



BANK USE PLAN

July 28, 2020



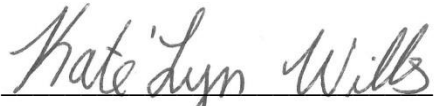
Al Helenberg Memorial Boat Launch Safety Improvements *Castle Rock, Washington*

Prepared for
City of Castle Rock
360 A Street
Castle Rock, Washington 98611
(360) 274-7478

Prepared by
Ecological Land Services
1157 3rd Avenue, Suite 220A • Longview, WA 98632
(360) 578-1371 • Project Number 102.76

SIGNATURE PAGE

The information in this report was compiled and prepared under the supervision and direction of the undersigned.



Kate'Lyn (KT) Wills

Biologist/Environmental Scientist IV



Joanne Bartlett

Senior Biologist

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RESPONSIBLE PARTIES

APPLICANT

City of Castle Rock

Contact: David Vorse, Director

Email: crpwd@ci.castle-rock.wa.us

360 A Street SW

Castle Rock, Washington, 98611

(360) 274-7478

PROJECT ENGINEER

Gibbs & Olson

Contact: Tom Gower, PE, Project Manager

E-mail: tgower@gibbs-olson.com

1157 3rd Ave. Suite 219

Longview, Washington 98632

(360) 425-0991

COWEEMAN MITIGATION BANK

Habitat Bank

Contact: Victor Woodward

Email: victorw@habitatbank.com

801 E. First St., Suite B 107

Cle Elum, Washington 98922

(360) 425-8428

ENVIRONMENTAL CONSULTANT

Ecological Land Services, Inc.

Kate'Lyn (KT) Wills

Email: kt@eco-land.com

1157 3rd Avenue, Suite 220A

Longview, Washington 98632

(360) 578-1371

INTRODUCTION

Ecological Land Services, Inc. (ELS) has completed this Bank Use Plan on behalf of the applicant, the City of Castle Rock (City), to address the impacts resulting from the construction of safety improvements to the existing Al Helenberg Memorial Boat Launch on the Cowlitz River, including improved maintenance access and dredging. The project area consists of a portion of Cowlitz County Tax Parcel Numbers 308770100 and 308800100 located at 5040 Westside Highway in Castle Rock, Washington, within in a portion of Section 10, Township 9 North, and Range 2 West, of the Willamette Meridian (Sheet 1). The applicant is proposing to address dangerous stream flow conditions by construction of a structure to reduce flow velocities. The project is proposed to be constructed in 2021 between July and September.

This project will directly impact 0.002 acres (90 sq. ft.) of aquatic habitat and 0.57 acres (25,037 sq. ft.) of riparian habitat. Impacts will be fully compensated for by purchasing 0.14 universal mitigation credits and 0.41 Discounted Service Acre Years (DSAYs) at the Coweeman Mitigation Bank (CRMB).

This Bank Use Plan was prepared according to the Castle Rock Municipal Code (CRMC) *Chapter 18.10.170 Mitigation plan performance standards* (2020), Interagency Review Team (IRT) for Washington State's Guidance Paper, *Using Credits from Wetland Mitigation Banks: Guidance to Applicants on Submittal Contents for Bank Use Plans* (2009), Habitat Bank's, *Coweeman River Mitigation Bank Mitigation Banking Instrument (MBI)* (2015), and the U.S. Army Corps of Engineers' (Corps) *Compensatory Mitigation for Losses of Aquatic Resources* (2008).

PROJECT DESCRIPTION

Project Location

The approximately 6-acre project area consists of the eastern portions of Cowlitz County Parcel Numbers 308770100 and 308800100 along the Cowlitz River adjacent to the Al Helenberg Memorial Boat Launch. The boat launch is accessed by a driveway located at located at 5040 Westside Highway in Castle Rock, Washington, within in a portion of Section 10, Township 9 North, and Range 2 West, of the Willamette Meridian (Sheet 1).

Project History/Project Need and Purpose

The Al Helenberg Memorial Boat Launch was constructed approximately 1,300 feet upstream of the State Route 411 Bridge to provide recreational boat access to the Cowlitz River in 2010. Since the construction of the boat launch, boaters have indicated through town hall meetings and letters to the City, that streamflow velocities at the boat ramp frequently make use of the ramp difficult or even dangerous. Emergency services have also indicated to the City the need for safety improvements at the boat launch in order to access to the Cowlitz River for rescues and recovery efforts. Currently, the nearest access for emergency services to the Cowlitz River is approximately 10 miles to the south in Kelso. Due to these increasing safety concerns, usage of the boat launch has steadily declined over the last few years as evidenced by the permit totals in Table 1 below. To address safety concerns, the City of Castle Rock proposes to construct a structure that will reduce streamflow velocities at the boat ramp to improve both safety and access for boaters.

An alternative analysis has been prepared by ELS (ELS 2020) for the proposed impacts to the in-water habitat. A thorough alternatives analysis was conducted by West Consultants (West 2016) to determine the best design for the proposed flow control structure. They evaluated several different methods for “...relative ability to reduce streamflow velocities at the launch site and its potential effect on sedimentation conditions.” The best alternative was the construction of three reinforced 30-foot-long concrete panels supported by vertical and battered steel H-piles. The analysis also evaluated the best location for these panels, which are proposed about 300 feet upstream of the boat launch. This alternative was determined to be preferred because it slowed the velocity of the current and allow full use of the boat launch. The proposed walls will increase velocities along the bank compared with existing conditions and will necessitate bank protection in the form of a riprap revetment.

Table 1. Boat Launch Permit Totals.

Year	Day Use Permit Totals	Annual Use Permit Totals	Total Permits
2015	3,572	97	3,669
2016	3,131	86	3,217
2017	2,684	69	2,753
2018	2,168	58	2,226
2019	2,291	40	2,331
Grand Totals	13,846	350	14,196

**Permit totals provided by the City.*

Project Overview

The project has been designed based on the recommendations by WEST Consultants, dated November 1, 2016 (West 2016). This project proposes to construct a structure consisting of two reinforced 30-foot long cast-in-place concrete panels supported by a combination of vertical, diagonal, and battered-in H-piles. The panels are designed to improve safety at the boat launch by slowing the velocity of the water upstream while also maintaining adequate water velocity to minimize material deposition. The walls are proposed approximately 300 feet upstream of the launch, which will necessitate 1) construction of an access road to the work area (north maintenance access road); 2) installation of a steel sheet-pile cofferdam around of the work area; and 3) replacement of riprap on the riverbank in the project area. The access road functions to provide access to the work area but will ultimately be used as a maintenance access to the riprap revetment to assess potential failures of the erosion control measures. A second road (south maintenance access road) is proposed on the opposite side of the boat launch for the future maintenance access. Construction of the proposed facility improvements will necessitate the removal of 24 black cottonwood (*Populus balsamifera*) trees to facilitate construction of the north access road and direct access to the in-river work area. Maintenance dredging is on-going to maintain water depths suitable for launching boats and will continue after the walls are constructed.

North Maintenance and Construction Access

Construction equipment will access the project area via the proposed north road, consisting of a gravel access road that is 275 feet long and 12 feet wide. The road will be constructed along the top of the riverbank, north of the boat launch. To install this maintenance access, 22 cottonwood trees will need to be removed. The approximately 3,600 square feet of riverbank immediately waterward of the north road will be prepared for construction access by the removal of the existing riprap and its replacement with new heavy loose riprap (see below). This area will function as access to the work area, a solid base for the excavators to track down the riverbank, and erosion control post project completion. Materials will also be lowered to the construction site using a crane. Silt fencing will be installed at the waterward edge of tree removal and the north access road (Sheet 3). Additional BMPs will be utilized to prevent construction impacts to the Cowlitz River (see Avoidance and Minimization Section). This road will remain following construction and used for maintenance access by the City.

South Maintenance Access Road

As part of this project, a second maintenance access road will be constructed south of the boat launch to provide direct access to the floating docks. The access road will be a 12-foot wide gravel road that extends approximately 215-feet from the existing parking area to the top of the riverbank. To install this maintenance access, 2 cottonwood trees will need to be removed. Stormwater generated on the south side road will be conveyed into the stormwater pond that currently provides storage function for the park. Silt fencing will be placed waterward of the work area to protect the river from impacts (Sheet 3).

Riprap Replacement

The riprap will be composed, a 3-foot thick layer of heavy loose riprap (Washington Department of Transportation specifications) and will be placed along the shoreline with a flat toe extending below the OHWM (Sheet 6). The riprap will be placed in the area cleared for access to the in-river work area from the north side maintenance access road. The riprap will extend along the shoreline for 125 feet downriver of the concrete panels. Approximately 132 cubic yards of riprap are expected to be required.

Temporary Cofferdam Installation and Removal

To allow for the installation of the concrete walls, a temporary cofferdam will be installed around the work area (Sheet 3). This cofferdam will be constructed of approximately 275 linear feet of steel sheet piles, which will be installed using excavator-mounted vibratory equipment. The selected contractor will develop a more specific cofferdam plan so other cofferdam systems may be utilized to isolate the work area, depending on actual field conditions at the time of construction. Vertical interlocking sheet piles (1-foot thick by 2 feet wide) will be vibratory driven to refusal at the assumed gravel layer approximately 30 feet below the mudline and then hammer driven an additional 4 feet minimum as needed to reach the appropriate depth. A driving shoe¹ will be used at end of the piles for ease of driving the pile into the substrate and a confined bubble curtain will be used for installation of the cofferdam during hammer driving.

¹ A driving shoe is a cast or fabricated steel drive shoe which may be pointed and is fixed to the pile shaft at the tip for easier driving, improved penetration, protection against damage in dense material or boulders and improved bearing at the tip. Also called Driving Point, Drive Shoe, Pile Shoe or Conical Point.

Once the cofferdam is fully installed, the work area will be dewatered to allow for wall construction in a dry environment. Fish exclusion will precede dewatering and will be conducted using block nets that are set upstream and downstream of the work area. The block nets will remain in place at least through cofferdam installation but may remain for the duration of the proposed work. River water removed from the cofferdam area will be pumped to a tank or temporary pond outside of all critical areas that will facilitate settling before it is release back into the river downstream of the project area.

After construction is complete, the temporary cofferdam will be removed utilizing the same equipment as was used for the installation. The steel sheets, equipment and remaining materials will be lifted from the riverbank utilizing a crane and the excavation equipment will track back up the ripped bank.

The work area within the cofferdam will be dewatered using a pump that will force water through pipe up the riverbank and into a tank or pond. The water will be allowed to settle for at least 1 day before it is pumped from the tank or pond and piped for discharge into the river downstream of the work area.

Fish Exclusion

The work area will be isolated from the Cowlitz River by installation of a temporary cofferdam to dewater the work area. It will be confined to along a section of the riverbank and does not extend across the entire wetted channel so fish exclusion will take the form of upstream and downstream block nets. The upstream block net will be installed at the start of the in-water work and precedes the start of cofferdam installation. Block nets are composed of 9.5 millimeter stretched nylon mesh that are installed at an angle to the direction of flow. The nets will be held in place using anchor bags filled with clean washed gravel and will be removed following dewatering of the work area within the cofferdam. The nets will be regularly inspected for impinged fish at least three times daily or as requested by the project engineer. Inspections will occur at the start, middle and end of each work day; in the morning, noon, and evening of non-work days; and within the first 24 hours following a significant rainfall and/or when there is a change in flow volume or velocity.

Wall Construction

The two 30-foot long by 5-foot-thick concrete panels will be supported by 34 - W12x53 (12-inch x 53 lbs./foot) steel H-piles placed vertical, battered, and in-plane diagonal directions (Sheet 5). Installation of the vertical piles will be done using vibratory equipment and impact driving as necessary to a depth of approximately 34-feet below the existing mudline. Batter and in-line diagonal piles will be driven using vibratory equipment to refusal at the gravel layer. The gravel layer is assumed to be approximately 30 feet below mudline. If shallower gravel layer prevents the pile from being vibratory driven to the required depth, the engineer will be contacted to determine if the first refusal gravel layer will be sufficient or if hammer driving will be needed to reach the required depth. The 5 feet by 30 feet, 8-inch thick concrete panels will be cast in place.

Maintenance Dredging

The City maintains the boat launch area to ensure proper water depths for boat launching, which involves dredging the sediments from within the Cowlitz River. Sediment accumulates within the launch basin and alcove at a rate that necessitates regular maintenance dredging as described in the

2007 biological evaluation (URS 2007). The river was dredged in 2008 for construction of the current boat launch to create an alcove and launch basin for boat accessibility to the concrete launch lanes. Mitigation for dredging activities was completed at this time offsite at Whittle Creek. The City has been conducting dredging on a regular basis, which according to documentation from the City, has been conducted nine times over the past three years. The document also indicates that even though dredging has been conducted multiple times per year, the removed material does not exceed the originally specified 200 cubic yard annual maximum. Dredging is conducted using an excavator staged on the boat launch, which reaches into the basin to remove the accumulated sediment. It is loaded onto a dump truck and moved to an onsite upland location outside of the riparian zone in proximity to the river. Maintenance dredging is ongoing under the current permit which expires in March of 2022 and is expected to be necessary in the long term for which a new 10-year permit is requested.

Construction Sequencing

The project will be initiated with the removal trees followed by construction of the north maintenance access road and installation of the cofferdam. Construction will be conducted in the following sequence:

1. Removal of 24 black cottonwood trees from the upper riverbank.
2. Construction of the north maintenance access road for access to the work area. This road will be a permanent feature for future maintenance activities. The south maintenance access road may also be constructed during this step.
3. Preparation of the riverbank will include removal of existing riprap that was placed when the boat launch was constructed. New heavy loose riprap will be placed on the riverbank and will function as access to the work area, a solid base for the excavators, and future erosion control.
4. Install block nets in the river to exclude fish during cofferdam installation. The nets will be installed upstream and downstream to move fish away from the work area (upstream) and prevent them from entering the work area (downstream).
5. Installation of the temporary cofferdam in the river using vibratory hammer.
6. Dewater the area within the cofferdam using pump that will convey water to a tank or pond where it will remain until the sediments settle out. Water will then be discharged back into the river downstream of the work area.
7. Drive the H-pile supports for the concrete wall panels using vibratory hammer method with impact hammer method as needed.
8. Cast concrete walls in place.
9. Remove temporary cofferdam.
10. Remove equipment from work area.

Project Timing

The project is proposed to be constructed in 2021 between July and September. Construction activities will be limited to daylight hours and from 7:00 a.m. to 6:00 p.m., Monday through Friday.

Upland work away from the shoreline will take approximately 1 month to complete and includes earthwork, grading, installing constructing the access roads, and installation and removal of temporary erosion control measures.

In-water work will occur within the current Cowlitz River work window between August 1 through August 15 per the Corps and WDFW. This work will include installation of temporary cofferdam, pile driving, concrete panel installation and installing riprap. The total in water work is expected to take approximately 10 days (2 work weeks).

EXISTING CONDITIONS

Existing and Surrounding Land Uses

The property is zoned for “Parks, Recreation, and Open Space”. The site currently consists of a parking lot, boat launch, floating docks, various outbuildings, and walking trails. The land westerly adjacent to the Cowlitz River had been used as a location for dredge spoils from the emergency clean-up efforts after the eruption of Mount St. Helens in 1980. The site is defined by generally flat topography with an approximately 35 percent slope along the shoreline of the Cowlitz River which comprises the eastern project boundary. The vegetation onsite consists of mowed and maintained yard grass with a thin stand of black cottonwood (*Populus balsamifera*) trees along the shoreline. The study area is bordered to the north and west by property owned and utilized by the Castle Rock School District. Properties to the south consist of small residential lots containing single-family dwellings (Sheet 2).

Landscape Position

The project area consists of a portion of Cowlitz County Tax Parcel Number 308770100 located at 5040 Westside Highway in Castle Rock, Washington, within in a portion of Section 10, Township 9 North, and Range 2 West, of the Willamette Meridian at River Mile (RM) 17 of the Cowlitz River (Sheet 1). The Washington State Department of Ecology’s Water Quality Atlas maps the project area within lower portion of Watershed Resource Inventory Area (WRIA) 26 – Cowlitz Watershed, and is within the 12-digit Hydrologic Unit Code (HUC): 170800050904, within the Whittle Creek-Cowlitz River subwatersheds. The Toutle River is one of the largest tributaries to the Cowlitz River, with the confluence approximately 2.4 miles upstream of the site and the confluence of the Cowlitz River and Columbia River is approximately 17 miles downstream.

