



Lower Russell Road Levee Setback Project

Final

30% Design Report

King County, Washington

January 15, 2016



King County

Prepared for King County by

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Appendix B:	Typical Cross Sections
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1.0 Introduction

1.1 Purpose

The Lower Russell Road Levee Setback project area is along the right (east) bank of the Green River between river mile (RM) 17.85 (S. 212th Street Bridge) and RM 19.25 (Veterans Drive/S. 228th Street Bridge) in the City of Kent. The objectives of the project include:

- Remove and/or replace the existing flood containment system of levee and revetments in order to provide long-term flood protection.
- Improve riparian and aquatic habitat and support recreational enhancements as informed by project site opportunities, constraints, policies and funding.

The King County Flood Control District (FCD) authorized this 30% Design Report of the proposed Lower Russell Road Setback Levee Project (LRRP) to determine the project costs, lay out a proposed implementation schedule, and provide an overview of the investigations and studies conducted to develop the proposed project. In addition, 30% Design Drawings have been prepared (see Appendix A).

Several alternatives were considered prior to identifying the selected alternative. The Flood Control District's selected alternative (Alternative 4B) is the basis for this design report with additional City of Kent-funded recreation elements. Figure 1 depicts the general project location. Project elements include the following:

- A new flood protection system that is a floodwall along the southern third of the project length and an earthen levee along the northern two-thirds of the project length.
- Habitat improvements to increase the quality and quantity of habitat for juvenile salmon, increase vegetative cover along the shoreline and river, and mitigate for wetland impacts.
- Utility relocation and replacement, primarily water main and Puget Sound Energy (PSE) power.
- Scour protection along selected segments of the new flood protection system.
- Real Estate acquisition.
- Recreational features including completing a missing link of the regional Green River Trail and relocating Van Doren's Landing Park.

1.2 Project Background

The LRRP will replace the existing flood protection system, which is currently made up of levees and revetments, with a new flood protection system along the right (east) bank of the Green River between river mile (RM) 17.85 (S. 212th Street) and RM 19.25 (Veterans Drive [formerly S. 231st Street]/ S. 228th Street) in the City of Kent, Washington (see Figure 1). The project reach is approximately 1.4 river miles in length. When implemented, the LRRP will improve flood protection for the residents and businesses of Kent, Tukwila, Renton, and the Green River Valley, as well as enhance riparian and aquatic habitat and recreational opportunities within the reach.

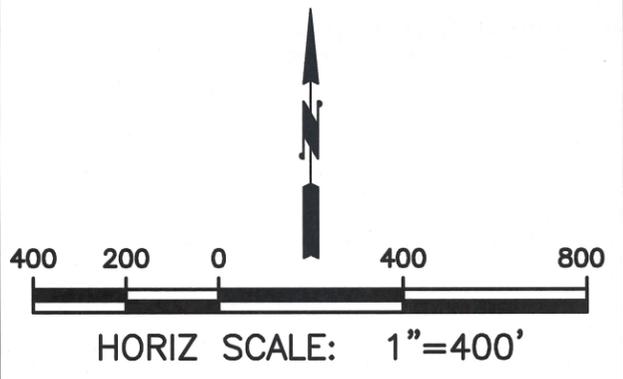
1.3 Project Goals and Objectives

The LRRP goals are described below:

- Increase the flow containment capacity of the flood protection system.
- Construct a flood protection system that balances policy directives regarding flood protection (e.g., scour protection, stability, and vegetation maintenance), habitat restoration, and recreational use.
- Set the new flood protection system back from the river, where feasible, to improve riverine and riparian processes, functions, and habitat.
- Design a system that minimizes long-term maintenance needs and associated costs.

The LRRP objectives associated with these goals are as follows:

- Flood Protection:
 - Convey the 0.2 percent annual exceedance probability (500-year) flood with 3 feet of freeboard. The design flood flow is 18,500 cfs (corresponds to 18,800 cfs at the U.S. Geological Survey [USGS] Auburn gage).
 - Set back the flood protection system (levees and/or floodwall), where feasible, to reduce scour potential, increase resiliency, -reduce life cycle costs.
- Riparian and Aquatic Habitat:
 - Provide suitable rearing habitat for juvenile salmon by creating shallow slow water edge habitats that provide suitable depths and velocities over a range of flows during the rearing period.
 - Provide high flow refuge habitat for juvenile salmon.
 - Provide large woody debris to perform multiple functions, including cover, velocity refuge during high flows, and scour to create pools.
 - Provide habitats that function over a sustained period and manage adaptively.
 - Provide compatibility with future efforts to expand habitat.
 - Provide native riparian vegetation, including trees, to reduce solar heating, stabilize streambanks, create overhanging cover, and allow for future large woody debris recruitment.
- Recreation and Access:
 - Maintain vehicular access to Van Doren's Landing Park, Kent Nursery, and Green River Natural Resource Area (GRNRA) via Lower Russell Road.
 - Improve pedestrian/bicycle access and tie into existing trails at S. 228th Street and S. 212th Street bridges.
 - Reduce vehicular traffic on Lower Russell Road that impacts GRNRA and recreational users.
 - Relocate and enhance Van Doren's Landing Park.



