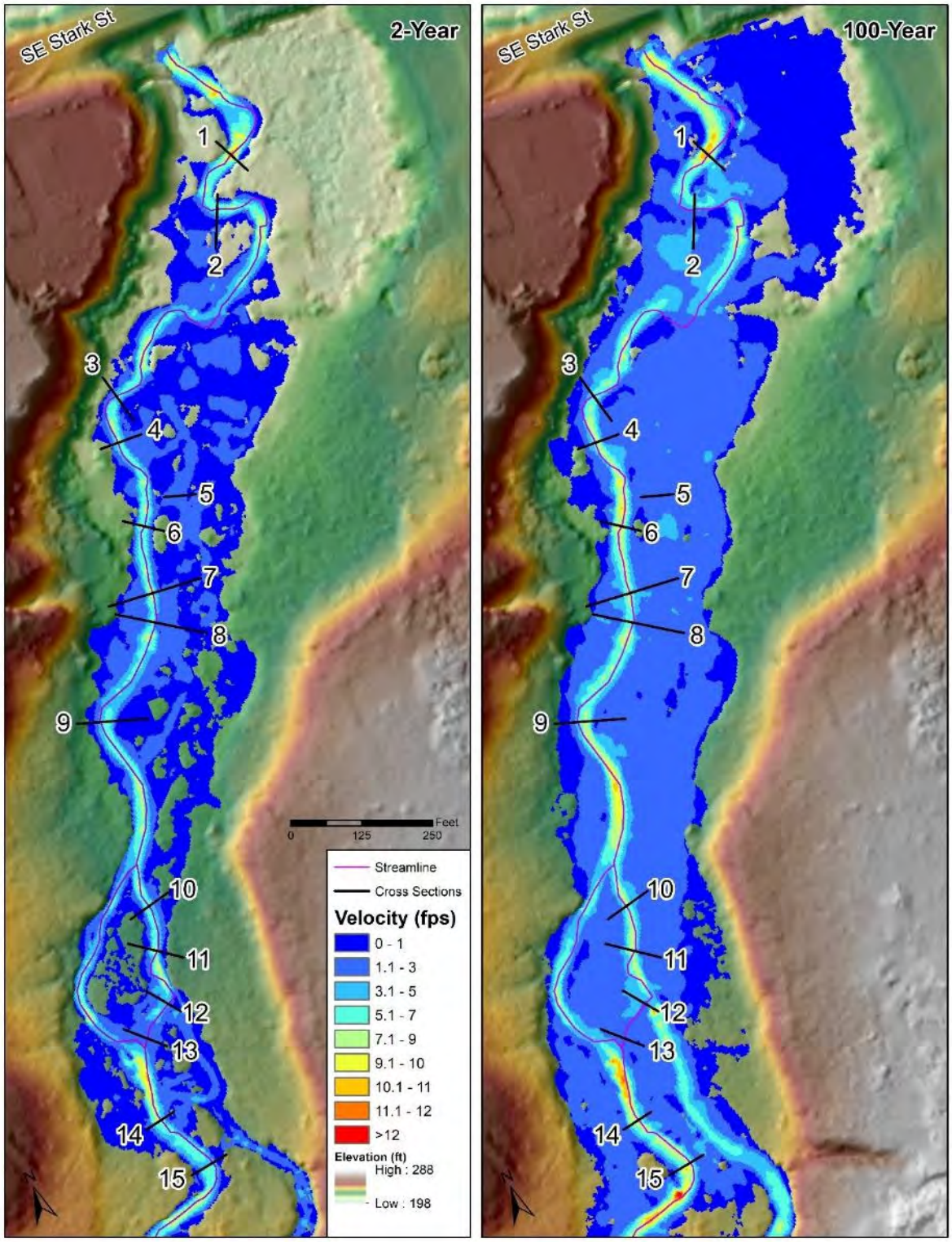

Figure A-4. 2-Year and 100-Year Velocity (North)