Aquatic Habitat

In general, aquatic habitat in the lower Cowlitz River has been degraded since western civilization arrived. Dam construction changed many of the baseline conditions, including habitat-forming processes, habitat types, primary productivity, the food web, access to habitats, and predation. In the 1970s, artificial levees were constructed on both sides of the Cowlitz River through the City of Castle Rock, Kelso, and Longview to prevent flooding. Additionally, the eruption of Mount St. Helens in 1980 changed the entire nature of the river. The mudflow that was conveyed down the Toutle River and into the Cowlitz raised the bottom depth by up to 15 feet in some areas greatly reducing the flood-carrying capacity (Lombard et al. 1981). Since the eruption, the Toutle River has continued the downstream movement of sediment-laden water into the Cowlitz and Columbia Rivers which require periodic dredging to maintain navigability by boat traffic.

The Cowlitz River is a Type 1 Stream according to CRMC *Chapter 18.10.130 Table 7* with a designated buffer width of 250 feet according to *Chapter 18.10.130 Table 8*. Additionally, the Cowlitz River is designated as a Type S (shoreline) and shoreline of statewide significance and as such is subject to shoreline regulations according to the City of Castle Rock Shoreline Master

Program (SMP) (City 2016). Shoreline Jurisdiction extends for 200 feet from the ordinary high water mark (OHWM) of the Cowlitz River. More information can be found in the *Critical Areas Report and Habitat Management Plan for the Al Helenberg Memorial Boat Launch Safety Improvements, Castle Rock, Washington* (ELS 2020).

Riparian Areas

The land westerly adjacent to the Cowlitz River around and including the project area had been used as a location for dredge spoils from the emergency clean-up efforts after the eruption of Mount St. Helens in 1980, leaving the soils onsite comprised of sand and silt. The site is defined by generally flat topography with an approximately 35 percent slope along the shoreline of the Cowlitz River. Riprap is present along the stream banks upstream and downstream of the project area. The riparian buffer of the Cowlitz River is functionally isolated by Mosier Road and the parking area for the boat launch in the southern portion of the project area and is functionally isolated by a frequently used and maintained gravel access road that runs from the parking area, north along the parcel boundary at the top of the shoreline slope for the extent of the project area. The vegetation onsite consists of mowed and maintained yard grass with a thin stand of cottonwood trees and invasive Himalayan and native trailing blackberry (*Rubus armeniacus* & *R. ursinus*) shrubs along the shoreline.

Table 2. Summary of Critical Areas.

Critical Area	Stream Type	Stream Buffer Width ¹	Shoreline Jurisdiction ²
Cowlitz River	Type S, “Shoreline of the State”	250 feet	200 feet

¹CRMC 18.10.130 Table 8

²CCSMP 3.1A.1.

AVOIDANCE AND MINIMIZATION

The preferred mitigation sequencing of first avoidance, then minimization, and finally compensation for unavoidable impacts to critical areas was taken into consideration during the project design process; however, due to the nature of the project certain impacts were unavoidable. Two alternatives analyses were prepared to address alternative designs (ELS 2020, WEST 2016).

The project has been designed to avoid and minimize impacts to habitats and species that may potentially occur in the vicinity of the project area. This will be accomplished by using the following measures:

Design:

- The original plan described to the agencies proposed construction of three walls and it was reduced to two at their request.
- Avoid detrimental impacts to fish during construction by constructing the temporary cofferdam.
- Dewatering behind the temporary cofferdam will be directed to a tank or pond for settling before being released into the river.

- Using vibratory installation methods for piling installation to the maximum extent possible to minimize the use of the impact driving.
- Stormwater runoff from the construction area will be directed to the tank or pond for settling before being released into the river. The stormwater will be collected independently of the river water pumped from within the cofferdam. Stormwater collection will begin following discharge of the river water back into the river.
- The north maintenance road will be constructed above OHW and will function as access to the work area for construction activities.

General

- Conditions in local, state, and federal permits will be followed.
- Any stockpiled soils from construction of the access roads and wall sections will either be hauled away the same day or covered with plastic until it is removed from the site.
- During construction disturbed soils will be stabilized by grading and compaction, and installation of temporary silt fence to avoid impacts to the river from erosion.
- Permanent erosion control of the site will include riprap stabilization of the riverbank and hydroseeding of the disturbed upland areas.
- No equipment refueling will take place within 150 feet of the river.

In-Water

- Contractors will have a spill containment and pollution control plan, and their employees will be trained in its implementation.
- The concrete panels will be constructed within the work area while the cofferdam is in place so that it can be constructed in the dry. Following construction, the area of construction will be cleaned of all remnants of concrete materials.
- New piles will be installed mainly using a vibratory hammer. Impact hammer will be used to move the piles through hard layers necessary to reach the desired depth.
- Bird deterrents taking the form of plastic or steel bird deterrent spikes will be placed atop the walls to prevent perching and impacts from bird activity. The deterrent spikes are available in lengths of 24 feet long and are intended to keep birds from landing and will not injure birds.
- A soft-start technique will be used for vibratory and impact-hammer pile driving outside of the cofferdam to allow aquatic species to leave the work area before full energy is used to drive the pile.
- Use of an impact hammer to install the cofferdam piling may require use of a confined bubble curtain.

UNAVOIDABLE IMPACTS

The proposed aquatic and riparian impacts to the Cowlitz River are unavoidable. The construction of the two 30-foot by 1.5-foot wall sections will permanently impact approximately 0.002 acres (90 sq. ft.) of stream channel below the OHWM. In order to construct the wall sections, 24 mature black cottonwood trees with a combined canopy of 0.45 acres (19,578 sq. ft.) will be removed from the shoreline, as well as 0.07 acres (3,188 sq. ft.) and 0.05 acres (2,271 sq. ft.) of gravel will be compacted north and south of the boat ramp (respectively) to create maintenance and construction access to the project site. A total of 0.002 acres (90 sq. ft.) of aquatic impacts are

proposed waterward of the OHWM while 0.57 acres (25,037 sq. ft.) of riparian impacts are proposed landward of the OHWM (Sheet 3). Project impacts are summarized in the table below.

Table 3. Proposed Impacts.

Habitat Area	Proposed Impact	Impact Amount
Aquatic Habitat (Waterward of OHWM)	Two Wall Segments (30' by 1.5')	0.002 ac./90 sq. ft.
	Total Aquatic Impacts	0.002 ac./90 sq. ft.
Riparian Habitat (Landward of OHWM)	North Maintenance Road (Gravel)	0.07 ac./3,188 sq. ft.
	South Maintenance Road (Gravel)	0.05 ac./2,271 sq. ft.
	Removal of 24 Black Cottonwood Trees (<i>Populus balsamifera</i>)	24 Trees <u>Canopy Area</u> 0.45 ac./19,578 sq. ft.
	Total Riparian Impacts	0.57 ac./25,037 sq. ft.

IMPACTED STREAM AND BUFFER FUNCTIONS

The physical habitat parameters include water quality, habitat access, habitat elements, channel conditions, flow and hydrology, and watershed conditions. The NMFS Matrix of Pathways and Indicators (1996) describes in detail how to determine if the physical parameter is functioning properly. This assessment is discussed in detail in Appendix A. The current condition of the approximately 0.50-acre of stream habitat that will be impacted by the project received a low score using this method.

Riparian functions in the impacted riparian areas are low when compared to best-functioning conditions for riparian buffers because they provide some minor habitat and provide some protection from streambank erosion, but there are few native trees and shrubs to provide most riparian functions or to provide woody material to the stream as the reach of stream within the project area is diked on both banks and armored with riprap.

MITIGATION SITE SELECTION RATIONALE

The Coweeman River Mitigation Bank (CRMB or Bank site) provides mitigation through Universal Credits for projects impacting wetlands, streams, buffers, and other aquatic resources. The portion of the Cowlitz River and associated buffer proposed for impact is located approximately 12 miles north of the CRMB site in the southern portion of the service area for CRMB (Sheets 4 and 5). Offsite mitigation has a greater likelihood of providing equal or improved habitat functions than the impacted habitat. The 2008 *Compensatory Mitigation for Losses of Aquatic Resources, Final Rule* (Corps) recommends purchasing mitigation bank credits for ecological considerations (lower risk of failure and lower temporal loss of resources and services) and to avoid the maintenance and contingency issues and outright failures that often accompany permittee-responsible mitigation sites. Use of CRMB substantially lowers the risk of failure and temporal loss of resource functions and services over newly established, permittee-responsible mitigation sites. As described below, the functional lift anticipated in the CRMB will adequately compensate for stream and buffer functions lost because of this project.

ANTICIPATED FUNCTIONAL LIFT AT MITIGATION BANK

The following are excerpts from the Coweeman River Mitigation Bank *Mitigation Banking Instrument* (Habitat Bank 2016):

The broad ecological goals of the CRMB's establishment are:

- Restore site hydrology and floodplain connectivity to existing and created aquatic areas;
- Increase habitat function and complexity for anadromous fish and other aquatic dependent wildlife;
- Re-establish wetland and riparian vegetation communities typically found in the Lower Columbia River floodplain environment.

The Bank will reconstruct a mosaic of habitat types within the floodplain environment, which is consistent with what would have historically been found in this dynamic riverine environment prior to human alteration during the late 19th and early 20th centuries. Before the Coweeman River was cleared of woody material and diked in the Kelso area, aquatic areas and floodplain uplands within the Bank site would have had a more consistent and sustained hydrologic connection to the Coweeman River. Because of these activities, the Coweeman River has become incised, with drained wetlands and lowered tributary elevations, which created points of hydrologic disconnection and incision throughout this floodplain environment. Additionally, historical aerial photographs and topographic mapping shows a mixture of trees and shrubs in the floodplain that are no longer present because of the last 100 years of clearing and agricultural activities on the bank site.

The Bank design addresses specific elements within the Salmon Recovery Plan (LCFRB 2010) such as protecting and restoring habitat types critical and beneficial to anadromous fish including the 208.70 acres of lowland forest preservation, of which 174.01 acres is priority old-growth forest providing shading and food chain support to 5 tributaries to the Coweeman River. The bank project also addresses the limiting factors within the Cowlitz and Coweeman Watersheds as identified by the Salmon Recovery Plan which include the loss of floodplain habitat and connectivity of wetlands and other aquatic habitats used by

anadromous fish, and the increase of river temperatures as a result of clearing the floodplain, riparian corridors and headwaters of the river systems (Habitat Bank, LLC and ELS 2016).

- With the completion of Phase 1, the Bank will have created 21.33 acres of new wetland area, rehabilitated 14.68 acres of existing wetland area, enhanced 14.53 acres of existing wetland area and preserved 8.44 acres of existing wetland area. The wetlands are located within a 14-digit HUC characterized within the Lower Columbia River Recovery Plan's Integrated Watershed Assessment as being locally impaired for hydrology, locally impaired for sediment conditions, and fully impaired for riparian functions (LCFRB 2010).
- The project's restoration activities will result in improvements to the following priority attributes that benefit Coweeman River Chinook, chum, and coho salmon, as defined within the Recovery Plan:
 - **Flow:** Minor grading to improve surface water connectivity between Wetland A and the tributaries will provide access to cool, permanent flow within the hillside area for forage and rearing of juvenile fish within Area A during low-water periods.
 - **Habitat Diversity:** The Bank includes in-river attraction points and refuge points with habitat features to provide a variety of instream habitat improvements for juvenile and adult salmonids. Newly created off-channel habitat in Areas B and C provide additional off-channel habitat to the system for juvenile salmonids. Improvements to the Wetland A outlet channel and creation of the Area A alcove will provide additional refuge, rearing and potential spawning habitat and increase fish passage for juvenile salmonids into Wetland A.
 - **Sediment Loading:** Re-grading the banks along the Coweeman River and installing native woody vegetation and LWM will provide improved channel stability.
 - **Temperature:** The Bank will preserve cold water tributary sources to Wetland A and the Coweeman River. Additionally, through the wetland and riparian upland plantings, a forested riparian corridor will establish over time and provide increased shading to the existing and created wetland areas and the outlet tributary to maintain cold water temperatures in those aquatic areas.

Due to the low functionality of the impacted stream and riparian habitats on the project site and the compensatory functional lift anticipated at the Bank site, the Bank will adequately mitigate for all stream and riparian functions permanently impacted by the proposed detention structure modifications.

UNIVERSAL MITIGATION CREDIT CALCULATION

Appendix E.6 of the Mitigation Banking Instrument (MBI) for the CRMB states, "Impacts to critical area buffers for wetlands, streams, lakes, and other areas regulated by local jurisdictions within the Bank service area, including Cowlitz County, can be mitigated by use of universal bank credits with the approval of the appropriate regulatory agencies. Since one bank credit is generated for every 4 acres of upland buffer or riparian buffer restoration, a ratio of "0.25 : 1" for critical area buffer impacts results in a "1 : 1" ratio for an area on the ground of permitted buffer impact to buffer restoration by the Bank." This project will directly impact 0.57 acres (25,037 sq. ft.) of

the riparian buffer of the Cowlitz River which can be fully compensated for with the purchase of 0.14 universal mitigation credits. The table below summarizes the universal credits to be purchased.

Table 4. Universal Mitigation Credits Proposed for Purchase.

Proposed Riparian Buffer Impact	Impact Amount	Mitigation Ratio	Credits Proposed for Purchase
North Maintenance Road (Gravel)	0.07 ac. 3,188 sq. ft.	0.25:1	0.0175
South Maintenance Road (Gravel)	0.05 ac. 2,271 sq. ft.		0.0125
Removal of 24 Black Cottonwood Trees (<i>Populus balsamifera</i>)	24 Trees <u>Canopy Area</u> 0.45 ac. 19,578 sq. ft.		0.1125
Total Credit Purchase	0.14		

DISCOUNTED SERVICE ACRE YEARS (DSAYs) CALCULATION

When the aquatic habitat proposed for impact supports the presence of listed salmonid species, the National Marine Fisheries Service (NMFS) has recommended the Habitat Equivalency Analysis (HEA) to quantify aquatic habitat and riparian habitat losses and gains. This method was used to determine DSAYs, which represents the quantified functional habitat loss at the project site. Details of this analysis are included in Appendix A. This analysis determined that 0.41 DSAYs are required to fully mitigate the 0.002 acre (90 sq. ft.) of aquatic habitat impact proposed by the project.

Table 5. Discounted Service Acre Years (DSAYs) Proposed for Purchase.

Proposed Aquatic Habitat Impact	Impact Amount	DSAYs Proposed for Purchase
Two Wall Sections (30' by 1.5')	0.002 ac./90 sq. ft.	0.41

CREDIT PURCHASE OR TRANSFER TIMING

The City of Castle Rock will enter into a Purchase Agreement with Habitat Bank for mitigation credits (in the quantity specified in Tables 4 and 5) that would appropriately mitigate for the proposed project impacts. The actual purchase of credits may occur prior to permit issuance, or upon permit issuance. However, in no case shall credits be applied (e.g. debited from the bank) to a receiving (impact) project unless and until permits have been issued for the underlying activity by the agencies with jurisdiction. Nothing in the mitigation credit Purchase Agreement shall be interpreted or construed to permit any activity that otherwise requires a federal, state, and/or local permit. Upon permit issuance and completion of purchase, the transfer will be made. Proof of the mitigation transfer will be provided in the form of a notification letter to the approving agency(s).

CONFIRMATION OF MITIGATION CREDIT AVAILABILITY

Habitat Bank has met all the required terms and conditions for the release of mitigation credits from the CRMB which are currently available for use within the Bank's approved Service Area (Sheet 5). Proof of the current number of available mitigation credits at the CRMB site can be confirmed by approving agency(s) through the IRT.

Kate Thompson

Washington Department of Ecology
Shorelands and Environmental Assistance Program
P.O. Box 47600
Olympia, WA 98504
(360) 407-6749
kate.thompson@ecy.wa.gov

Suzanne Anderson

US Army Corps of Engineers
Regulatory Branch, Seattle District
4735 E Marginal Way South
PO Box 3755
Seattle, WA 98124
206-764-3708
Suzanne.L.Anderson@usace.army.mil

REFERENCES

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- City of Castle Rock. 2016. *Shoreline Master Program*, Washington State Department of Ecology Partnership. September 2016.
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FIGURES

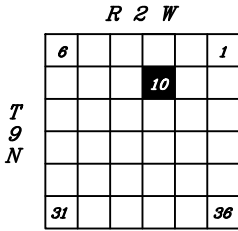
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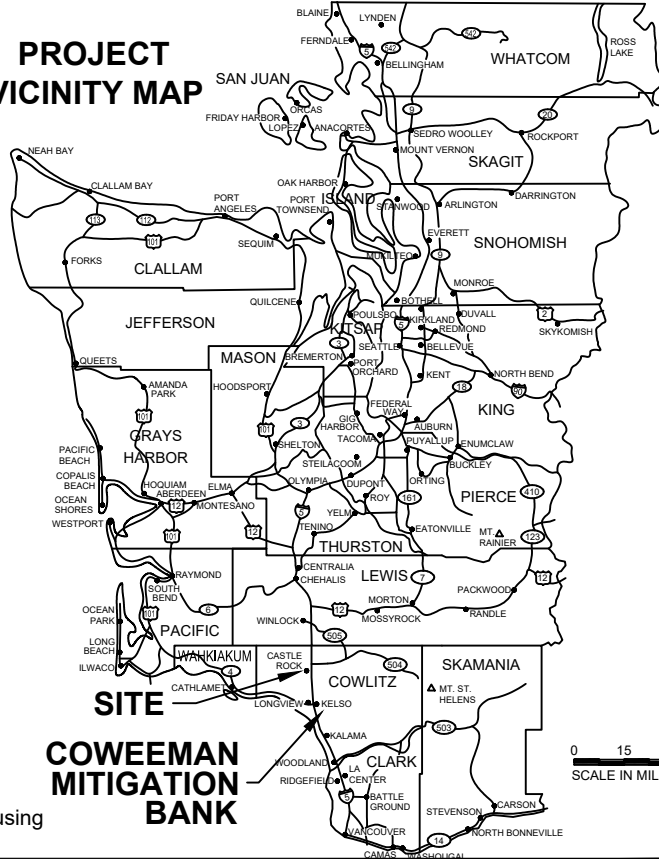
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LOCATION MAP



NOTE:
USGS topographic quadrangle map reproduced using MAPTECH Inc., Terrain Navigator Pro software.