LEGEND

- PROPERTY LINE
- EXISTING WATER
- EXISTING SEWER
- EXISTING STORM DRAIN
- EXISTING ELECTRICAL

FIGURE 1
PROJECT OVERVIEW MAP
LOWER RUSSELL ROAD
LEVEE SETBACK PROJECT



King County

JANUARY 12, 2015

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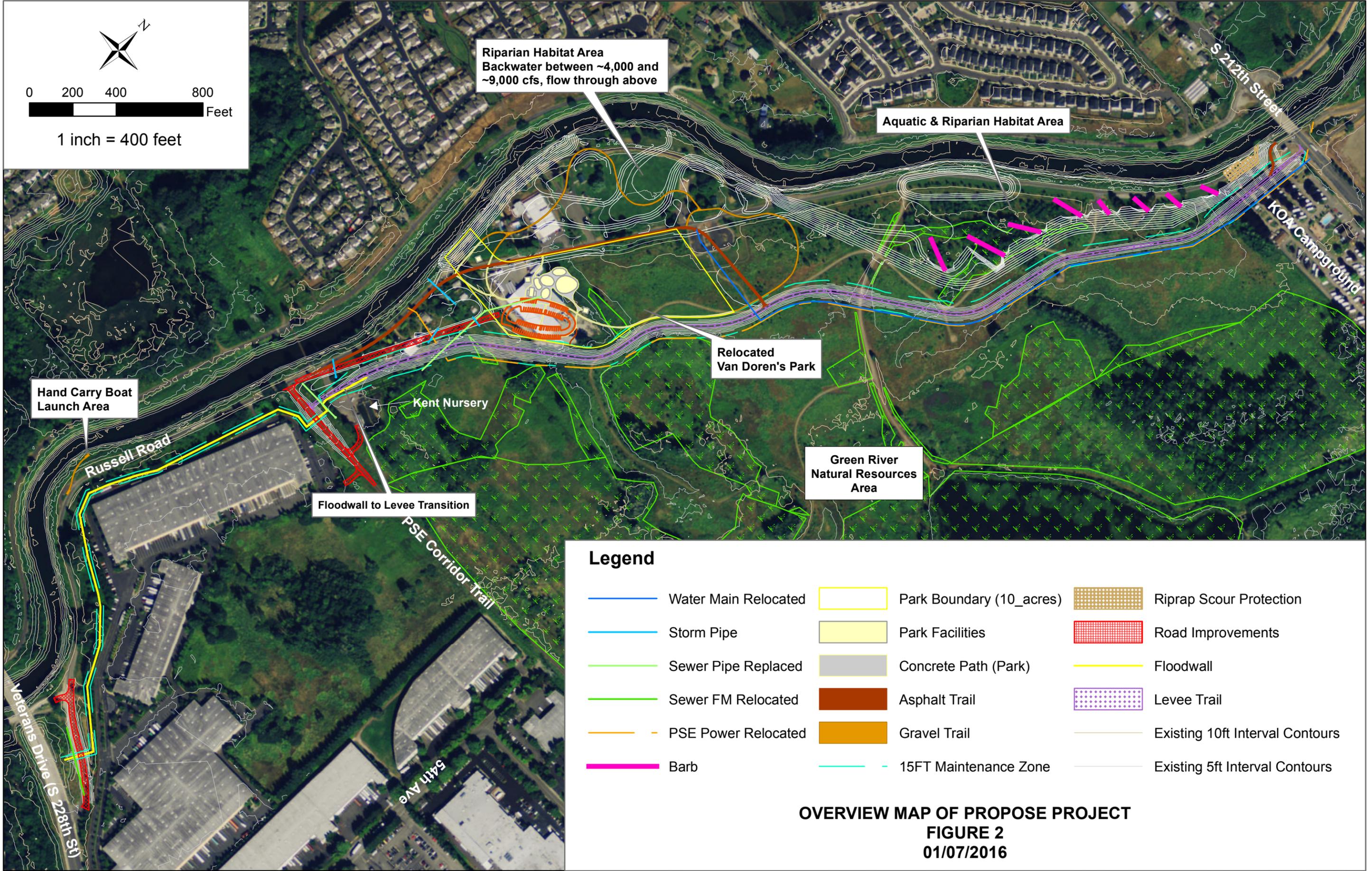
2.0 Project Description/Features