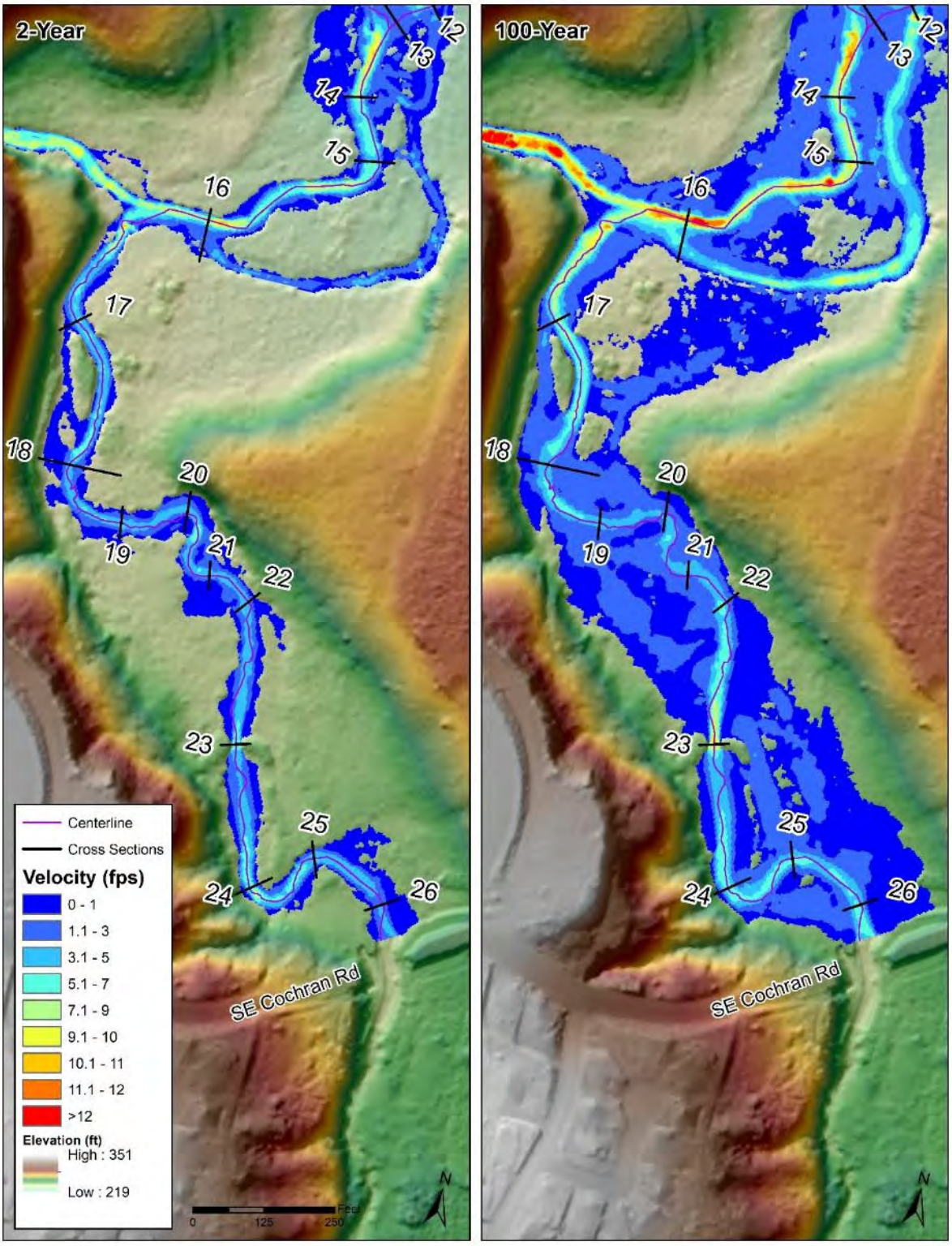

Figure A-5. 2-Year and 100-Year Velocity (South)

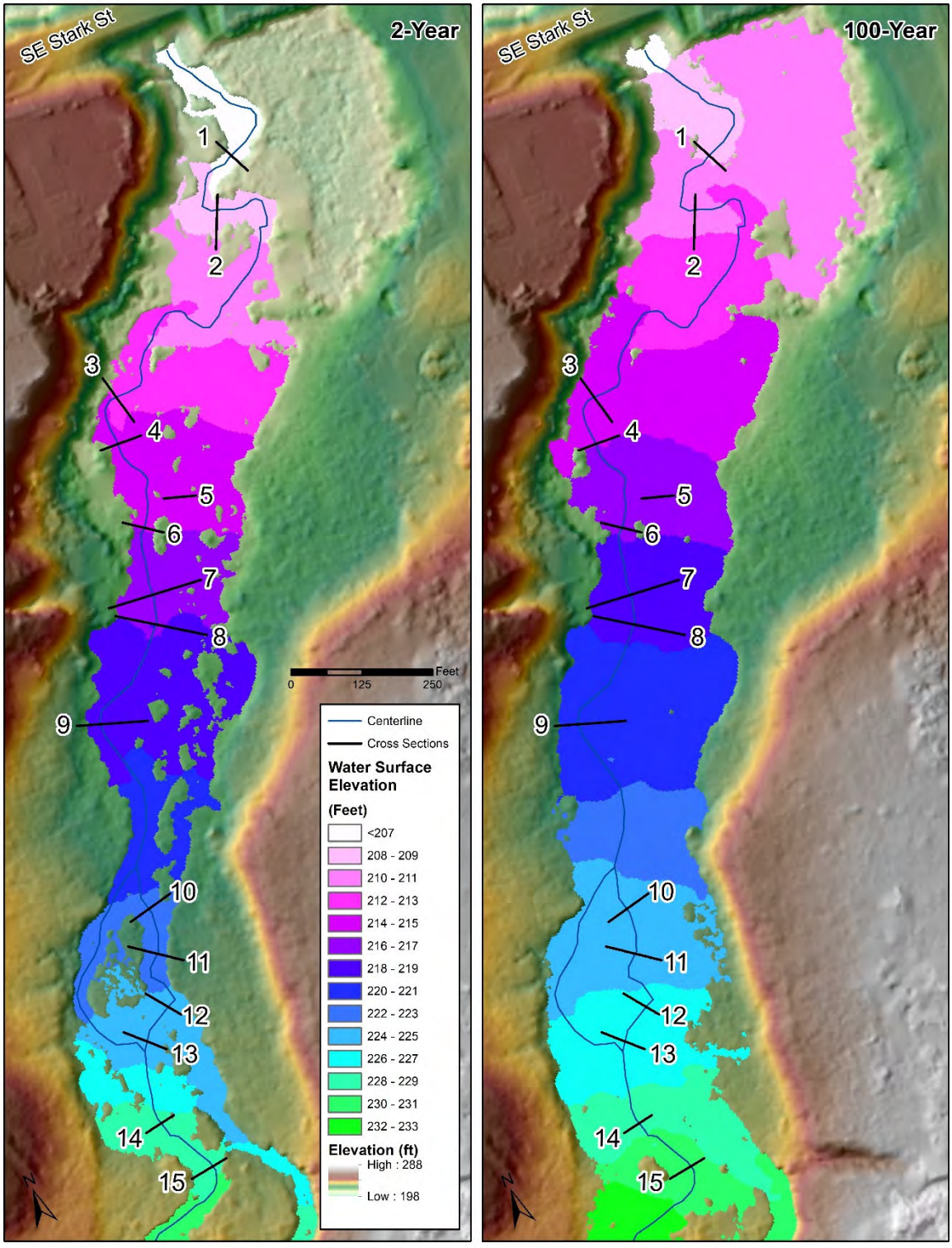

Figure A-6. 2-Year and 100-Year Water Surface Elevation (North)