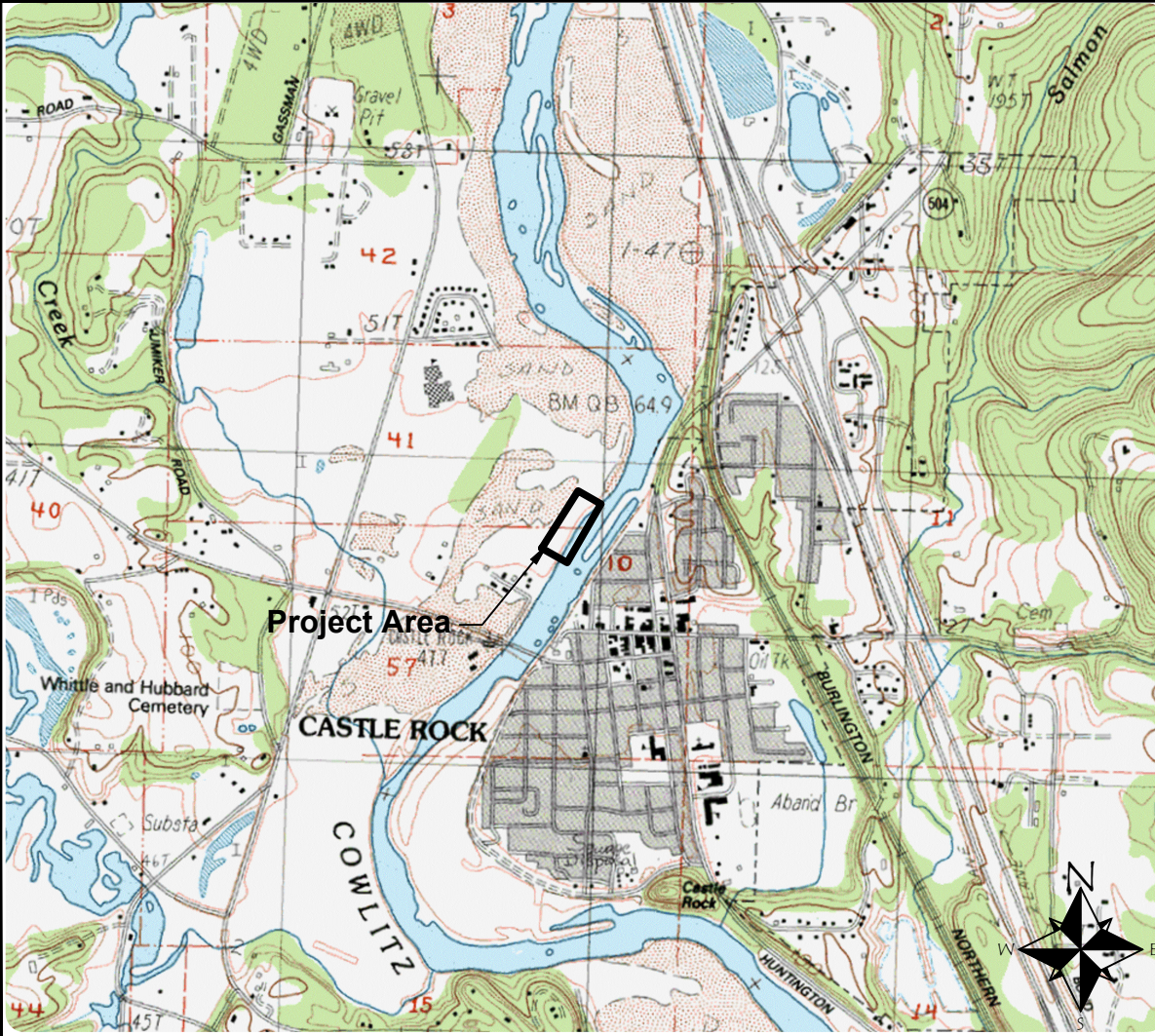
PROJECT VICINITY MAP



COWEEMAN MITIGATION BANK

PROPOSED: Construction of structure to reduce streamflow velocities in Cowlitz River
NEAR: Castle Rock
COUNTY: Cowlitz
STATE: WA
SHEET 1 OF 9
DATE: 7/28/20

VICINITY MAP
APPLICANT: City of Castle Rock
PROJECT NAME: C.R. Boat Launch Safety Improvements
REFERENCE #: Not Yet Assigned
SITE LOCATION ADDRESS:
 R.M. 17.6 Access at 5040 Westside Highway
 Castle Rock, WA 98611



PURPOSE: Safety and access improvements at boat launch
DATUM: NAD83
ADJACENT PROPERTY OWNERS:

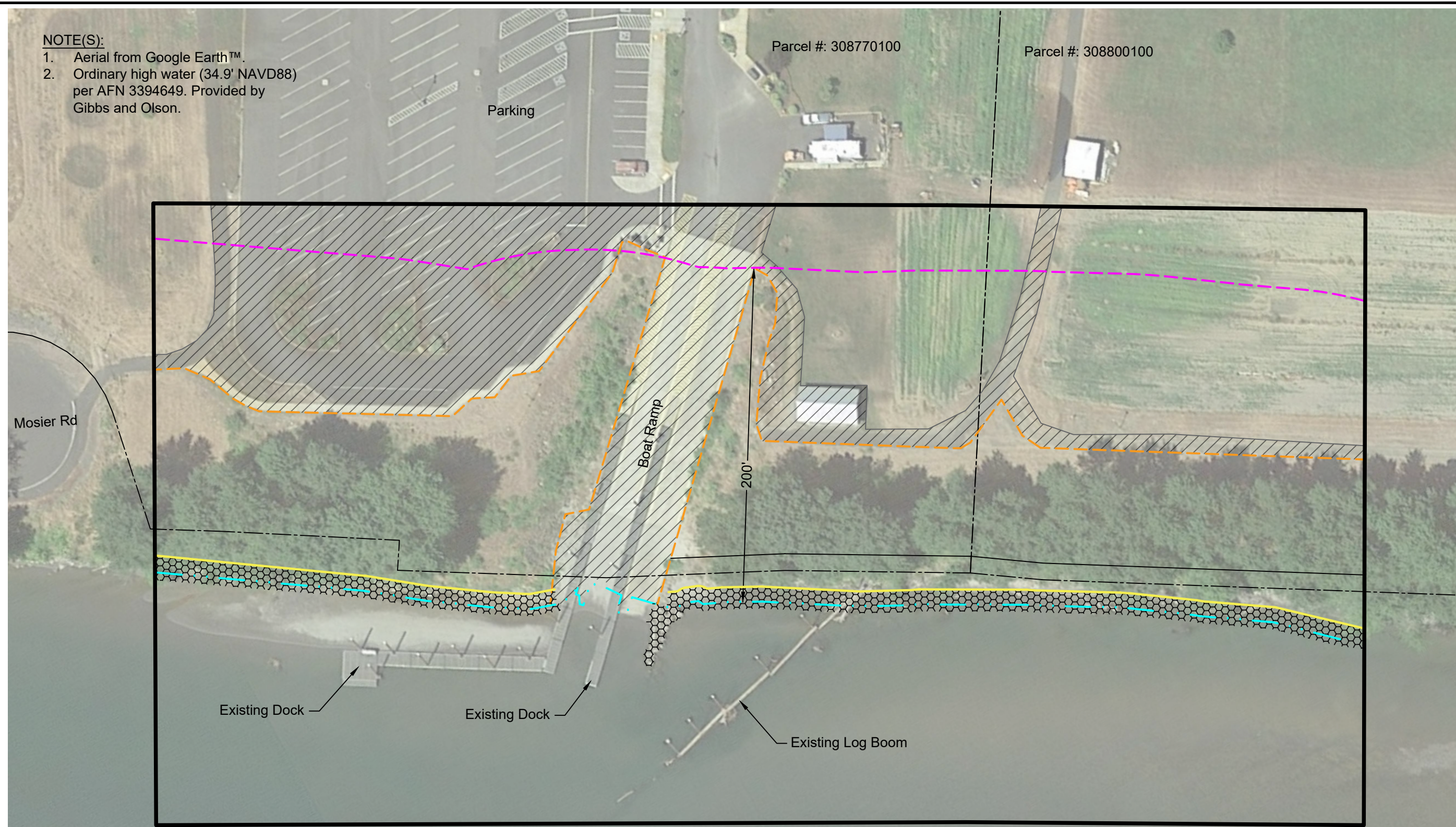
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 Longview, WA 98632
 Phone: (360) 578-1371



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NOTE(S):

1. Aerial from Google Earth™.
2. Ordinary high water (34.9' NAVD88) per AFN 3394649. Provided by Gibbs and Olson.



LEGEND:

- Project Area
- Parcel Boundaries
- Stream with Flow Direction
- OHWM

LEGEND:

- Shoreline Jurisdiction (200')
- Functionally Isolated Shoreline Buffer (250')
- Existing Impervious Surface
- Existing Rip Rap
- Existing Levee

Cowlitz River (Type S, Shoreline of Statewide Significance)



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 Longview, WA 98632
 Phone: (360) 578-1371



PURPOSE: Safety and access improvements at boat launch

DATUM: NAD83

ADJACENT PROPERTY OWNERS:

EXISTING CONDITIONS

APPLICANT: City of Castle Rock
PROJECT NAME: C.R. Boat Launch Safety Improvements
REFERENCE #: Not Yet Assigned
SITE LOCATION ADDRESS:
 R.M. 17.6 Access at 5040 Westside Highway
 Castle Rock, WA 98611

PROPOSED: Construction of structure to reduce streamflow velocities

IN Cowlitz River
NEAR: Castle Rock
COUNTY: Cowlitz
STATE: WA
SHEET 2 OF 9
DATE: 7/28/20

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LEGEND:

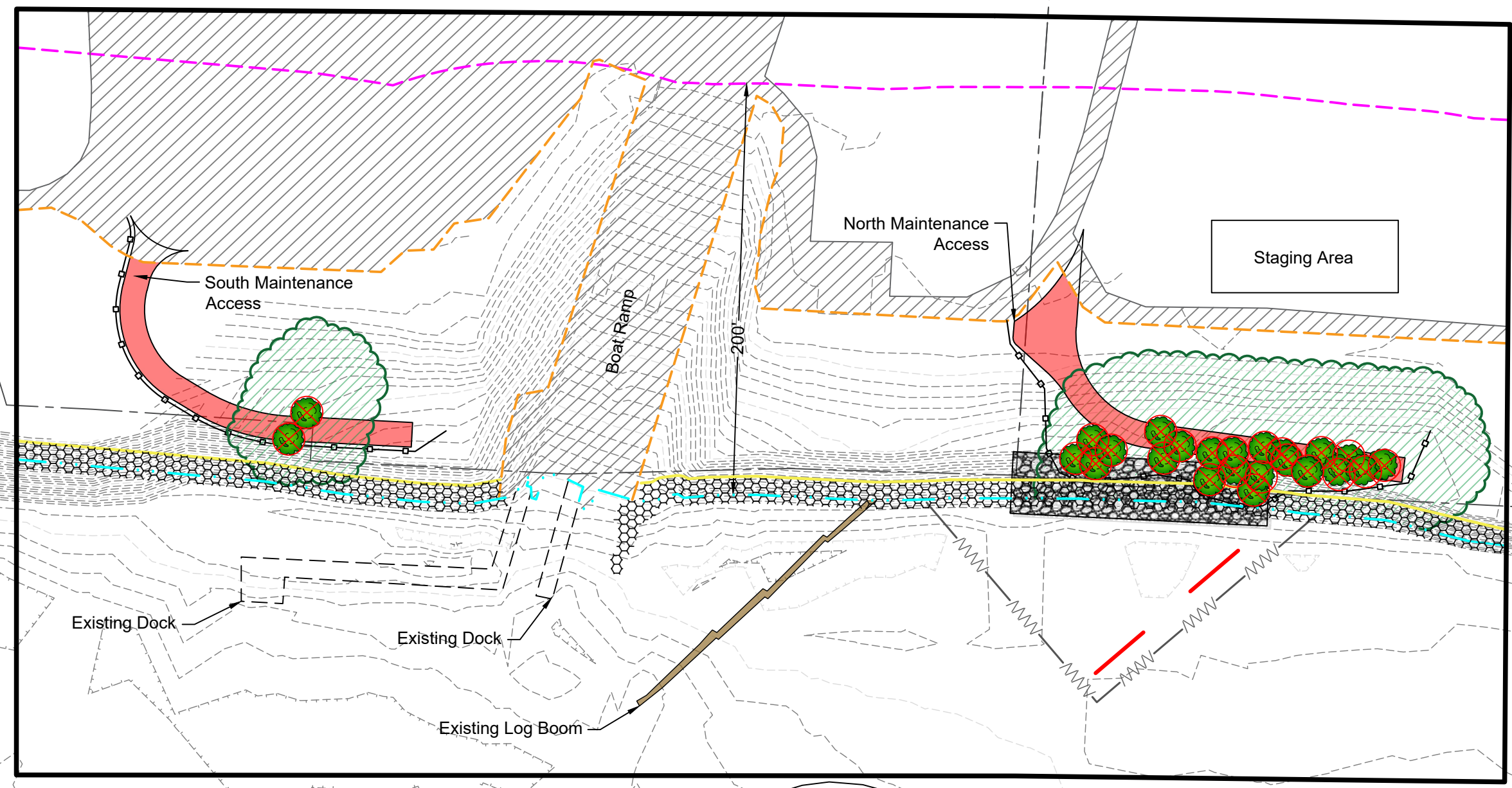
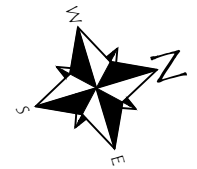
- Project Area
- Parcel Boundaries
- Shoreline Jurisdiction (200')
- Functionally Isolated Shoreline Buffer (250')
- OHWM
- Existing Impervious Surface
- Existing Rip Rap
- Existing Levee

LEGEND:

- Silt Fence
- Gravel Maintenance Access Impacts
North - (0.07 ac./ 3,188 sq. ft.)
South - (0.05 ac./ 2,271 sq. ft.)
- Riprap to be Replaced
Landward of OHWM - (0.06 ac./ 2,400 sq. ft.)
Waterward of OHWM - (0.03 ac./ 1,200 sq. ft.)
- Cofferdam
- Wall Sections (30' x 1'6" x 45')(0.001 ac./ 45 sq. ft. Each)

Cottonwood Trees to be Removed

- Stems (24 Total)
- Canopy (0.45 ac./ 19,578 sq. ft.)



Cowlitz River (Type S, Shoreline of Statewide Significance)

NOTE(S):

1. Site plan, topography, and bathymetry from Gibbs and Olson.
2. Ordinary high water (34.9' NAVD88) per AFN 3394649: Provided by Gibbs and Olson.



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PURPOSE: Safety and access improvements at boat launch

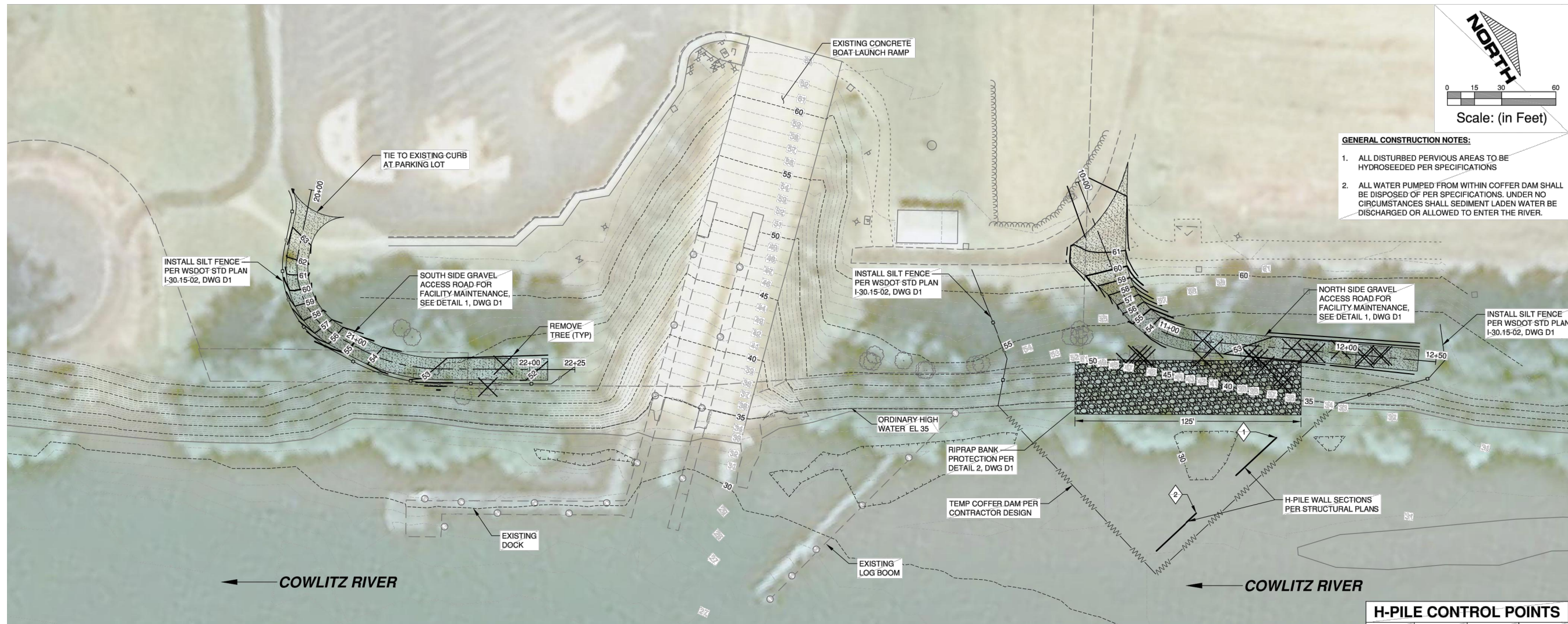
DATUM: NAD83
ADJACENT PROPERTY OWNERS:

PROPOSED CONDITIONS

APPLICANT: City of Castle Rock
PROJECT NAME: C.R. Boat Launch Safety Improvements
REFERENCE #: Not Yet Assigned
SITE LOCATION ADDRESS:
R.M. 17.6 Access at 5040 Westside Highway
Castle Rock, WA 98611

PROPOSED: Construction of structure to reduce streamflow velocities
IN: Cowlitz River
NEAR: Castle Rock
COUNTY: Cowlitz **STATE:** WA
SHEET 3 OF 9
DATE: 7/28/20

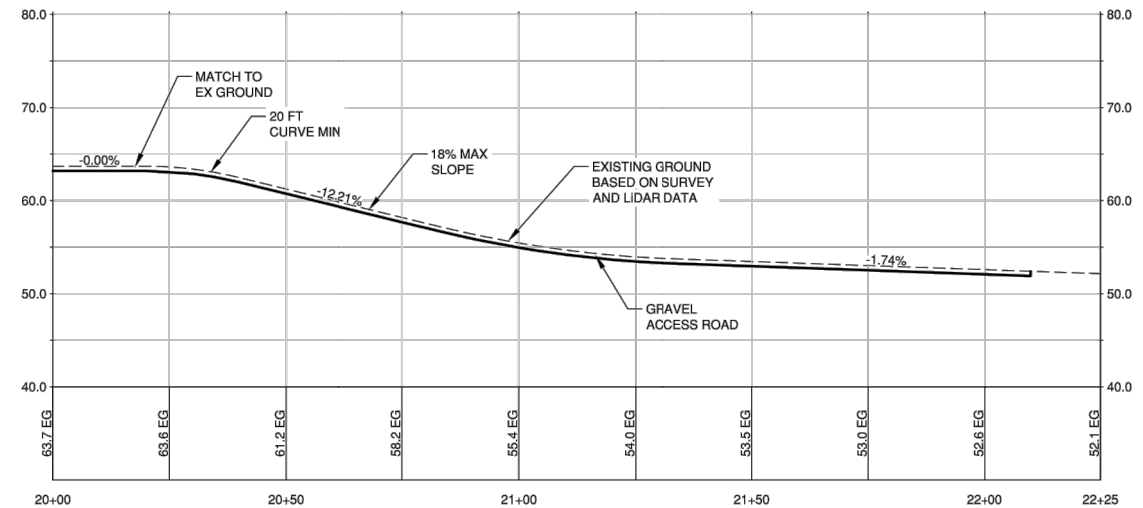
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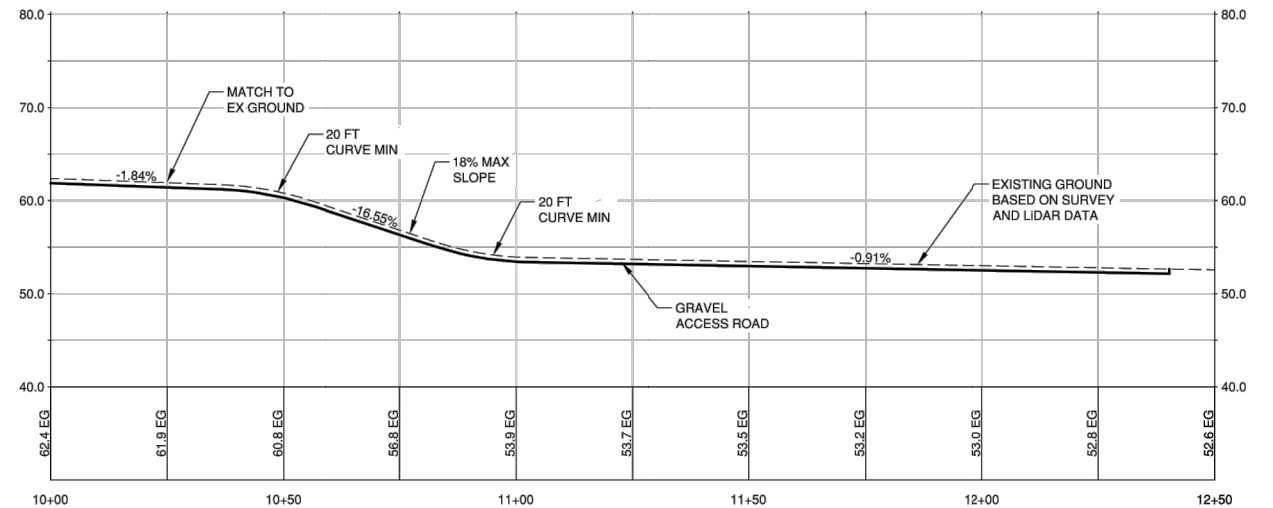
- GENERAL CONSTRUCTION NOTES:**
1. ALL DISTURBED PERVIOUS AREAS TO BE HYDROSEED PER SPECIFICATIONS
 2. ALL WATER PUMPED FROM WITHIN COFFER DAM SHALL BE DISPOSED OF PER SPECIFICATIONS. UNDER NO CIRCUMSTANCES SHALL SEDIMENT LADEN WATER BE DISCHARGED OR ALLOWED TO ENTER THE RIVER.

H-PILE CONTROL POINTS

POINT NO	NORTHING	EASTING	ANGLE
1	354134.53	1030918.92	S11°4'13"E
2	354074.89	1030930.98	S11°4'13"E



SOUTH ACCESS ROAD



NORTH ACCESS ROAD

RIGHT-OF-WAY DISCLAIMER
 THE RIGHT-OF-WAY AND/OR PROPERTY LINES SHOWN HEREON ARE BASED ON AVAILABLE INFORMATION, NOT ON A SURVEYED LOCATION AND ARE ONLY APPROXIMATE

PROPOSED: Construction of structure to reduce streamflow velocities
IN Cowlitz River
NEAR: Castle Rock
COUNTY: Cowlitz **STATE:** WA
SHEET 4 **OF** 9
DATE: 7/28/20

BOAT LAUNCH PLAN VIEW
APPLICANT: City of Castle Rock
PROJECT NAME: C.R. Boat Launch Safety Improvements
REFERENCE #: Not Yet Assigned
SITE LOCATION ADDRESS:
 R.M. 17.6 Access at 5040 Westside Highway
 Castle Rock, WA 98611

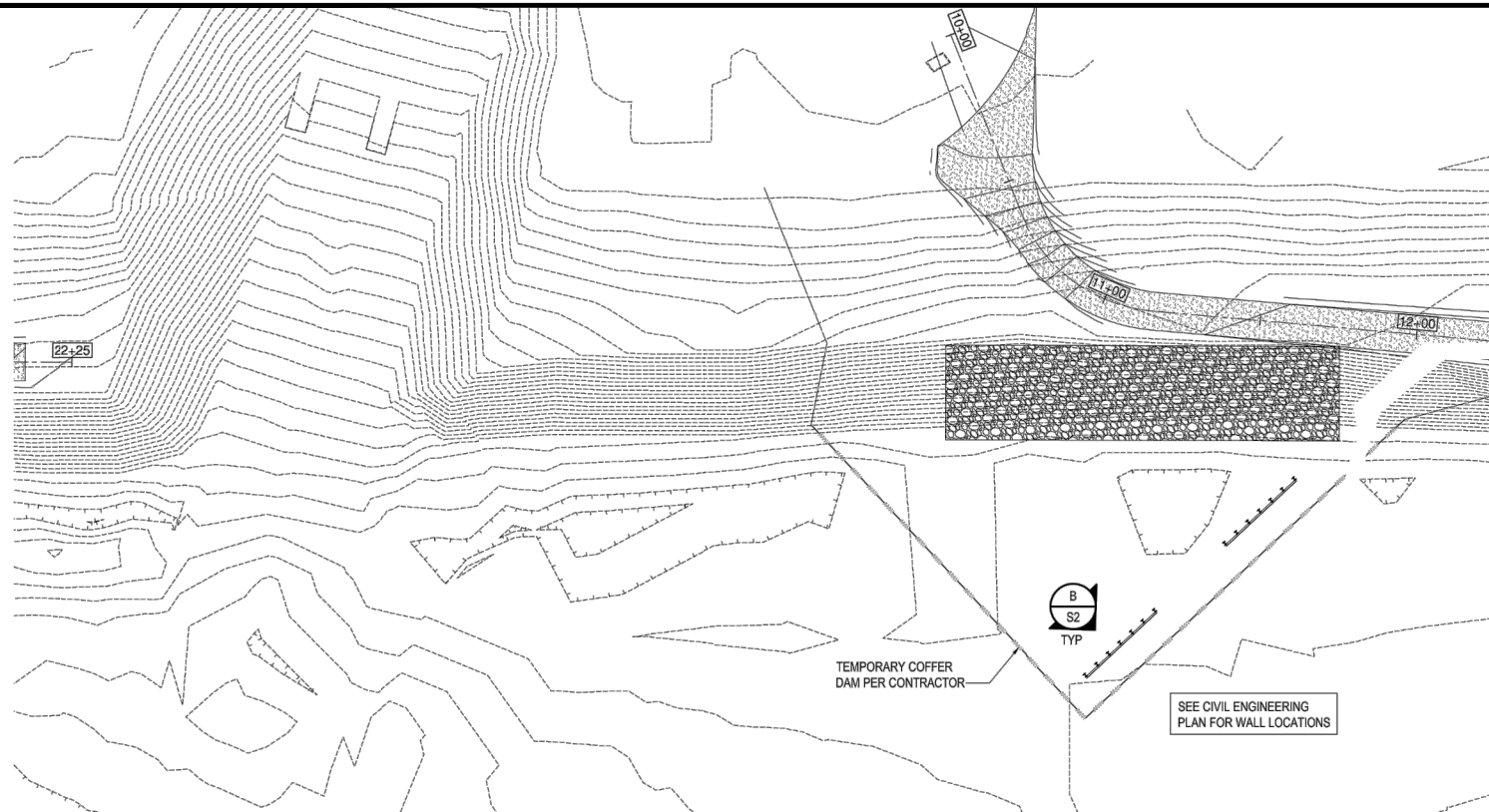
PURPOSE: Safety and access improvements at boat launch
DATUM: NAD83
ADJACENT PROPERTY OWNERS:

NOT TO SCALE

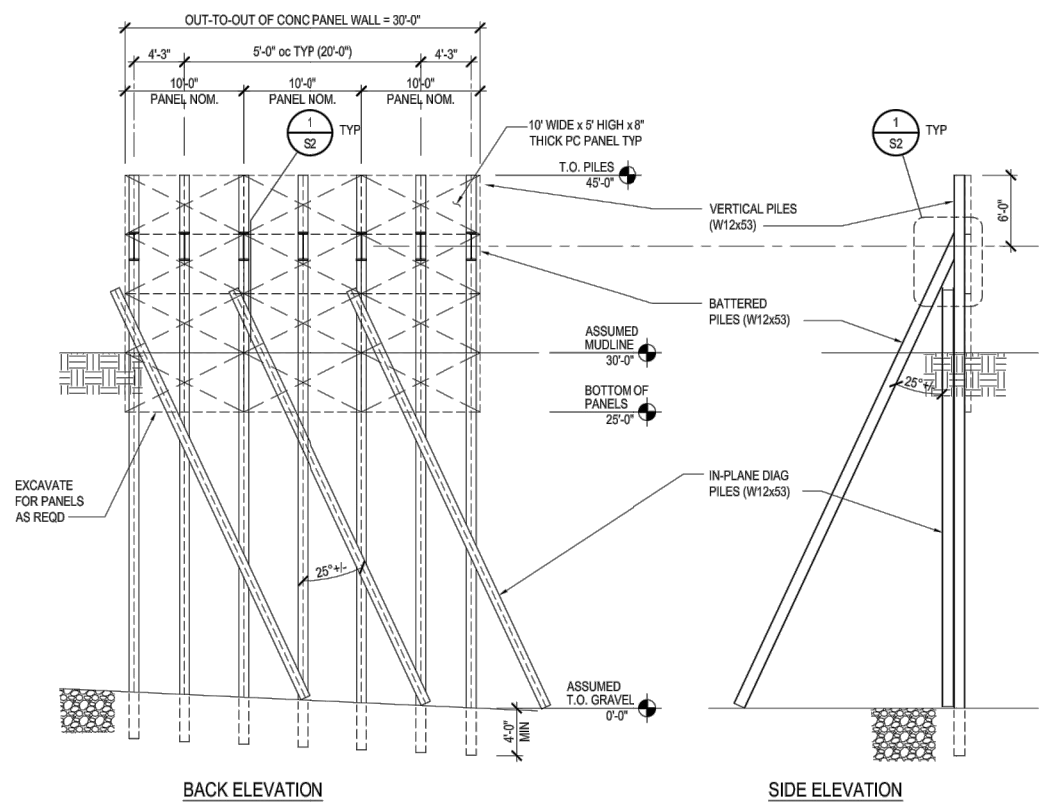


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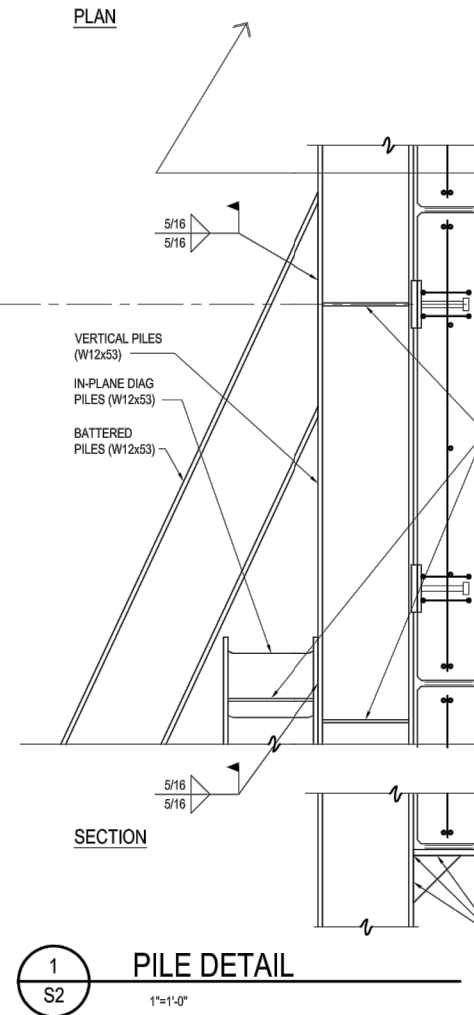
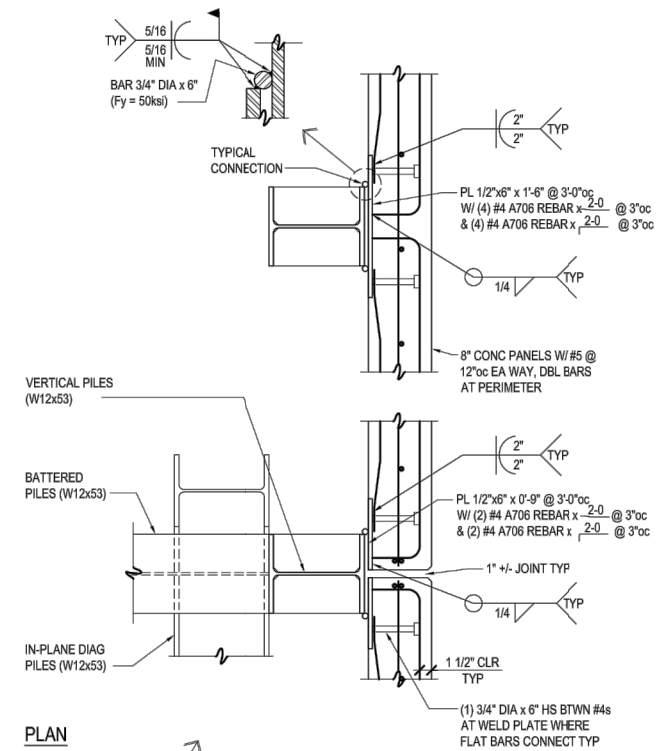