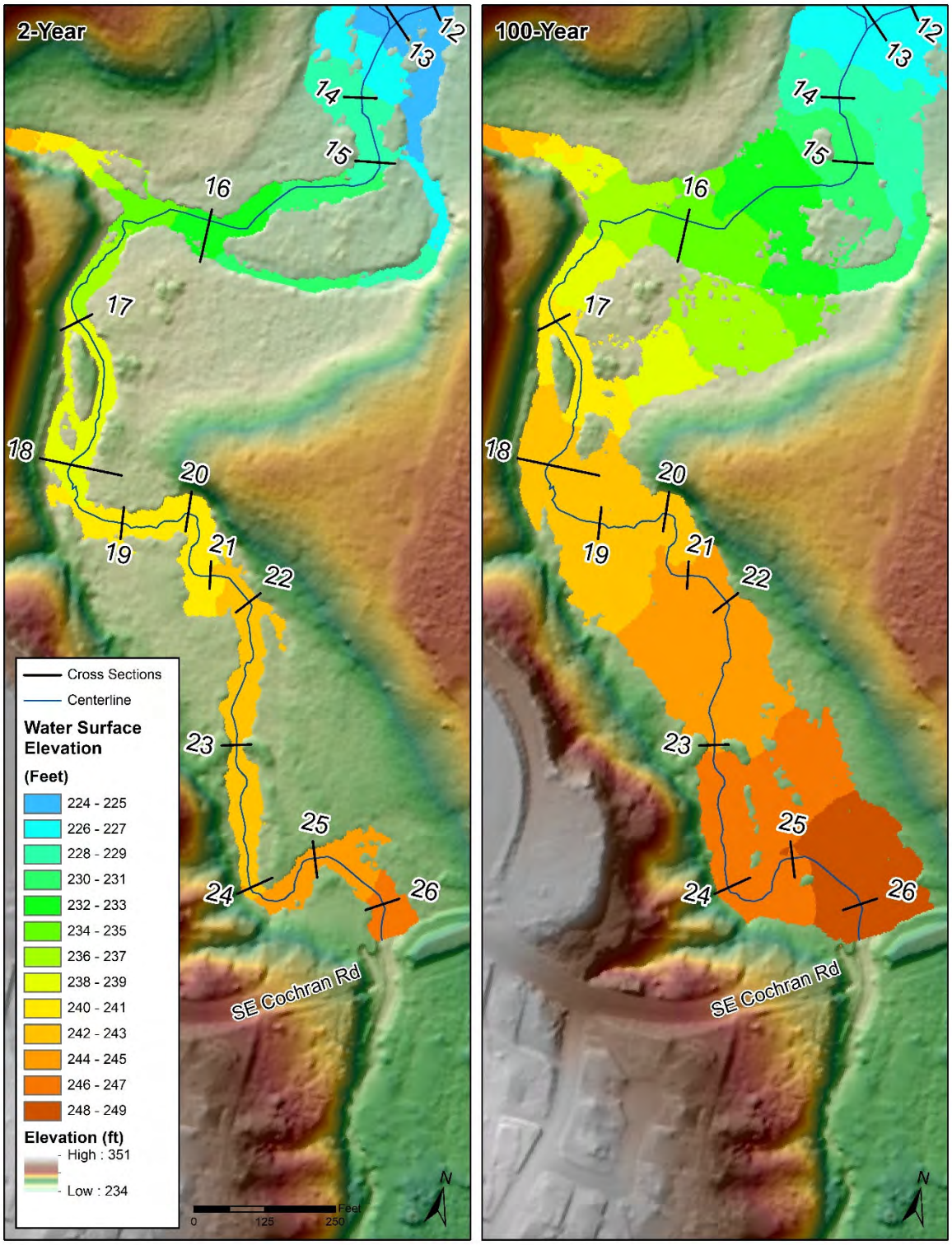

Figure A-7. 2-Year and 100-Year Water Surface Elevation (South)

Appendix B. Fish Habitat Requirements for ESA-Listed and Sensitive Fish Species within the South Beaver Creek Natural Area

	Fish Species			
	Fall Chinook	**Coho Salmon**	**Winter Steelhead**	**Pacific Lamprey**
ESA Listing Status	T	T	T	SOC
Distribution[1]	Beaver Cr. up to Kelly Cr. confluence[2]	Beaver Cr. (entire project reach) and Kelly Cr. up to MHCC pond[2]	Beaver Cr. (entire project reach) and Kelly Cr. up to MHCC pond[2]	Beaver Cr. up to Kelly Cr. confluence
Life Stages	S/R/M	S/R/M	S/R/M	S/R/M (presumably)
Timing				
Spawning	Oct-Dec	Oct-Dec	Feb-May	Feb-May
Juv Rearing	Jan-Mar	Year-round	Year-round	Year-round
Juv Outmigration	Mar-June	Mar-June	Mar-May	Late fall to Spring
Habitat Needs				
Adult Migration	Suitable flow, water temperature, and water quality. Temperature range: Fall Chinook: 10.6-19.4ºC; Coho: 7.2-15.6ºC. Minimum depths: 0.18-0.24 m. Maximum velocity: 2.4 m/s.			
Spawning	Gravel and small cobble (1.3-10.2 cm); fines <20%; main channel pool and riffle tailouts; Water depth>24 cm; Velocity: 30-91 cm/sec.; Temp: 5-14ºC.	Gravel and small cobble (1.3-10.2 cm); main and side channel pool and riffle tailouts; fines <20%; Water depth>18 cm; Velocity: 30-91 cm/sec.; Temp: 4-9ºC.	Gravel and small cobble (0.6-10.2 cm); fines <20%; main and side channel pool and riffle tailouts; Water depth>24 cm; Velocity: 40-91 cm/sec.; Temp: 4-9ºC.	Gravel substrate, upstream end of riffle habitat. Similar habitat as steelhead and may use their redds to spawn.
Incubation	Similar to spawning habitat (gravel/cobble substrate, low fines); need protection from scour and high flows as well as suitable water temperature (4-13ºC) and DO (>7 mg/L).			N/A
Newly Emerged Fry	Timing: Jan-Mar; Velocity<10 cm/s; Depth<60 cm. Stream margins and fine substrates with abundant cover.	Timing: Jan-Mar; Velocity<10 cm/s; Depth<60 cm. Stream margins and backwater pools.	Timing: Mar-June; Velocity<10 cm/s; Depth<60 cm; Temps <16ºC. Stream margins; cobble/small boulders.	N/A

	Fish Species			
	Fall Chinook	**Coho Salmon**	**Winter Steelhead**	**Pacific Lamprey**
Juveniles (Year-round)	NA. Outmigrate to ocean.	Suitable water depths (20-100 cm), low velocities (up to 40 cm/s), abundant cover (LWD and boulders), and water temperature (<16ºC). Coho seek low velocity pools and off-channel habitats. Steelhead prefer coarse substrate and cover. Larger juveniles move to main channel and occupy swifter, deeper habitat in pools, riffles, and runs.		
Overwintering (Nov to Feb)	NA	Velocity<30 cm/s; Depth>50 cm. Off-channel and protected habitats with complex LWD.	Velocity<30 cm/s; Depth>15 cm. Interstices of gravel, cobble, and boulder substrates and cover within stream channels.	Ammocoetes drift downstream to areas of low velocity and fine substrates where they burrow and live for 2-7 years.