A
S2
PARTIAL PLAN
1" = 30'-0"



B
S2
WALL ELEVATION
1/8" = 1'-0"

- NOTES**
- BATTER & IN-LINE DIAGONAL PILES TO BE VIBRATORY DRIVEN TO REFUSAL AT GRAVEL LAYER. GRAVEL LAYER ASSUMED TO BE APPROXIMATELY 30 FEET BELOW MUD LINE. IF SHALLOWER GRAVEL LAYER PREVENTS PILE FROM BEING VIBRATORY DRIVEN TO REQUIRED DEPTH, CONTACT ENGINEER TO VERIFY IF ACCEPTABLE OR IF HAMMER DRIVING WILL BE REQUIRED.
 - SOLDIER PILES TO BE VIBRATORY DRIVEN TO REFUSAL AT THE ASSUMED GRAVEL LAYER APPROXIMATELY 30 FEET BELOW THE MUD LINE AND THEN HAMMER DRIVEN AN ADDITIONAL 4 FEET MINIMUM. USE DRIVING SHOE AT END OF THE PILES AND AIR BUBBLE CURTAIN FOR PORTION OF DRIVING WITH HAMMER. USE BUBBLE TUBING AS A PREFERRED METHOD TO CREATE A CURTAIN AROUND THE PILE.
 - SEE GEOTECHNICAL REPORT FOR INFORMATION CONCERNING SOILS AT INSTALLATION SITE.



1
S2
PILE DETAIL
1" = 1'-0"

- NOTE(S):**
- Concrete panel walls were designed by Gibbs and Olson.

RIGHT-OF-WAY DISCLAIMER
THE RIGHT-OF-WAY AND/OR PROPERTY LINES SHOWN HEREON ARE BASED ON AVAILABLE INFORMATION, NOT ON A SURVEYED LOCATION AND ARE ONLY APPROXIMATE

SCALE IN FEET
0 10 20 30 40 50 60 70 80 90 100

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PURPOSE: Safety and access improvements at boat launch

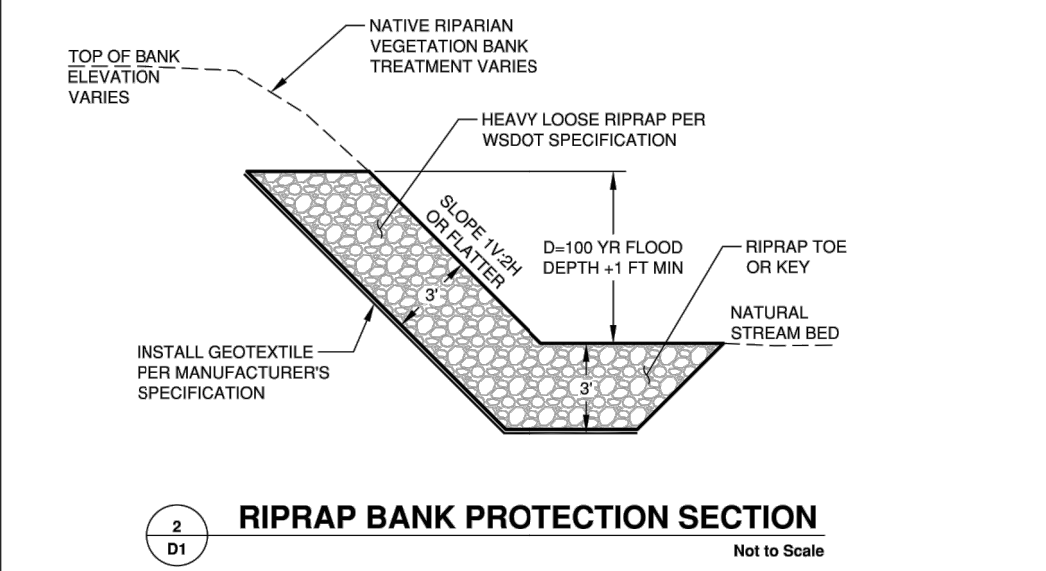
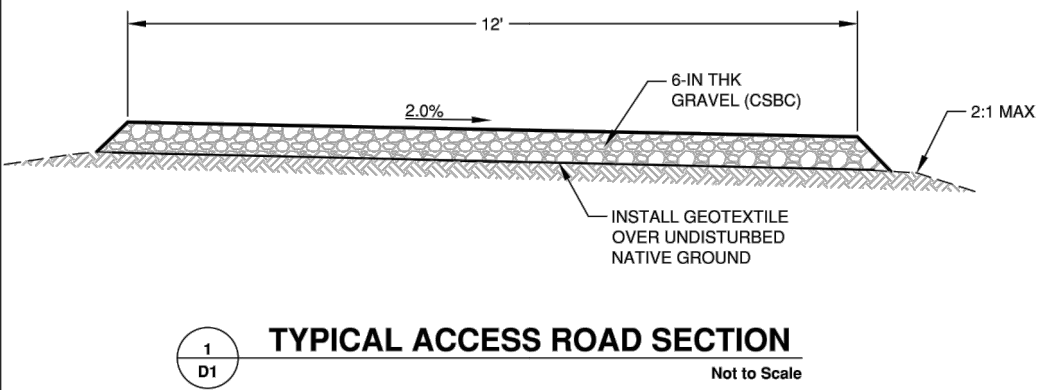
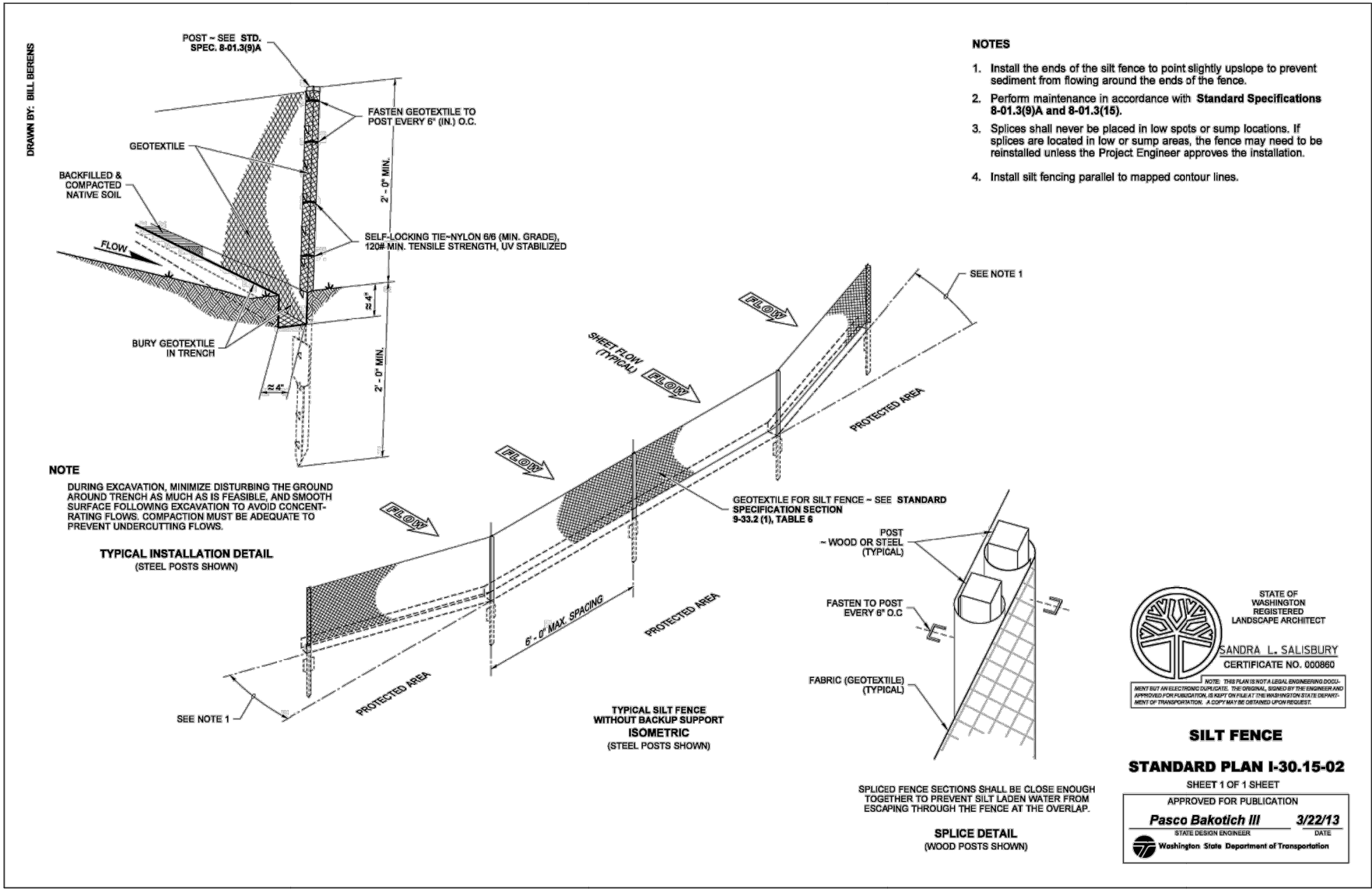
DATUM: NAD83

ADJACENT PROPERTY OWNERS:

CONCRETE PILE WALLS DETAIL
APPLICANT: City of Castle Rock
PROJECT NAME: C.R. Boat Launch Safety Improvements
REFERENCE #: Not Yet Assigned
SITE LOCATION ADDRESS: R.M. 17.6 Access at 5040 Westside Highway Castle Rock, WA 98611

PROPOSED: Construction of structure to reduce streamflow velocities IN CowIitz River
NEAR: Castle Rock
COUNTY: CowIitz
STATE: WA
SHEET 5 OF 9
DATE: 7/28/20

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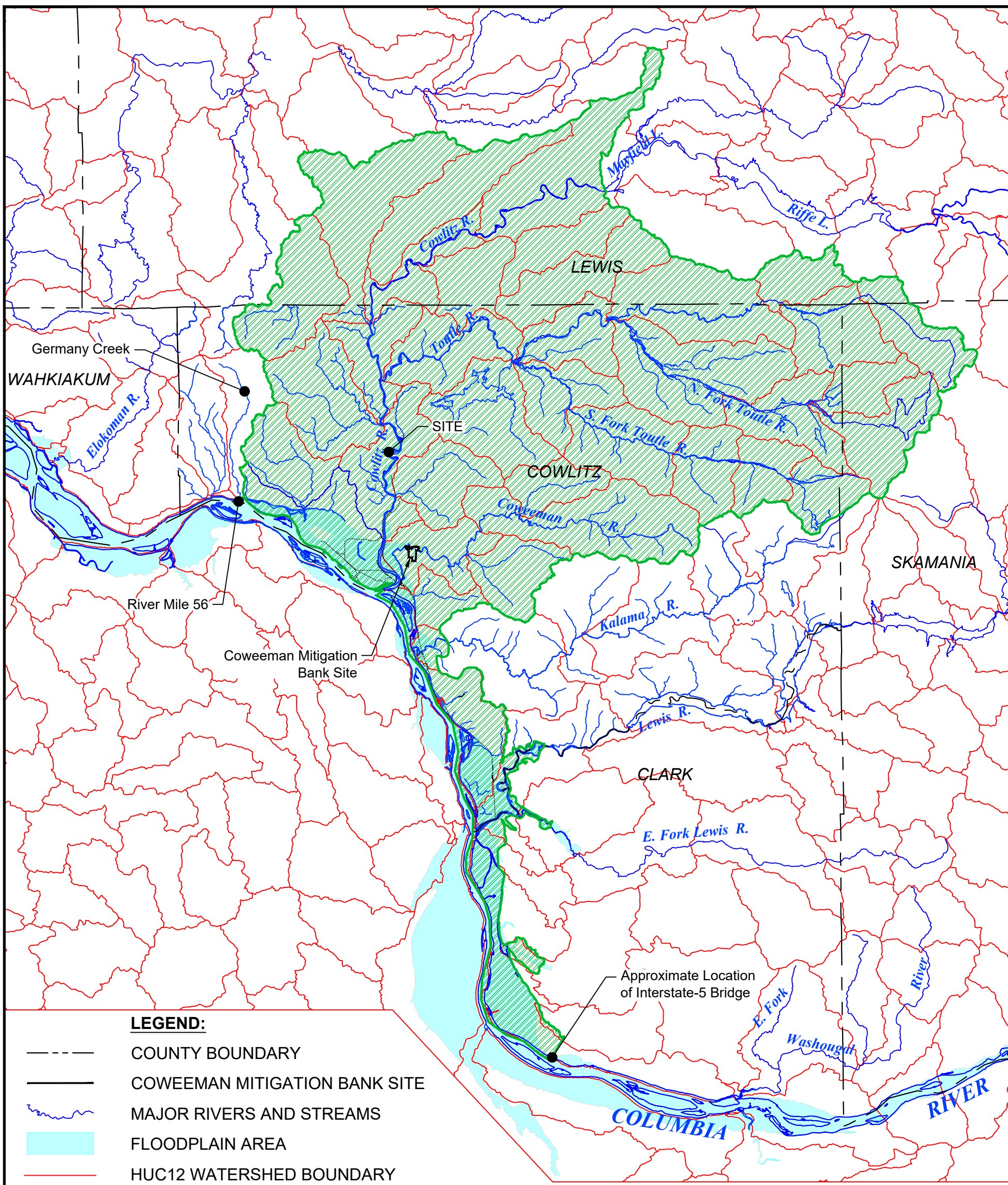
PROPOSED: Construction of structure to reduce streamflow velocities IN Cowlitz River
NEAR: Castle Rock
COUNTY: Cowlitz
STATE: WA
SHEET 6 OF 9
DATE: 7/28/20

BOAT LAUNCH CROSS SECTION VIEW
APPLICANT: City of Castle Rock
PROJECT NAME: C.R. Boat Launch Safety Improvements
REFERENCE #: Not Yet Assigned
SITE LOCATION ADDRESS: R.M. 17.6 Access at 5040 Westside Highway Castle Rock, WA 98611

PURPOSE: Safety and access improvements at boat launch
DATUM: NAD83
ADJACENT PROPERTY OWNERS:

NOT TO SCALE
1157 3rd Ave., Suite 220A
Longview, WA 98632
Phone: (360) 578-1371





LEGEND:

- COUNTY BOUNDARY
- COWEEMAN MITIGATION BANK SITE
- MAJOR RIVERS AND STREAMS
- FLOODPLAIN AREA
- HUC12 WATERSHED BOUNDARY
- COWEEMAN MITIGATION BANK UNIVERSAL CREDIT SERVICE AREA

SERVICE AREA LIMITATIONS:

- COLUMBIA RIVER UPSTREAM LIMIT: INTERSTATE 5 BRIDGE IN VANCOUVER
- COLUMBIA RIVER DOWNSTREAM LIMIT: RIVER MILE 56 NEAR STELLA
- COWLITZ WATERSHED: ALL OF WRIA 26 BELOW MAYFIELD DAM