Key: cm = centimeter; ESA = Endangered Species Act; LWD = large woody debris; M=Migration; R = Rearing; s = second; S = Spawning; SOC = Species of Concern; T = Threatened.

Notes:

[1]Based on ODFW 2020 Fish Distribution Data. However, recent fish passage projects have improved the ability for anadromous fish to access stream reaches upstream of the project area. Fish may also seasonally rear in adjacent tributaries when habitat conditions are favorable.

[2]Spawning surveys conducted from 2011 to 2020 by MHCC and ODFW have observed a few fall Chinook and coho salmon spawners in Beaver Creek upstream of the Kelly Creek confluence. Limited spawning surveys have been conducted for winter steelhead.

[3]ESA-listed chum and spring Chinook salmon may occur in lower Beaver Creek but are not expected to migrate as far upstream as the South Beaver Creek Natural Area. Cutthroat trout (SOC) have not been documented in the Beaver Creek system.

[4]Western Brook Lamprey (SOC) may also occur within all accessible stream reaches within project area. Habitat use is similar to Pacific lamprey.

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Appendix C. Fish Species Documented in Beaver Creek Watershed

Fish Species		Documented Presence		
Family, Species	**Common Name**	**WFC 2011 Fish Assemblage Study**	**PWB 2019 Smolt Trap Monitoring**	**Stark/Cochran Culvert Removal Projects**
Petromyzontidae	Lampreys	X	X	X
Lampetra richardsoni	Western brook lamprey[d3]	X		
Lampetra tridentata	Pacific lamprey[d3]		X	
Salmonidae	Trouts and Salmon	X	X	X
Oncorhynchus clarki clarki	Coastal cutthroat trout[b3]			X
Oncorhynchus kisutch	Coho salmon[c3]	X	X	X
Oncorhynchus mykiss	Steelhead trout[b3]	X	X	X
Oncorhynchus tshawytscha	Chinook salmon[c3]		X	
Cyprinidae	Carps and Minnows	X	X	X
Acrochilus alutaceus	Chiselmouth[e2]		X	
Misgurnus anguillicaudatus	Oriental weatherfish[a1]		X	
Mylocheilus caurinus	Peamouth[b2]	X	X	
Ptychocheilus oregonensis	Northern pikeminnow[c1]	X	X	
Rhinichthys cataractae	Longnose dace[b2]	X	X	
Rhinichthys osculus	Speckled dace[b2]	X	X	X
Richardsonius balteatus	Redside shiner[b2]	X	X	
Catastomidae	Suckers	X	X	
Catostomus macrocheilus	Largescale sucker[a1]	X	X	
Ictaluridae	Catfishes	X	X	X
Ameiurus natalis	Yellow bullhead[b1]	X		X
Ameiurus nebulosis	Brown bullhead[b1]	X		
Ictalurus punctatus	Channel catfish[b1]		X	
Gasterosteidae	Sticklebacks		X	
Gasterosteus aculeatus	Threespine stickleback[b2]		X	
Cyprinodontidae	Killifishes		X	
Fundulus diaphanous	Banded killifish[b1]		X	

Fish Species		Documented Presence		
Family, Species	**Common Name**	**WFC 2011 Fish Assemblage Study**	**PWB 2019 Smolt Trap Monitoring**	**Stark/Cochran Culvert Removal Projects**
Poeciliidae	Live Bearers	X		
Gambusia affinis	Western mosquitofish[b1]	X		
Centrarchidae	Sunfishes	X	X	X
Lepomis cyanellus	Green sunfish [b1]		X	X
Lepomis gibbosus	Pumpkinseed[b1]	X	X	X
Lepomis macrochirus	Bluegill[b1]		X	X
Micropterus salmoides	Largemouth bass[c1]	X		
Pomoxis nigromaculatus	Black crappie[b1]	X		
Cottidae	Sculpins	X	X	X
Cottus asper	Prickly sculpin[b2]	X		
Cottus perplexus	Reticulate sculpin[b1]	X		
Cottus gulosus	Riffle sculpin[b3]	X		

Notes: Trophic Group: a= omnivore; b=insectivore; c=piscivore; d=parasitic; e=herbivore;
Pollution Tolerance: 1= tolerant; 2= sensitive; 3= intolerant

Sources:

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Portland Water Bureau. 2020. Appendix H. Sandy River Basin Smolt Monitoring. Bull Run Water Supply Habitat Conservation Plan. Annual Compliance Report 2019- Year 10. September 2020.

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EXHIBIT 6

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Attachment 4. IPAC and ORBIC Species