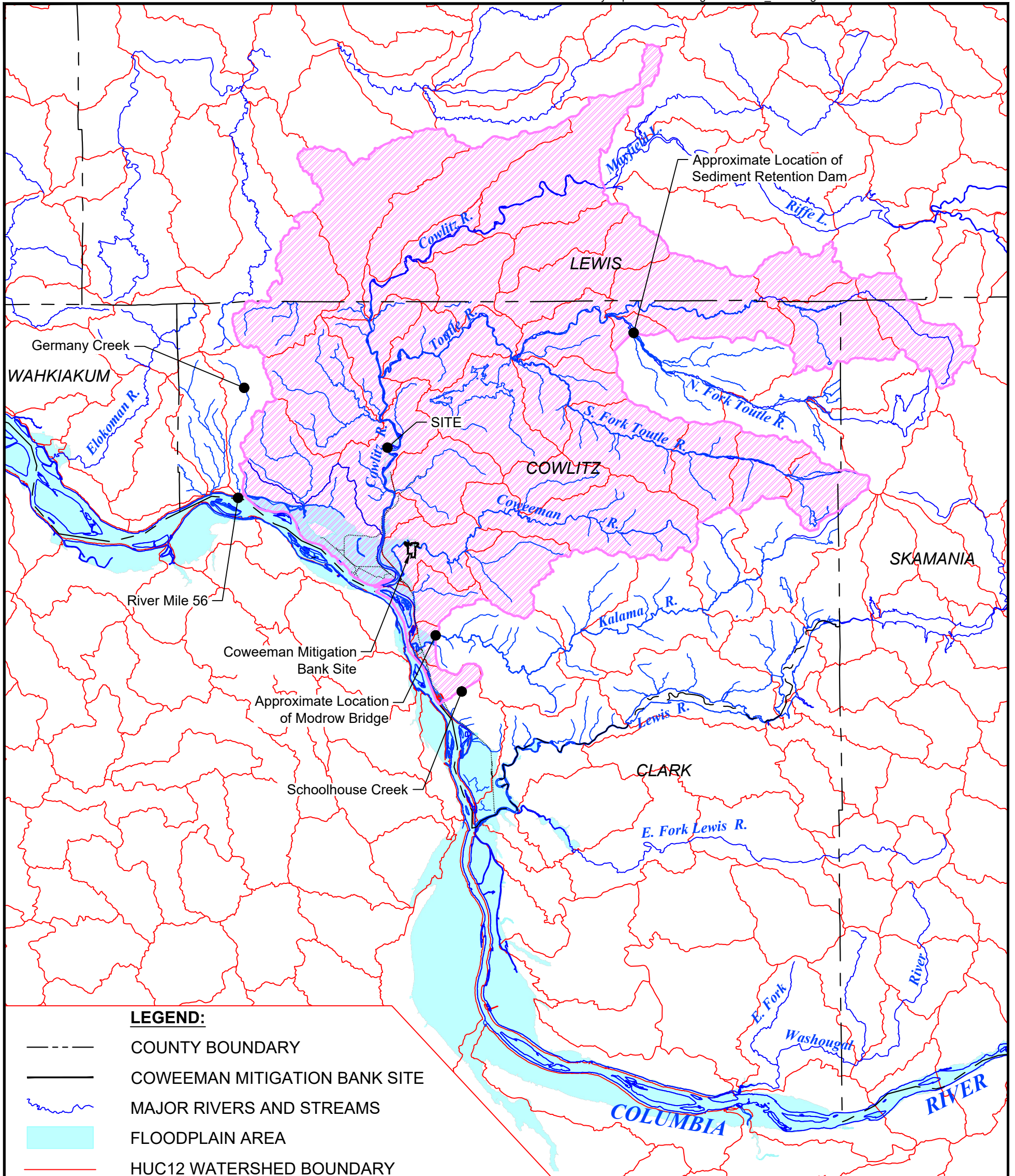
NOTES:

1. STATE, COUNTY, RIVERS, AND STREAM BOUNDARIES FROM ECOLOGY WEBSITE:
<http://www.wsdot.wa.gov/mapsdata/geodatacatalog/default.htm>
2. FLOODPLAIN DATA FROM J. BURKE, UNIVERSITY OF WASHINGTON
3. HUC12 WATERSHED BOUNDARIES FROM USGS WEBSITE:
<http://www.water.usgs.gov/wsc/cat/17080001.html>
4. BASE MAP PREPARED BY ECOLOGICAL LAND SERVICES, INC., FEBRUARY 2015.



ECOLOGICAL LAND SERVICES, INC.
1157 3rd Avenue, Suite 220
Longview, WA 98632

<p>PURPOSE: Safety and access improvements at boat launch</p> <p>DATUM: NAD83</p> <p>ADJACENT PROPERTY OWNERS:</p>	<p>Coweeman Bank Universal Credit Service Area</p> <p>APPLICANT: City of Castle Rock</p> <p>PROJECT NAME: C.R. Boat Launch Safety Improvements</p> <p>REFERENCE #: Not Yet Assigned</p> <p>SITE LOCATION ADDRESS: R.M. 17.6 Access at 5040 Westside Highway Castle Rock, WA 98611</p>	<p>PROPOSED: Construction of structure to reduce streamflow velocities in Cowlitz River</p> <p>NEAR: Castle Rock</p> <p>COUNTY: Cowlitz STATE: WA</p> <p>SHEET 7 OF 9</p> <p>DATE: 7/28/20</p>
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LEGEND:

- COUNTY BOUNDARY
- COWEEMAN MITIGATION BANK SITE
- MAJOR RIVERS AND STREAMS
- FLOODPLAIN AREA
- HUC12 WATERSHED BOUNDARY
- COWEEMAN MITIGATION BANK DSAY SERVICE AREA*



SERVICE AREA LIMITATIONS:

- COLUMBIA RIVER UPSTREAM LIMIT: BETWEEN RIVER MILE 77 & 78 AT SHOOLHOUSE CREEK
- COLUMBIA RIVER DOWNSTREAM LIMIT: RIVER MILE 56 NEAR STELLA
- COWLITZ WATERSHED: ALL OF WRIA 26 BELOW MAYFIELD DAM EXCEPT FOR ABOVE SEDIMENT RETENTION STRUCTURE (SRS) ON THE NORTH FORK OF THE TOUTLE RIVER



NOTES:

1. STATE, COUNTY, RIVERS, AND STREAM BOUNDARIES FROM ECOLOGY WEBSITE: <http://www.wsdot.wa.gov/mapsdata/geodatacatalog/default.htm>
2. FLOODPLAIN DATA FROM J. BURKE, UNIVERSITY OF WASHINGTON.
3. HUC12 WATERSHED BOUNDARIES FROM USGS WEBSITE: <http://www.water.usgs.gov/wsc/cat/17080001.html>.
4. BASE MAP PREPARED BY ECOLOGICAL LAND SERVICES, INC., FEBRUARY 2015.

*For details on DSAY use for specific fish species within the DSAY Service Area Boundary, please refer to the service area limitations and boundaries for certain species contained in section E.3 of Appendix E.



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Phone: (360) 578-1371

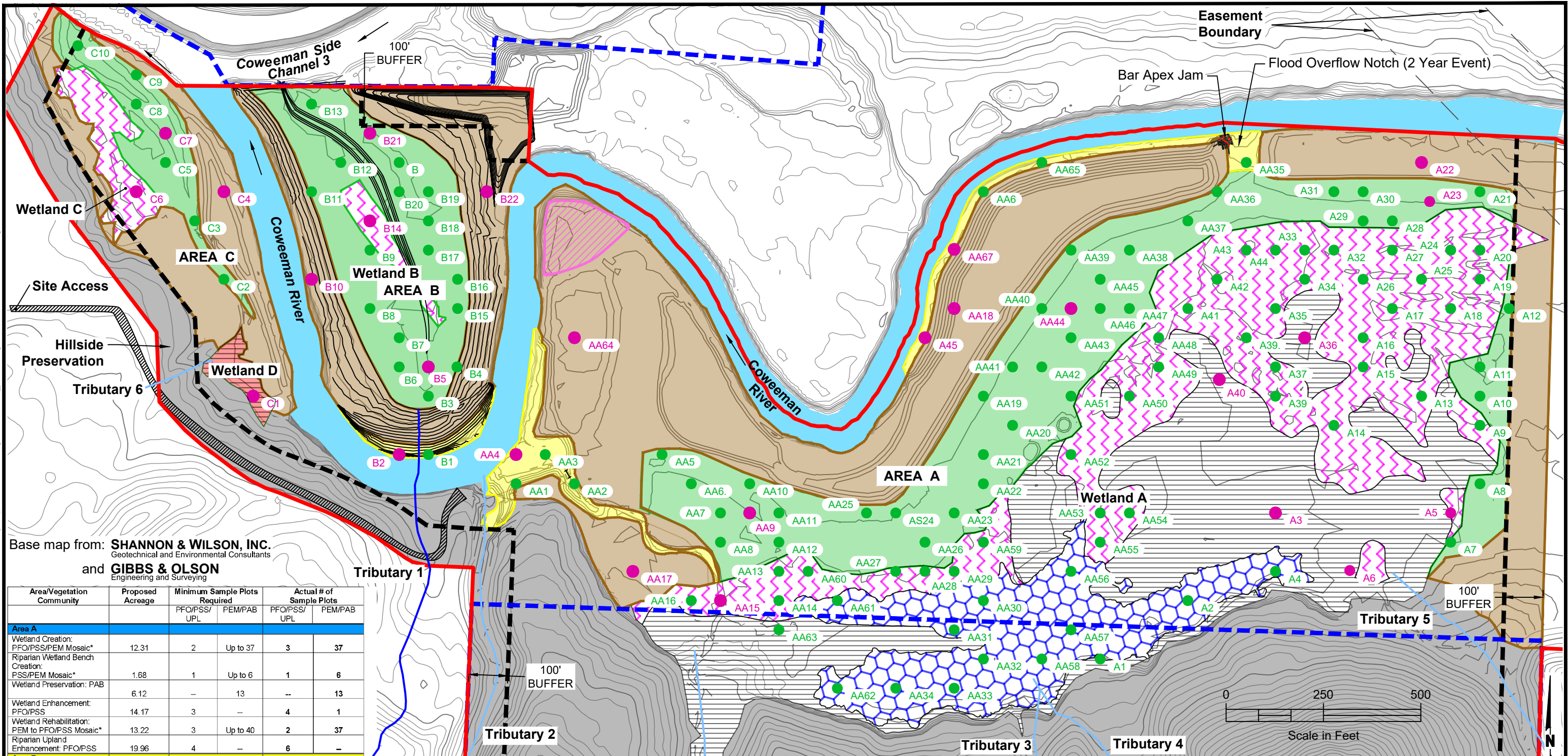
PURPOSE: Safety and access improvements at boat launch

DATUM: NAD83
ADJACENT PROPERTY OWNERS:

COWEEMAN BANK DSAY CREDIT SERVICE AREA
APPLICANT: City of Castle Rock
PROJECT NAME: C.R. Boat Launch Safety Improvements
REFERENCE #: Not Yet Assigned
SITE LOCATION ADDRESS:
R.M. 17.6 Access at 5040 Westside Highway
Castle Rock, WA 98611

PROPOSED: Construction of structure to reduce streamflow velocities in Cowlitz River
NEAR: Castle Rock
COUNTY: Cowlitz **STATE:** WA
SHEET 8 OF 9
DATE: 7/28/20

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Base map from: **SHANNON & WILSON, INC.**
Geotechnical and Environmental Consultants
and **GIBBS & OLSON**
Engineering and Surveying

Area/Vegetation Community	Proposed Acreage	Minimum Sample Plots Required		Actual # of Sample Plots	
		PFO/PSS/UPL	PEM/PAB	PFO/PSS/UPL	PEM/PAB
Area A					
Wetland Creation: PFO/PSS/PEM Mosaic*	12.31	2	Up to 37	3	37
Riparian Wetland Bench Creation: PSS/PEM Mosaic*	1.68	1	Up to 6	1	6
Wetland Preservation: PAB	6.12	-	13	-	13
Wetland Enhancement: PFO/PSS	14.17	3	-	4	1
Wetland Rehabilitation: PEM to PFO/PSS Mosaic*	13.22	3	Up to 40	2	37
Riparian Upland Enhancement: PFO/PSS	19.96	4	-	6	-
Area B					
Wetland Creation: PFO/PSS/PEM Mosaic*	5.28	1	Up to 16	2	16
Riparian Wetland Bench Creation: PSS/PEM Mosaic*	0.32	1	Up to 1	1	1
Wetland Rehabilitation: PEM to PFO/PSS Mosaic*	0.44	1	-	1	-
Riparian Upland Enhancement: PFO/PSS	5.34	1	-	2	-
Area C					
Wetland Creation: PFO/PSS/PEM Mosaic*	1.74	1	Up to 6	1	6
Wetland D Enhancement: PSS/PEM to PSS/PFO	0.36	1	-	1	-
Wetland C Rehabilitation: PEM to PSS/PFO	1.02	1	-	1	-
Riparian Upland Enhancement: PFO/PSS	3.59	1	-	1	-
Total Plots		21	Up to 119	26	117

* In mosaic habitats, both woody and emergent vegetation will be intermingled in irregular patterns. Enough potential plot coordinates will be generated to meet the minimum sampling requirements for both woody (PFO/PSS) and emergent vegetation (PEM). Each individual plot will be assigned to a vegetation stratum (PFO, PSS, PEM) at the time of monitoring based on as-built plantings. If both emergent and woody vegetation are present in the vicinity of the same plot center then a PEM plot may be nested within the larger woody vegetation sampling plot. Some PEM plots will transition to woody vegetation-dominated over time.
* One plot will be located in non-creditable buffer area.

LEGEND

- Existing Contour 1'
- Existing Contour 5'
- Bank Site Boundary
- GAS - Underground Gas
- Fiber Optic
- Easement
- Existing Wetland
- Stream
- 100' Bank Buffer
- Area to Remain Undisturbed
- Riparian Upland Enhancement
- Wetland Creation (PFO/PSS/PEM Mosaic)
- Riparian Wetland Creation (PSS/PEM)
- Existing Wetland/Wetland Enhancement Area
- Hillside Preservation
- Existing PAB Preservation
- Existing PFO/PSS/PEM Enhancement
- Existing PEM Rehabilitation
- City of Kelso Jurisdictional Boundary

PURPOSE: Safety and access improvements at boat launch	COWEEMAN MITIGATION BANK SITE DESIGN	PROPOSED: Construction of structure to reduce streamflow velocities
DATUM: NAD83	APPLICANT: City of Castle Rock	IN Cowlitz River
ADJACENT PROPERTY OWNERS:	PROJECT NAME: C.R. Boat Launch Safety Improvements	NEAR: Castle Rock
	REFERENCE #: Not Yet Assigned	COUNTY: Cowlitz STATE: WA
	SITE LOCATION ADDRESS: R.M. 17.6 Access at 5040 Westside Highway	SHEET 9 OF 9
	Castle Rock, WA 98611	DATE: 7/28/20



APPENDIX A: HABITAT EQUIVALENCY ANALYSIS

HABITAT EQUIVALENCY ANALYSIS

The proposed development impacts and mitigation have been quantified using the Habitat Equivalency Analysis (HEA) to obtain the number of discounted service acre years (DSAYs) created by the project using the model spreadsheet and draft guidance (guidance) provided by Zack Woodward from Habitat Bank (Fisher and Ehinger/NMFS 2015).

In the HEA, the following input parameters are needed to calculate habitat loss:

- Initial habitat value.
- Years until habitat is fully functioning.
- Years that impact will last.
- Value of restored habitat.
- Size of impacted habitat area.
- Determination of crediting factors.

Values for; “Base Year” (0), “Discount Rate” (0.03), and “Number of Years Project Exists” (300) are fixed in the HEA spreadsheet utilized for this assessment. The completed HEA models used for this project can be found at the end of this appendix.

NMFS provides a “*rule set*” and rationale in the guidance for impact assessment and habitat restoration compensation using the HEA model. The numbered steps below detail the methodology used for the HEA during the analysis of the proposed project.

1. *Determine habitat types present within discrete polygons (areas).*

Descriptions of habitat types are provided in Appendix B of the guidance. The habitat types (polygons) present within the project area are Active Channel Margin (ACM) which includes Shallow Water habitat and Riparian Upland.

Active Channel Margin

The ACM habitat is located between ordinary low water (OLW) and the ordinary high water mark (OHWM). This area is sloped (8:1) and is comprised of riprap and fine sediment with little to no vegetation. The habitat contains a small amount of large woody material (LWM) but no other natural habitat features. The site provides little to no habitat function for juvenile salmonids.

Riparian Upland

The riparian upland corridor includes the area above the ACM and within 200 feet landward of the OHWM. The western riparian buffer of the Cowlitz River within the project area is functionally isolated by Mosier Road and the parking area for the boat launch in the southern portion of the project area and is functionally isolated by a frequently used and maintained gravel access road that runs from the parking area, north along the parcel boundary at the top of the shoreline slope for the extent of the project area. The vegetation onsite consists of mowed and maintained yard grass with a thin stand of cottonwood trees and invasive blackberry shrubs along the shoreline.

2. *Analysis of habitat function of aquatic polygons.*

To assess the habitat function of the project area, the NMFS Matrix of Pathways and Indicators checklist was completed for the impacted reach of the Cowlitz River for the approximately 0.5-acre ACM habitat polygon. This checklist categorizes pathways and indicators as either properly functioning, at risk, or not properly functioning, and can be found in Table A-1.

3. *Rate habitat function indicators.*

According to the guidance, indicators that are “properly functioning” are assigned a score of 1, indicators that are “at risk” are assigned a score of 0.5, and indicators that are “not properly functioning” are assigned a score of 0. For a site-specific scale of analysis, the guidance indicates that certain habitat indicators may not be relevant, such as “Watershed Condition”. The proposed project is site-specific and as such the “Watershed Condition” indicator is not relevant and has been omitted. Once completed, the properly functioning conditions (PFC) values are totaled and averaged. For this project, a PFC score of 5 out of a possible score of 15 is an average of 0.33. This is the “Initial Value of Habitat” used in the HEA calculation for the ACM habitat polygon. The scores assigned for indicators for ACM habitat polygon can be found below in Table A-1.

Table A-1. National Marine Fisheries Service’s Matrix of Pathways and Indicators for the Al Helenberg Memorial Boat Launch Safety Improvements Project.

PATHWAYS ■ <i>Indicators</i>	HABITAT FUNCTION AND SCORES		
	Properly Functioning	At Risk	Not Properly Functioning
Water Quality			
■ Temperature	1	-	-
■ Sediment	-	-	0
■ Chemical Contaminants/Nutrients	1	-	-
Habitat Access			
■ Physical Barriers	1	-	-
Habitat Elements			
■ Substrate	-	-	0
■ Large Woody Debris	-	0.5	-
■ Pool Frequency	-	-	0
■ Pool Quality	-	-	0
■ Off-channel Habitat	-	-	0
■ Refugia	-	-	0
Channel Condition & Dynamics			
■ Width/Depth Ratio	-	-	0
■ Streambank Condition	1	-	-
■ Floodplain Connectivity	-	-	0
Flow Hydrology			
	-	-	0

PATHWAYS ▪ <i>Indicators</i>	HABITAT FUNCTION AND SCORES		
	Properly Functioning	At Risk	Not Properly Functioning
▪ Change in Peak/Base Flows			
▪ Drainage Network Increase	-	0.5	-
Watershed Conditions			
▪ Road Density & Location	N/A	N/A	N/A
▪ Disturbance History	N/A	N/A	N/A
▪ Riparian Reserves	N/A	N/A	N/A
Totals	4	1	0
Total PFC Score	5		
“Initial Value of Habitat”	5/15 = 0.33		

4. *Analysis of habitat function of riparian polygons.*

NMFS’ guidance explains that although riparian habitat provides essential functions for adjacent aquatic habitat, riparian uplands cannot receive a score of 1 because they are considered to have a lower functional contribution to salmonid habitat at the site-specific scale. In order to assess habitat function of riparian uplands, the site-specific tree height must be determined. The vegetation onsite consists of mowed and maintained yard grass with a thin stand of black cottonwood (*Populus balsamifera*) trees along the shoreline. The maximum height of trees onsite is approximately 60 feet with a maximum height of 200 feet for the species (NRCS 2003). The potential of the site-specific tree height to provide maximum riparian function when compared to the maximum height for cottonwoods is estimated to be 0.3 ($60/200 = 0.3$)

According to the guidance and Grette and Associates, the pre-determined value for riparian upland habitat functions is 0.1. The next step is to multiply the estimated habitat value for the site’s existing riparian function to the pre-determined maximum value for riparian uplands which is called “normalizing” the habitat value. For this project, 0.03 ($0.3 \times 0.1 = 0.03$) is the normalized initial value of habitat for riparian uplands. This is the “Initial Value of Habitat” used in the HEA calculation for the riparian upland polygon.

5. *Determine years until habitat is fully functioning.*

Using the HEA method, the number of years until the habitats are fully functioning is essentially zero, because impacts to aquatic and riparian uplands will be completed within a short time period and last permanently. However, the HEA equation does not allow an input of zero years because mathematically, dividing a number by zero cannot occur. Therefore 0.1 years was used as the input number. This is the “Years to a Fully Functioning Habitat” value used in the HEA calculation for both the ACM and riparian upland polygons.

6. *Determine value of restored habitat.*

Due to impacts being permanent, the habitat value of the post-construction area is 0. This is the “Value of Restored Habitat” value used in the HEA calculation for both the ACM the riparian upland polygons.

7. *Determine size of impacted area for each habitat polygon.*

Active Channel Margin

The construction of the two 30-foot by 1.5-foot wall sections will permanently impact approximately 0.002 acres (90 sq. ft.) of stream channel below the OHWM. This is the “Acres of Habitat” value used in the HEA calculation for the ACM polygon.

Riparian Upland

In order to complete the proposed project, 24 mature black cottonwood trees with a combined canopy of 0.45 acres (19,578 sq. ft.) will be removed from the shoreline, as well as 0.07 acres (3,188 sq. ft.) and 0.05 acres (2,271 sq. ft.) of gravel will be compacted north and south of the boat ramp (respectively) to create maintenance and construction access to the project site. A total of 0.57 acres (25,037 sq. ft.) of riparian impacts are proposed landward of the OHWM. This is the “Acres of Habitat” value used in the HEA calculation for the riparian upland polygon. Table A-2 below summarizes the values calculated for each input parameter in Steps 1-7.

Table A-2. Summary of Values Used and Calculated in the HEA Model.

Input Parameter	Methodology Step Number	Value Used for ACM Habitat Polygon	Value Used for Riparian Upland Habitat Polygon
Initial Value of Habitat	Steps 3 & 4	0.33	0.03
Years to a Fully Functioning Habitat	Step 5	0.1	0.1
Base Year	Fixed Value	0	0
Discount Rate	Fixed Value	0.03	0.03
Number of Years Project Exists	Fixed Value	300	300
Value of Restored Habitat	Step 6	0	0
Total Beneficial Increase from Restoration	HEA Calculated Value	-0.33	-0.03
Acres of Habitat	Step 7	0.002	0.57
Total DSAYS/Acre	HEA Calculated Value	-0.028	-0.719

8. *Calculate DSAYs.*

Active Channel Margin

Using the values determined in steps 1-7, the total DSAYs per acre generated for the ACM habitat polygon is -0.028 per acre for a total of -0.000056 DSAYs ($-0.028 \times 0.002 = -0.000056$).

Riparian Upland

Using the values determined in steps 1-7, the total DSAYs per acre generated for the riparian upland habitat polygon is -0.719 per acre for a total of -0.40983 DSAYs ($-0.719 \times 0.57 = -0.40983$).

9. *Determine crediting factors.*

According to the guidance, crediting factors can be applied to the DSAY calculation for aquatic habitat polygons when that habitat supports multiple life stages or multiple species of salmonids. It is assumed that the habitat area will provide habitat for at least one ESA-listed salmonid species, and one life stage. If only one species and one life stage are supported by a habitat area, then no crediting factor is applied.

Multiple Life Stages

The life stages to be considered include juvenile rearing and refuge, juvenile migration, adult migration, and adult spawning. According to the guidance, a crediting factor of 0.1 is applied to the total DSAY output for each additional life stage supported by the habitat. The designated reach of the Cowlitz River within the project area supports juvenile migration as well as adult migration, therefore a crediting factor of 1 is applied to adult migration and a crediting factor of 0.1 is applied for the additional life stage of juvenile migration for a total crediting factor of 1.1.

Multiple Salmonid Species

The listed salmonid species to be considered include Lower Columbia River (LCR) coho salmon, LCR Chinook salmon, Columbia River (CR) chum salmon, and LCR steelhead trout. According to the guidance, a crediting factor of 0.1 is applied to the total DSAY output for each additional salmonid species supported by the habitat. The designated reach of the Cowlitz River within the project area supports all four of the listed salmonid species, therefore a crediting factor of 1 is applied to LCR coho, and 0.1 is applied for each additional species (Chinook, chum, and steelhead) for a total crediting factor of 1.3.

10. *Determine total DSAYs.*

According to the guidance, to determine the final calculation of DSAYs to compensate for total project impacts, crediting factors should be applied to the DSAY value of the correlating aquatic habitat polygon. In this case, the -0.000056 DSAYs calculated for the ACM habitat polygon are multiplied first by the crediting factor of 1.1 for multiple life stages ($-0.000056 \times 1.1 = -0.0000616$) and secondly by a crediting factor of 1.3 for multiple species ($-0.013728 \times 1.3 = -0.00008008$) for a total of -0.00008008 DSAYs for the ACM habitat polygon. For the final DSAY calculation, all DSAY totals from all habitat polygons should be combined. For this project, the total DSAY output calculated for project impacts is -0.40991008 (-0.00008008 [ACM] + -0.40983 [riparian upland] = -0.40991008). The DSAY outputs from HEA

applications conceptually represent a “habitat currency” from which to compare functional losses (or gains-if a restoration project) in aquatic habitat before and after an action (Ray 2008). For project actions that improve habitat functions, the resultant DSAY value will be positive; for project actions that degrade habitat functions, the resultant DSAY value will be negative. A positive value indicates a DSAY purchase is not needed, while a negative value indicates the need for the purchase of DSAYs to compensate for project impacts. The purchase amount is the absolute value of the negative output value. For this project, 0.41 is the number of DSAYs to be purchased from CRMB. Table A-3 below summarizes the total calculation of DSAYs to be purchased.

Table A-3. Summary of Total DSAYs.

Habitat Polygon	Total DSAYs/Acre	Acres of Habitat	Total DSAYs	Crediting Factor for Multiple Life Stages	Crediting Factor for Multiple Species	Total DSAYs
Active Channel Margin (ACM)	-0.028	0.002	-0.000056	1.1	1.3	-0.00008008
Riparian Upland	-0.719	0.57	-0.40983	N/A	N/A	-0.40983
DSAY Output						-0.40991008
Grand Total of DSAYs to be Purchased <i>Value is rounded to nearest hundredth</i>						0.41

References

Fisher, J.P., and Ehinger, S. 2015. *Habitat Types and Values for the Lower Columbia River Salmon and Steelhead Recovery Domain for Use with the Habitat Equivalency Analysis*. National Marine Fisheries Service. July 31, 2015.

Grette and Associates, 2015. *Technical Memorandum Coweeman Mitigation Bank Habitat Equivalency Analysis Review*. Prepared for Habitat Bank, LLC. August 24, 2015.

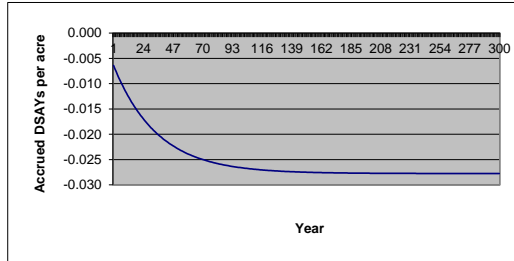
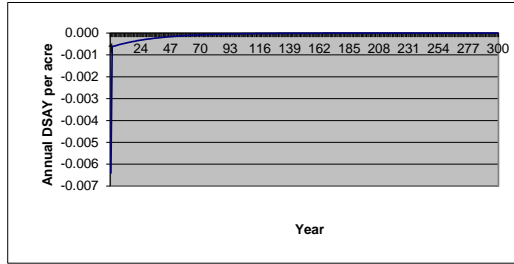
Natural Resources Conservation Service (NRCS). 2003. *Plant Guide, BLACK COTTONWOOD, Populus balsamifera L. ssp. trichocarpa (Torr. & Gray ex Hook.) Brayshaw*. Contributed by USDA NRCS National Plant Data Center & the Biota of North America Program.

Ray, G. 2008. *Habitat equivalency analysis, a potential tool for estimating environmental benefits*. ERDC TN-EMRRP-EI02.

ACTIVE CHANNEL MARGIN – HEA MODEL OUTPUT

To use model, only enter values in highlighted areas.

Initial Value of Habitat: 0.33
 Years to a Fully Functioning Habitat: 0.1
 Base Year: 0
 Discount Rate: 0.03
 # Years Project Exists: 300
 Value of Restored Habitat: 0
 Total Beneficial Increase from Restoration: -0.33
 Acres of Habitat: 0.002



TOTAL DSAYS/acre: -0.028

YEAR	DISCOUNT FACTOR	% INCREASE TOWARDS FULL VALUE	STARTING HABITAT VALUE	ADDITIONAL HABITAT BENEFITS	TOTAL HABITAT VALUE	ACRES OF HABITAT	DISCOUNTED BENEFITS ACRES	SUMMATION OF DSAYS
1	0.971	10.000	0.33	-3.30	-2.97	0.002	-0.006	-0.006
2	0.943	1.000	0.33	-0.33	0.00	0.002	-0.001	-0.007
3	0.915	1.000	0.33	-0.33	0.00	0.002	-0.001	-0.008
4	0.888	1.000	0.33	-0.33	0.00	0.002	-0.001	-0.008
5	0.863	1.000	0.33	-0.33	0.00	0.002	-0.001	-0.009
6	0.837	1.000	0.33	-0.33	0.00	0.002	-0.001	-0.009
7	0.813	1.000	0.33	-0.33	0.00	0.002	-0.001	-0.010
8	0.789	1.000	0.33	-0.33	0.00	0.002	-0.001	-0.010
9	0.766	1.000	0.33	-0.33	0.00	0.002	-0.001	-0.011
10	0.744	1.000	0.33	-0.33	0.00	0.002	0.000	-0.011
11	0.722	1.000	0.33	-0.33	0.00	0.002	0.000	-0.012
12	0.701	1.000	0.33	-0.33	0.00	0.002	0.000	-0.012
13	0.681	1.000	0.33	-0.33	0.00	0.002	0.000	-0.013
14	0.661	1.000	0.33	-0.33	0.00	0.002	0.000	-0.013
15	0.642	1.000	0.33	-0.33	0.00	0.002	0.000	-0.014
16	0.623	1.000	0.33	-0.33	0.00	0.002	0.000	-0.014
17	0.605	1.000	0.33	-0.33	0.00	0.002	0.000	-0.014
18	0.587	1.000	0.33	-0.33	0.00	0.002	0.000	-0.015
19	0.570	1.000	0.33	-0.33	0.00	0.002	0.000	-0.015
20	0.554	1.000	0.33	-0.33	0.00	0.002	0.000	-0.016
21	0.538	1.000	0.33	-0.33	0.00	0.002	0.000	-0.016
22	0.522	1.000	0.33	-0.33	0.00	0.002	0.000	-0.016
23	0.507	1.000	0.33	-0.33	0.00	0.002	0.000	-0.017
24	0.492	1.000	0.33	-0.33	0.00	0.002	0.000	-0.017
25	0.478	1.000	0.33	-0.33	0.00	0.002	0.000	-0.017
26	0.464	1.000	0.33	-0.33	0.00	0.002	0.000	-0.018
27	0.450	1.000	0.33	-0.33	0.00	0.002	0.000	-0.018
28	0.437	1.000	0.33	-0.33	0.00	0.002	0.000	-0.018
29	0.424	1.000	0.33	-0.33	0.00	0.002	0.000	-0.018
30	0.412	1.000	0.33	-0.33	0.00	0.002	0.000	-0.019
31	0.400	1.000	0.33	-0.33	0.00	0.002	0.000	-0.019
32	0.388	1.000	0.33	-0.33	0.00	0.002	0.000	-0.019
33	0.377	1.000	0.33	-0.33	0.00	0.002	0.000	-0.019
34	0.366	1.000	0.33	-0.33	0.00	0.002	0.000	-0.020
35	0.355	1.000	0.33	-0.33	0.00	0.002	0.000	-0.020
36	0.345	1.000	0.33	-0.33	0.00	0.002	0.000	-0.020
37	0.335	1.000	0.33	-0.33	0.00	0.002	0.000	-0.020
38	0.325	1.000	0.33	-0.33	0.00	0.002	0.000	-0.021
39	0.316	1.000	0.33	-0.33	0.00	0.002	0.000	-0.021
40	0.307	1.000	0.33	-0.33	0.00	0.002	0.000	-0.021
41	0.298	1.000	0.33	-0.33	0.00	0.002	0.000	-0.021
42	0.289	1.000	0.33	-0.33	0.00	0.002	0.000	-0.021
43	0.281	1.000	0.33	-0.33	0.00	0.002	0.000	-0.022
44	0.272	1.000	0.33	-0.33	0.00	0.002	0.000	-0.022
45	0.264	1.000	0.33	-0.33	0.00	0.002	0.000	-0.022
46	0.257	1.000	0.33	-0.33	0.00	0.002	0.000	-0.022
47	0.249	1.000	0.33	-0.33	0.00	0.002	0.000	-0.022
48	0.242	1.000	0.33	-0.33	0.00	0.002	0.000	-0.022
49	0.235	1.000	0.33	-0.33	0.00	0.002	0.000	-0.023
50	0.228	1.000	0.33	-0.33	0.00	0.002	0.000	-0.023
51	0.221	1.000	0.33	-0.33	0.00	0.002	0.000	-0.023
52	0.215	1.000	0.33	-0.33	0.00	0.002	0.000	-0.023