EXHIBIT 6

EXHIBIT 6

Latin name	Common name	Habitat	State listing	Federal listing	Habitat in project
Strix occidentalis caurina	Northern spotted owl	old-growth conifer forest	Threatened	Threatened	There is final critical habitat for this species. Project location does not overlap the critical habitat; also no suitable habitat present in Project.
Eremophila alpestris strigata	Streaked Horned Lark	grassland	Critical	Threatened	There is final critical habitat for this species. Project location does not overlap the critical habitat; potential suitable habitat present in Project staging and access.
Coccyzus americanus	Yellow-billed cuckoo	oak woodland	Critical	Threatened	There is final critical habitat for this species. Project location does not overlap the critical habitat; also no suitable habitat present in Project.
Icaricia icarioides fenderi	Fender's Blue Butterfly	upland prairie, requires Kincaid's lupine	not listed	Threatened	There is final critical habitat for this species. Project location does not overlap the critical habitat; also no suitable habitat present in Project.
Danaus plexippus	Monarch Butterfly	grassland	not listed	Candidate	
Sidalcea nelsoniana	Nelson's Checker-mallow		Threatened	Threatened	There is final critical habitat for this species. Project location does not overlap the critical habitat; also no suitable habitat present in Project.
Erigeron decumbens	Willamette Daisy	Willamette Valley grassland	Endangered	Threatened	There is final critical habitat for this species. Project location does not overlap the critical habitat; also no suitable habitat present in Project.
Haliaeetus leucocephalus	Bald Eagle	near large bodies of water, nests in large trees and cliff edges	not listed	not listed	Bird of Conservation Concern
Cypseloides niger	Black Swift	migratory only in Oregon	not listed	not listed	Bird of Conservation Concern
Larus californicus	California gull	Coastal, wetlands	not listed	not listed	Bird of Conservation Concern
Aechmophorus clarkii	Clark's grebe	lakes, pacific coast (winter)	not listed	not listed	Bird of Conservation Concern
Coccothraustes vespertinus	Evening grosbeak	conifer forest	not listed	not listed	Bird of Conservation Concern
Tringa flavipes	Lesser yellowlegs	forested wetland	not listed	not listed	Bird of Conservation Concern
Contopus cooperi	Olive-sided flycatcher	conifer forest edges	vulnerable	species of concern	Bird of Conservation Concern
Selasphorus rufus	Rufous hummingbird	various	not listed	not listed	Bird of Conservation Concern
Aechmophorus occidentalis	Western grebe	lakes, pacific coast (winter)	not listed	not listed	Bird of Conservation Concern
Chamaea fasciata	Wrentit	oak woodland	not listed	not listed	Bird of Conservation Concern
Batrachoseps wrighti	Oregon slender salamander	wetland/riparian	Sensitive	Species of concern	Appropriate habitat may be present.
Delphinium leucophaeum	White rock larkspur	oak woodlands, in dry roadside ditches, basalt cliffs, along river banks and bluffs, on moist rocky slopes	Endangered	species of concern	Appropriate habitat not present.

EXHIBIT 6

Latin name	Common name	Habitat	State listing	Federal listing	Habitat in project
Delphinium nuttallii	Nuttall's larkspur	moist sites such as prairie-oak ecosystems, gravelly outwashes, basalt cliffs and rocky outcroppings, especially in prairies	not listed	not listed	Appropriate habitat may be present.
Entosphenus tridentatus	Pacific lamprey	aquatic	Sensitive	species of concern	Appropriate habitat present.
Oncorhynchus kisutch	Coho salmon	aquatic	Endangered	Threatened	Appropriate habitat present; will use IWWW for Beaver Ck
Oncorhynchus mykiss	Steelhead	aquatic	Critical	Threatened	Appropriate habitat present; will use IWWW for Beaver Ck
Oncorhynchus tshawtscha	Chinook salmon	aquatic	Critical	Threatened	Appropriate habitat present; will use IWWW for Beaver Ck
Sullivantia oregana	Oregon sullivantia	Basaltic cliffs, typically near waterfalls	Candidate	species of concern	Appropriate habitat not present.
Thaleichthys pacificus	Eulachon	aquatic	not listed	Threatened	Appropriate habitat not present.
Pyrgulopsis sp. 7	Lost River Springsnail	aquatic	not listed	not listed	Appropriate habitat not present.

Attachment 5. Printed Adjacent Landowner List/Labels

TECHNICAL MEMORANDUM

To: Brian Vaughn (Metro)

From: Rod Lundberg, PE; Ken Vigil PE; Nick Cook PhD, PE (Otak)

Copies: File

Date: March 17, 2023

Subject: **No-Rise Analysis for Beaver Creek Restoration Project**

Project No.: 21184

INTRODUCTION

This memorandum provides a brief summary of the no-rise analysis performed in support of the Beaver Creek Restoration Project. The project is focused on the reach of Beaver Creek located between SE Cochran Road and SE Stark Street within Troutdale city limits (Figure 1). The stream crossings at these two streets were updated in 2017 (Stark Street) and 2019 (SE Cochran Road) with much larger structures that will allow natural sediment processes, the passage of large wood, and generally allow natural stream function to reestablish throughout the reach. As a result of the previously undersized structures, this reach contains less large wood than it would naturally. The reach is heavily populated by beaver, with several dams in the reach and evidence of more under construction. Beaver Creek is also home to several species of spawning salmon. The aim of this project is to jumpstart the natural wood recruitment in the reach by adding clusters of two to five pieces of wood in disparate locations along the reach. In addition to the wood placement, a concrete weir structure in the reach will be removed, and the adjacent earthen berm will be laid back at a stable slope after removal of the concrete structure is complete. This project will increase opportunities for beaver to establish dams, increase floodplain connectivity, and provide heterogeneity in habitat for spawning salmon.

ANALYSIS

Beaver Creek has a mapped Federal Emergency Management Agency (FEMA) floodplain and associated floodway (FIRM 41051C0219J) and is subject to no-rise conditions for any development occurring in the floodway per Chapter 14 of the Troutdale Development Code. The term development includes the placement of large wood or terrain grading. A map of effective FEMA data is included (Figure 2) for the project reach for reference. The reach in question is set aside as a natural area and no development or future development would occur within the floodplain or floodway extents. The flooding along this reach is confined in the stream valley and as such presents minimal risk to property or infrastructure. Because of the complex planform, large floodplain, numerous beaver dams and other roughness elements, two-dimensional (2D) hydrodynamic modeling is the most accurate representation of river dynamics at the site. A 2D model was developed for the reach by AECOM in 2021. To best represent the effects of placement of large wood in such a system, this 2D model was carried forward to perform the no-rise analysis. FEMA published guidance in 2022 detailing the recommended procedure for completing no-rise analysis using a 2D model. FEMA 2D no-rise procedures evaluate water surface elevations (WSELs) using the following guidance:

- No-rise is evaluated along even-foot WSELs generated by the 2D model for the 100-year flood event by approximating evaluation lines along the contour.
- Evaluation lines sample the 2D WSEL data; final elevation is determined using discharge-weighted averaging along the evaluation line.
- Evaluation lines must be placed relative to each other within a scale equivalent to the FIRM mapping scale (typically 1 inch = 500 feet).
- If no evaluation line intersects proposed terrain changes for the project, an evaluation line should be added at that location.
- All evaluation lines must demonstrate no-rise with WSELs showing 0.00 feet of rise, consistent with FEMA guidelines and Chapter 14 of the Troutdale Development Code.