299	0.000	1.000	0.33	-0.33	0.00	0.002	0.000	-0.028
300	0.000	1.000	0.33	-0.33	0.00	0.002	0.000	-0.028
							-0.028	

FOIA EXEMPT - CONFIDENTIAL - ATTORNEY WORK PRODUCT - DRAFT DELIBERATIVE

Existing Habitat GIS Code	Potential Habitat GIS Code	Code From	Code To	Value From	Value To	Years To Full Function	Conversion DSAY/acre
0	3	= D	--> VB	= 0.100	--> 0.400	8	9.0364
0	5	= D	--> FFSSwl	= 0.100	--> 0.700	8	18.0729
0	6	= D	--> BAAlwl	= 0.100	--> 0.750	4	20.7353
0	7	= D	--> FFflwl	= 0.100	--> 0.900	8	24.0972
0	9	= D	--> FFSSos	= 0.100	--> 0.700	1	19.9972
0	10	= D	--> BAlos	= 0.100	--> 0.750	1	21.6636
0	14	= D	--> BAlex	= 0.100	--> 0.750	4	19.5790
0	15	= D	--> FFflex	= 0.100	--> 0.900	8	24.0972
1	3	= UU	--> VB	= 0.000	--> 0.400	8	12.0486
1	14	= UU	--> BAlex	= 0.000	--> 0.750	4	23.9253
1	15	= UU	--> FFflex	= 0.000	--> 0.900	8	27.1093
1	17	= UU	--> FFEMex	= 0.000	--> 1.000	15	27.3199
2	14	= UG	--> BAlex	= 0.150	--> 0.750	4	19.1402
3	6	= VB	--> BAAlwl	= 0.400	--> 0.750	4	11.1651
3	14	= VB	--> BAlex	= 0.400	--> 0.750	4	11.1651
3	15	= VB	--> FFflex	= 0.400	--> 0.900	8	15.0607
6	7	= BAI	--> FFflwl	= 0.750	--> 0.900	8	4.5182
8	9	= BASS	--> FFSSos	= 0.550	--> 0.700	1	4.9993
14	15	= BAI	--> FFflex	= 0.750	--> 0.900	8	4.5182

multiplier calculated on
"DSAYs per acre" worksheet

- D = Degraded
- UU = Unvegetated Upland
- UG = Upland Greenbelt
- VB = Vegetated Buffer
- BAI = Baseline Adjusted Intertidal
- BASS = Baseline Adjusted Shallow Subtidal
- FFSS = Fully Functional Shallow Subtidal
- FFI = Fully Functional Intertidal
- FFEM = Fully Functional Estuarine Marsh
- wl = (wood waste, logs, or marine debris removed)
- ex = (excavation or regrading required)
- os = (overwater structure removed)

RIPARIAN UPLAND – HEA MODEL OUTPUT

To use model, only enter values in highlighted areas.

Initial Value of Habitat:

Years to a Fully Functioning Habitat:

Base Year:

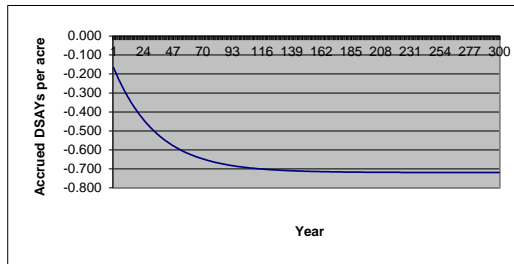
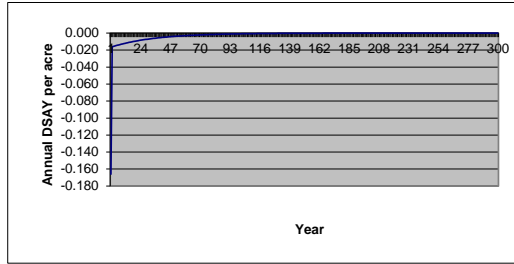
Discount Rate:

Years Project Exists:

Value of Restored Habitat:

Total Beneficial Increase from Restoration:

Acres of Habitat:



TOTAL DSAYS/acre: -0.719

YEAR	DISCOUNT FACTOR	% INCREASE TOWARDS FULL VALUE	STARTING HABITAT VALUE	ADDITIONAL HABITAT BENEFITS	TOTAL HABITAT VALUE	ACRES OF HABITAT	DISCOUNTED BENEFITS ACRES	SUMMATION OF DSAYS
1	0.971	10.000	0.03	-0.30	-0.27	0.57	-0.166	-0.166
2	0.943	1.000	0.03	-0.03	0.00	0.57	-0.016	-0.182
3	0.915	1.000	0.03	-0.03	0.00	0.57	-0.016	-0.198
4	0.888	1.000	0.03	-0.03	0.00	0.57	-0.015	-0.213
5	0.863	1.000	0.03	-0.03	0.00	0.57	-0.015	-0.228
6	0.837	1.000	0.03	-0.03	0.00	0.57	-0.014	-0.242
7	0.813	1.000	0.03	-0.03	0.00	0.57	-0.014	-0.256
8	0.789	1.000	0.03	-0.03	0.00	0.57	-0.013	-0.269
9	0.766	1.000	0.03	-0.03	0.00	0.57	-0.013	-0.283
10	0.744	1.000	0.03	-0.03	0.00	0.57	-0.013	-0.295
11	0.722	1.000	0.03	-0.03	0.00	0.57	-0.012	-0.308
12	0.701	1.000	0.03	-0.03	0.00	0.57	-0.012	-0.320
13	0.681	1.000	0.03	-0.03	0.00	0.57	-0.012	-0.331
14	0.661	1.000	0.03	-0.03	0.00	0.57	-0.011	-0.343
15	0.642	1.000	0.03	-0.03	0.00	0.57	-0.011	-0.354
16	0.623	1.000	0.03	-0.03	0.00	0.57	-0.011	-0.364
17	0.605	1.000	0.03	-0.03	0.00	0.57	-0.010	-0.375
18	0.587	1.000	0.03	-0.03	0.00	0.57	-0.010	-0.385
19	0.570	1.000	0.03	-0.03	0.00	0.57	-0.010	-0.394
20	0.554	1.000	0.03	-0.03	0.00	0.57	-0.009	-0.404
21	0.538	1.000	0.03	-0.03	0.00	0.57	-0.009	-0.413
22	0.522	1.000	0.03	-0.03	0.00	0.57	-0.009	-0.422
23	0.507	1.000	0.03	-0.03	0.00	0.57	-0.009	-0.431
24	0.492	1.000	0.03	-0.03	0.00	0.57	-0.008	-0.439
25	0.478	1.000	0.03	-0.03	0.00	0.57	-0.008	-0.447
26	0.464	1.000	0.03	-0.03	0.00	0.57	-0.008	-0.455
27	0.450	1.000	0.03	-0.03	0.00	0.57	-0.008	-0.463
28	0.437	1.000	0.03	-0.03	0.00	0.57	-0.007	-0.470
29	0.424	1.000	0.03	-0.03	0.00	0.57	-0.007	-0.478
30	0.412	1.000	0.03	-0.03	0.00	0.57	-0.007	-0.485
31	0.400	1.000	0.03	-0.03	0.00	0.57	-0.007	-0.491
32	0.388	1.000	0.03	-0.03	0.00	0.57	-0.007	-0.498
33	0.377	1.000	0.03	-0.03	0.00	0.57	-0.006	-0.505
34	0.366	1.000	0.03	-0.03	0.00	0.57	-0.006	-0.511
35	0.355	1.000	0.03	-0.03	0.00	0.57	-0.006	-0.517
36	0.345	1.000	0.03	-0.03	0.00	0.57	-0.006	-0.523
37	0.335	1.000	0.03	-0.03	0.00	0.57	-0.006	-0.528
38	0.325	1.000	0.03	-0.03	0.00	0.57	-0.006	-0.534
39	0.316	1.000	0.03	-0.03	0.00	0.57	-0.005	-0.539
40	0.307	1.000	0.03	-0.03	0.00	0.57	-0.005	-0.545
41	0.298	1.000	0.03	-0.03	0.00	0.57	-0.005	-0.550
42	0.289	1.000	0.03	-0.03	0.00	0.57	-0.005	-0.555
43	0.281	1.000	0.03	-0.03	0.00	0.57	-0.005	-0.560
44	0.272	1.000	0.03	-0.03	0.00	0.57	-0.005	-0.564
45	0.264	1.000	0.03	-0.03	0.00	0.57	-0.005	-0.569
46	0.257	1.000	0.03	-0.03	0.00	0.57	-0.004	-0.573
47	0.249	1.000	0.03	-0.03	0.00	0.57	-0.004	-0.577
48	0.242	1.000	0.03	-0.03	0.00	0.57	-0.004	-0.581
49	0.235	1.000	0.03	-0.03	0.00	0.57	-0.004	-0.585
50	0.228	1.000	0.03	-0.03	0.00	0.57	-0.004	-0.589
51	0.221	1.000	0.03	-0.03	0.00	0.57	-0.004	-0.593
52	0.215	1.000	0.03	-0.03	0.00	0.57	-0.004	-0.597

53	0.209	1.000	0.03	-0.03	0.00	0.57	-0.004	-0.600
54	0.203	1.000	0.03	-0.03	0.00	0.57	-0.003	-0.604
55	0.197	1.000	0.03	-0.03	0.00	0.57	-0.003	-0.607
56	0.191	1.000	0.03	-0.03	0.00	0.57	-0.003	-0.611
57	0.185	1.000	0.03	-0.03	0.00	0.57	-0.003	-0.614
58	0.180	1.000	0.03	-0.03	0.00	0.57	-0.003	-0.617
59	0.175	1.000	0.03	-0.03	0.00	0.57	-0.003	-0.620
60	0.170	1.000	0.03	-0.03	0.00	0.57	-0.003	-0.623
61	0.165	1.000	0.03	-0.03	0.00	0.57	-0.003	-0.625
62	0.160	1.000	0.03	-0.03	0.00	0.57	-0.003	-0.628
63	0.155	1.000	0.03	-0.03	0.00	0.57	-0.003	-0.631
64	0.151	1.000	0.03	-0.03	0.00	0.57	-0.003	-0.633
65	0.146	1.000	0.03	-0.03	0.00	0.57	-0.003	-0.636
66	0.142	1.000	0.03	-0.03	0.00	0.57	-0.002	-0.638
67	0.138	1.000	0.03	-0.03	0.00	0.57	-0.002	-0.641
68	0.134	1.000	0.03	-0.03	0.00	0.57	-0.002	-0.643
69	0.130	1.000	0.03	-0.03	0.00	0.57	-0.002	-0.645
70	0.126	1.000	0.03	-0.03	0.00	0.57	-0.002	-0.647
71	0.123	1.000	0.03	-0.03	0.00	0.57	-0.002	-0.650
72	0.119	1.000	0.03	-0.03	0.00	0.57	-0.002	-0.652
73	0.116	1.000	0.03	-0.03	0.00	0.57	-0.002	-0.654
74	0.112	1.000	0.03	-0.03	0.00	0.57	-0.002	-0.655
75	0.109	1.000	0.03	-0.03	0.00	0.57	-0.002	-0.657
76	0.106	1.000	0.03	-0.03	0.00	0.57	-0.002	-0.659
77	0.103	1.000	0.03	-0.03	0.00	0.57	-0.002	-0.661
78	0.100	1.000	0.03	-0.03	0.00	0.57	-0.002	-0.663
79	0.097	1.000	0.03	-0.03	0.00	0.57	-0.002	-0.664
80	0.094	1.000	0.03	-0.03	0.00	0.57	-0.002	-0.666
81	0.091	1.000	0.03	-0.03	0.00	0.57	-0.002	-0.667
82	0.089	1.000	0.03	-0.03	0.00	0.57	-0.002	-0.669
83	0.086	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.670
84	0.083	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.672
85	0.081	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.673
86	0.079	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.675
87	0.076	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.676
88	0.074	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.677
89	0.072	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.678
90	0.070	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.680
91	0.068	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.681
92	0.066	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.682
93	0.064	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.683
94	0.062	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.684
95	0.060	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.685
96	0.059	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.686
97	0.057	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.687
98	0.055	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.688
99	0.054	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.689
100	0.052	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.690
101	0.051	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.691
102	0.049	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.691
103	0.048	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.692
104	0.046	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.693
105	0.045	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.694
106	0.044	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.695
107	0.042	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.695
108	0.041	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.696
109	0.040	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.697
110	0.039	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.697
111	0.038	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.698
112	0.036	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.699
113	0.035	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.699
114	0.034	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.700
115	0.033	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.700
116	0.032	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.701
117	0.031	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.701
118	0.031	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.702
119	0.030	1.000	0.03	-0.03	0.00	0.57	-0.001	-0.703
120	0.029	1.000	0.03	-0.03	0.00	0.57	0.000	-0.703
121	0.028	1.000	0.03	-0.03	0.00	0.57	0.000	-0.703
122	0.027	1.000	0.03	-0.03	0.00	0.57	0.000	-0.704
123	0.026	1.000	0.03	-0.03	0.00	0.57	0.000	-0.704
124	0.026	1.000	0.03	-0.03	0.00	0.57	0.000	-0.705
125	0.025	1.000	0.03	-0.03	0.00	0.57	0.000	-0.705
126	0.024	1.000	0.03	-0.03	0.00	0.57	0.000	-0.706
127	0.023	1.000	0.03	-0.03	0.00	0.57	0.000	-0.706
128	0.023	1.000	0.03	-0.03	0.00	0.57	0.000	-0.706
129	0.022	1.000	0.03	-0.03	0.00	0.57	0.000	-0.707
130	0.021	1.000	0.03	-0.03	0.00	0.57	0.000	-0.707
131	0.021	1.000	0.03	-0.03	0.00	0.57	0.000	-0.708
132	0.020	1.000	0.03	-0.03	0.00	0.57	0.000	-0.708
133	0.020	1.000	0.03	-0.03	0.00	0.57	0.000	-0.708
134	0.019	1.000	0.03	-0.03	0.00	0.57	0.000	-0.709

299	0.000	1.000	0.03	-0.03	0.00	0.57	0.000	-0.719
300	0.000	1.000	0.03	-0.03	0.00	0.57	0.000	-0.719
							-0.719	

FOIA EXEMPT - CONFIDENTIAL - ATTORNEY WORK PRODUCT - DRAFT DELIBERATIVE

Existing Habitat GIS Code	Potential Habitat GIS Code	Code From	Code To	Value From	Value To	Years To Full Function	Conversion DSAY/acre
0	3	= D	--> VB	= 0.100	--> 0.400	8	9.0364
0	5	= D	--> FFSSwl	= 0.100	--> 0.700	8	18.0729
0	6	= D	--> BAAlwl	= 0.100	--> 0.750	4	20.7353
0	7	= D	--> FFflwl	= 0.100	--> 0.900	8	24.0972
0	9	= D	--> FFSSos	= 0.100	--> 0.700	1	19.9972
0	10	= D	--> BAlos	= 0.100	--> 0.750	1	21.6636
0	14	= D	--> BAlex	= 0.100	--> 0.750	4	19.5790
0	15	= D	--> FFflex	= 0.100	--> 0.900	8	24.0972
1	3	= UU	--> VB	= 0.000	--> 0.400	8	12.0486
1	14	= UU	--> BAlex	= 0.000	--> 0.750	4	23.9253
1	15	= UU	--> FFflex	= 0.000	--> 0.900	8	27.1093
1	17	= UU	--> FFEMex	= 0.000	--> 1.000	15	27.3199
2	14	= UG	--> BAlex	= 0.150	--> 0.750	4	19.1402
3	6	= VB	--> BAAlwl	= 0.400	--> 0.750	4	11.1651
3	14	= VB	--> BAlex	= 0.400	--> 0.750	4	11.1651
3	15	= VB	--> FFflex	= 0.400	--> 0.900	8	15.0607
6	7	= BAI	--> FFflwl	= 0.750	--> 0.900	8	4.5182
8	9	= BASS	--> FFSSos	= 0.550	--> 0.700	1	4.9993
14	15	= BAI	--> FFflex	= 0.750	--> 0.900	8	4.5182

multiplier calculated on
"DSAYs per acre" worksheet

- D = Degraded
- UU = Unvegetated Upland
- UG = Upland Greenbelt
- VB = Vegetated Buffer
- BAI = Baseline Adjusted Intertidal
- BASS = Baseline Adjusted Shallow Subtidal
- FFSS = Fully Functional Shallow Subtidal
- FFI = Fully Functional Intertidal
- FFEM = Fully Functional Estuarine Marsh
- wl = (wood waste, logs, or marine debris removed)
- ex = (excavation or regrading required)
- os = (overwater structure removed)