After making minor modifications to the 2D computational mesh and model calculation settings, the model was optimized for runtime and prepared for use in the analysis. Updates to channel roughness were added to the existing conditions model to better represent observed conditions at the creek. Next, the proposed conditions model was developed by adding increased roughness regions to the model to represent areas of large wood placement. The weir removal and bank layback were represented in the proposed conditions terrain. Wood placement locations and limits of terrain grading are shown in Figure 1. For the analysis at Beaver Creek, ten evaluation lines were placed within three to four hundred feet apart to achieve evaluation coverage from SE Cochran Road to SE Stark Street. An evaluation line was included at the site of the proposed weir removal at the 244 WSEL. Evaluation line locations are shown in Figure 1 generally, while WSEL results from existing and proposed conditions models are shown in Table 1.

RESULTS

As shown in Table 1, most WSEL comparisons yield values that are so small they round to 0.00. These evaluation lines include both positive and negative values in WSEL that are negligible. For the remainder of the evaluation lines with magnitudes larger than 0.00, the values are negative and result in a decrease in WSEL. These decreases are consistent with observed velocity changes and expected shifts in energy balance in the system.

Table 1: 2D No-Rise WSEL Results (all values feet, NAVD88)

Evaluation Line	Existing WSEL	Proposed WSEL	Diff.
1	207.11	207.01	-0.10
2	211.96	211.96	0.00
3	215.96	215.96	0.00
4	220.01	220.01	0.00
5	223.73	223.72	-0.01
6	227.43	227.39	-0.04
7	231.99	231.99	0.00
8	238.12	238.12	0.00
9	241.99	241.98	-0.01
10	243.65	243.49	-0.16
11	247.00	246.94	-0.06

CONCLUSIONS

Based on this analysis, the proposed improvements would not cause a rise in 100-year base flood elevations, meeting no-rise criteria in accordance with Chapter 14 of the Troutdale Development Code. By extension, the project meets the City's compliance with federal standards as the floodplain code is consistent with FEMA minimum standards. A stamped no-rise certification statement is attached to this report to attest to these findings.

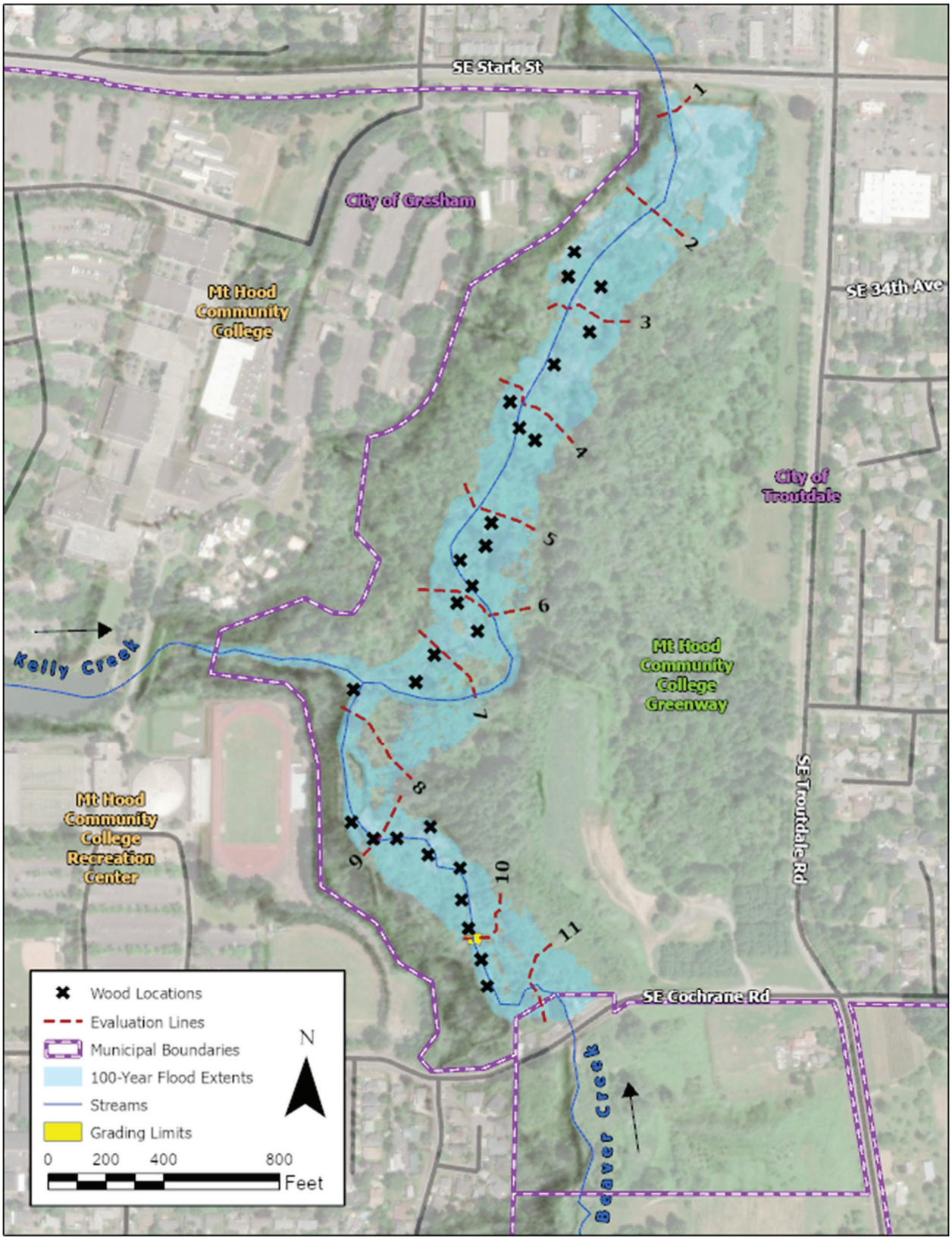


Figure 1: Project Location Map and 2D No-Rise Evaluation Lines

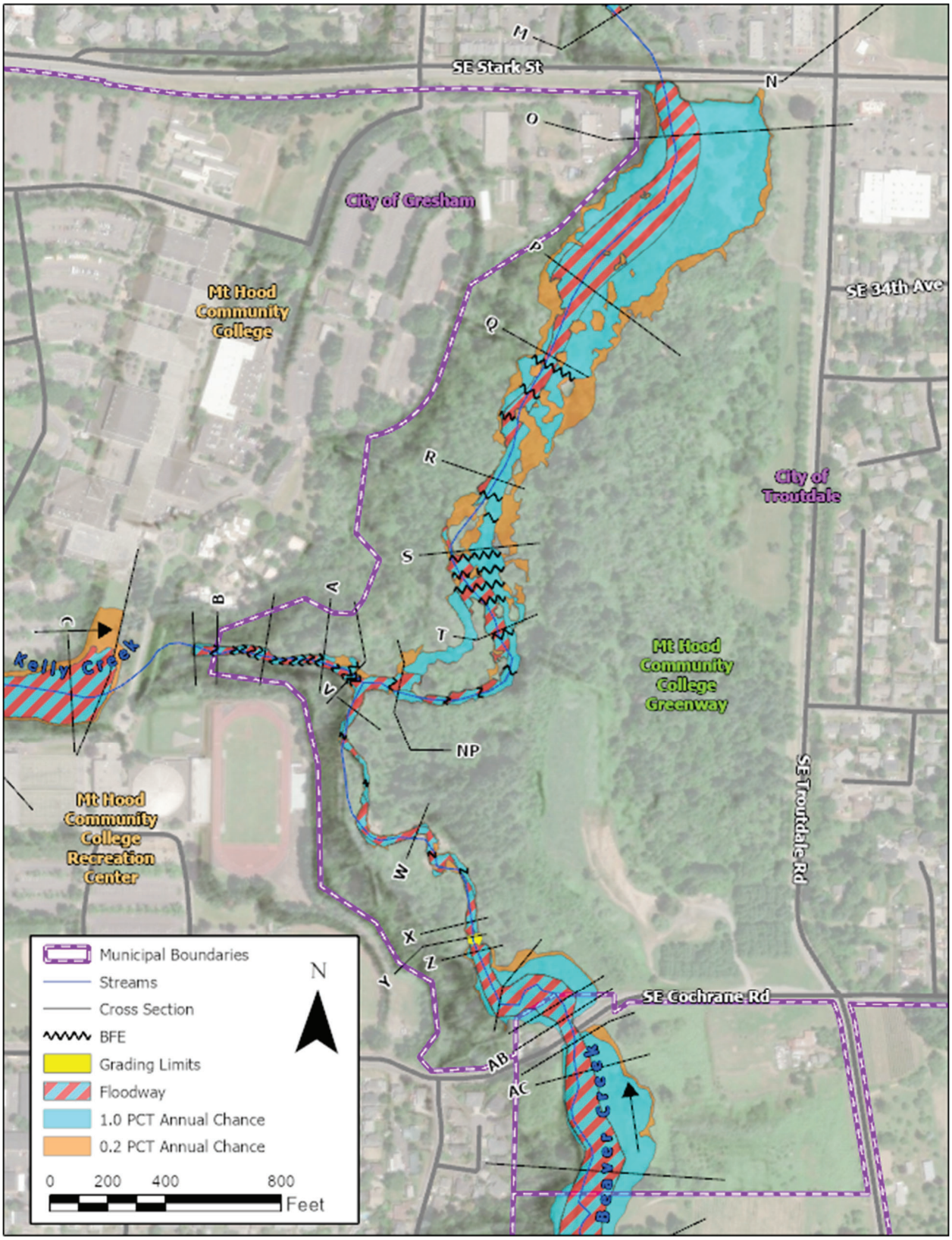


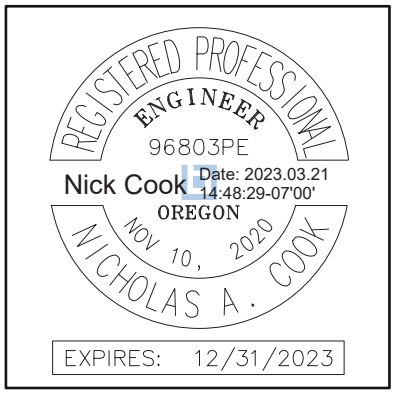
Figure 2: Effective FEMA Data at the Project Area

This document is to certify that I am a duly qualified engineer licensed to practice in the State of Oregon.

It is further to certify that the attached technical data supports the finding that the proposed Beaver Creek Restoration Project will not cause a rise in the 100-year base flood elevations on Beaver Creek in the vicinity of the proposed development.

3-17-2023 Nick Cook

(Date) (Signature)



Civil Engineer

(Title)

EXHIBIT 8

Metro/Mt. Hood Community College
Helicopter Landing and Construction Staging
Temporary Use Agreement

This Agreement is between **Metro**, located at 600 NE Grand Avenue, Portland, Oregon 97232 ("Metro") and **Mt. Hood Community College** located at 26000 SE Stark Street, Gresham, Oregon 97030 ("College").

College is the owner and operator of real property on which Mt. Hood Community College is located ("College Property") depicted in Exhibit A.

Metro is intending to demolish a home site and construct salmonid and riparian habitat improvements within and along Beaver Creek located adjacent to College Property ("Habitat Improvements"). *See* Exhibit A for general location of Habitat Improvements.

Metro is seeking required permits for the Habitat Improvements from jurisdictional agencies, including City of Troutdale, Oregon Department of Environmental Quality, Oregon Department of State Lands, and United States Army Corps of Engineers.

Due to the location, topography, and sensitive and protected nature of the stream corridor and fish species, the use of a helicopter is necessary to facilitate delivery of materials to and from the stream corridor.

Metro desires to temporarily access and utilize a portion of College Property for demolition of a nearby home site, helicopter landing, construction access, and staging in the areas detailed and depicted in Exhibit A ("Use Area"). *See* Exhibit A for the location of the Use Area.

College hereby grants Metro, its employees, agents, and contractors to utilize the portion of College Property depicted in Exhibit A subject to the terms and conditions contained in this Agreement.

1. Permission. College grants Metro (and its employees, agents, contractors, guests, and suppliers) permission to access, control and use parts of College Property in accordance to all laws, regulations, statutes and ordinances guiding the operations and functional use of the property in relation to the map identified in exhibit A for ingress, egress, parking, temporary use and storage of trucks, helicopters, vehicles, trailers, equipment, materials, and other items necessary and related to the construction of the Habitat Improvements. Metro must notify College prior to accessing and using College Property. Said notice must be 1) provided at least 7 days prior to use, 2) in writing, 3) and state the location and period use is intended.

2. Term. Access and use of College Property is permitted weekdays during the following hours: 7am-7pm. Work is yet to be scheduled but is anticipated to occur between December 1, 2023, through October 31, 2024. Periods of use are anticipated to be14-21 consecutive days each, with home demolition work in January-March 2024, staging of large wood for stream restoration in December 2023, and stream restoration construction and helicopter work in July-August 2024. Metro will notify College when work dates are scheduled. If Metro needs access at any other dates and times, Metro must contact College and obtain advanced permission in writing to do so.

3. Use by Others. Use Area depicted in Exhibit A is not exclusive to Metro. Metro understands that it is utilizing College Property, portions of which are open to the public and may be in use by other users during the term of this Agreement. Metro must ensure the safety of the general public and others utilizing College Property. Metro will ensure areas utilized under this Agreement are fenced, marked, or otherwise closed through signage or as directed by Metro or Metro's contract crews to prevent conflicts, promote public safety, and limit use and disturbances to the approved areas.

4. Representations. College makes no warranty or representation regarding the physical condition of College Property or its ability to support Metro's intended use, and Metro accepts use of the site in its "AS IS" condition.

5. Damage to College Property. Metro is responsible for any and all damage to College Property (identified on Exhibit A) associated with Metro's use under this Agreement, including subsequent claims associated with this Agreement. Metro shall require contractors fueling equipment on College Property to have a spill prevention kit, absorbent pads, and other spill prevention materials available for immediate use. Any disturbance or alteration to the College Property must be temporary in nature. Metro, at its sole cost and effort, is responsible to return and restore any disturbed area to the same or better condition in which it existed prior to the disturbance or alteration, subject to College approval. Metro must document conditions preceding disturbance with photographs or video. Said restoration must be completed within 14 days of Habitat Improvement completion, and no later than October 31, 2024. Metro must remove all items, debris, and equipment that Metro has placed or allowed to be placed on College Property no later than October 31, 2024.

6. Indemnification. Within the limits of the Oregon Tort Claims Act and Oregon Constitution, Metro agrees to indemnify, defend, and hold harmless College, its elected officials, employees, agents, and contractors from and against any and all claims, demands, liabilities, damages losses and/or expenses (including, without limitation, reasonable attorney's fees and costs at trial and on appeal), including but not limited to those founded upon personal injuries, death or property damage to third parties, arising out of or in any way connected with Metro's use of College Property, reckless, negligent or otherwise tortious acts or omissions (including the acts of Metro's employees, agents, contractors, guests, and suppliers), but excluding College's negligence or willful misconduct.

7. Notice. Any notice or communication required or through this Agreement must be provided to:

	Metro Representative	College Representative:
Name:	Brian Vaughn	Doug Schleichert
Telephone:	503-830-8719	503-491-7590
Email:	brian.vaughn@oregonmetro.gov	Doug.Schleichert@mhcc.edu

Metro musts promptly notify College if any issues or questions develop during access and use activities.

8. Insurance. Metro is self-insured. Metro must require all contractors accessing the site to purchase from and maintain in a company or companies lawfully authorized to do business in the

State of Oregon such insurance as will protect the contractors from claims that may arise out of or result from the uses and activities occurring under this Agreement and for which the contractors/consultants may be legally liable, whether such operations be by the contractor or by a subcontractor, or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable. Insurance must include:

a. Claims under workers' compensation;
b. Claims for damages insured by usual personal injury liability coverage and commercial general liability coverage with a minimum of $2,000,000 per occurrence.
c. Claims for damages because of bodily injury, death of a person, or property damage arising out of ownership, maintenance, or use of a helicopter with a minimum of $2,000,000 per occurrence;
d Claims for damages because of bodily injury, death of a person, or property damage arising out of ownership, maintenance, or use of a motor vehicle with a minimum of $1,000,000 per occurrence; and
e. Claims for third-party injury and property damage (including, without limitation, clean-up costs) as a result of pollution conditions arising from the contractor's operations or completed operations with a minimum of $2,000,000 per occurrence.

Contractor's third-party liability insurance policies must include Metro and College as ADDITIONAL INSUREDS. Metro must require contactors to provide Metro and College with a certificate of insurance complying with this section and naming Metro and College as additional insureds at least 15 days prior to the beginning of work.

9. Compliance with Law. Metro must comply and cause its contractors, agents, employees, and invitees to comply with all federal, state, and local statutes, laws, rules, regulations, and policies.

10. Miscellaneous. This permit is the entire and exclusive agreement between the parties. This permit may not be assigned or transferred by permittee without Metro's prior written approval. If any term or condition is held invalid or unenforceable, the validity of the remaining provisions is not affected. Failure at any time to require performance of any provision does not limit a party's right to enforce the provision. Any waiver of any breach is not a waiver of any succeeding breach or a waiver of any provision. Time is of the essence with respect to every term, condition, obligation, and provision. No rights in the public or third parties are created. This permit may only be amended in writing, signed by all parties. This Agreement must be construed and enforced in accordance with laws of the State of Oregon.

11. Authority. The undersigned below is authorized to enter into this Agreement on behalf of their respective entities.

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METRO **COLLEGE**

EXHIBIT 8

Signature:	DocuSigned by: Jonathan Soll 168B5D8C136E4BC...	DocuSigned by: JDement ABF08CDC20E6423...
Printed name:	Jonathan Soll	Jennifer DeMent
Title:	Science Division Manager	Vice President, Finance & Administration
Date:	December 12, 2023	December 13, 2023

Exhibit A – College Property and Use Area