2.1 Overview

An overview of the primary Project elements are delineated in Figure 2 and include:

1. A new floodwall extending from the vicinity of the intersection between S. 228th Street and Lower Russell Road to the vicinity of the intersection between Lower Russell Road and the Puget Sound Energy (PSE) Corridor Trail.
2. A new levee extending from the vicinity of the intersection between Lower Russell Road and the PSE Corridor Trail to its intersection with S. 212th Street.
3. Modifications to Lower Russell Road in the vicinity of its intersection with S. 228th Street. The road embankment will be raised through its intersection with the floodwall in order to avoid the need for a flood gate.
4. Modifications to the PSE Corridor Trail in the vicinity of its intersection with Lower Russell Road. The road embankment will be raised through its intersection with the floodwall in order to avoid the need for a flood gate.
5. Modifications to the PSE Corridor Trail in the vicinity of its intersection with Lower Russell Road to provide vehicle access to the Kent Nursery; emergency response vehicle secondary access to the TIAA-CREF warehouse property; and maintenance and emergency vehicle access to the top of the new levee embankment running to the north while maintaining pedestrian and bicycle use of the trail.
6. Relocation of a reach of Lower Russell Road extending from the vicinity of its intersection with the PSE Corridor Trail to the parking lot of the relocated Van Doren's Landing Park.
7. Relocation of Van Doren's Landing Park to the east of its current location in order to allow creation of a new riparian habitat area.
8. A new Trail System consisting of asphalt, gravel, and levee trails. The system will maintain continuity with the trails at S. 228th Street and S. 212th Street.
9. Storm drainage facilities to convey local runoff as required by the new Project elements.
10. Completion of mass grading of portions of the right bank and right bank floodplain to create new riparian and aquatic habitat.
11. Bank stabilization measures in the form of a launchable rock pad in the vicinity of S. 212th Street and flow deflectors (barbs) within the constructed riparian and aquatic habitat area.
12. Landscaping of the Project Area.
13. Relocation of the existing boat launch to a location in the vicinity of River Mile (RM) 19.0.
14. Relocation of utilities as required due to work associated with this project.
15. Acquisition of property directly impacted by this project.

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0 200 400 800 Feet
1 inch = 400 feet

Riparian Habitat Area
Backwater between ~4,000 and ~9,000 cfs, flow through above

Aquatic & Riparian Habitat Area

Relocated Van Doren's Park

Hand Carry Boat Launch Area

Kent Nursery

Green River Natural Resources Area

Floodwall to Levee Transition

Legend

- | | | |
|------------------------|----------------------------|-----------------------------------|
| — Water Main Relocated | □ Park Boundary (10_acres) | ▨ Riprap Scour Protection |
| — Storm Pipe | □ Park Facilities | ▨ Road Improvements |
| — Sewer Pipe Replaced | □ Concrete Path (Park) | — Floodwall |
| — Sewer FM Relocated | ▨ Asphalt Trail | ▨ Levee Trail |
| — PSE Power Relocated | ▨ Gravel Trail | — Existing 10ft Interval Contours |
| — Barb | — 15FT Maintenance Zone | — Existing 5ft Interval Contours |

**OVERVIEW MAP OF PROPOSE PROJECT
FIGURE 2
01/07/2016**

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2.2 Project Datum

The horizontal datum for the project is the North American Datum of 1983 (NAD83). The vertical datum for the project is the North American Vertical Datum of 1988 (NAVD88).

2.3 Design Hydrograph and Design Water Surface Elevations

King County has directed the project team to use a design peak discharge of 18,500 cubic feet per second (cfs), 500-year (0.2% annual chance) event (median flow value based on United States Army Corps of Engineers (USACE) work), for the project reach. This peak flow is based on preliminary data developed as part of the ongoing Green River System Wide Improvement Framework (SWIF) project. This flow value assumes some attenuation of the peak discharge downstream of the USGS Auburn gage (18,800 cfs).

The downstream tailwater condition at the S. 212th Street Bridge for the design discharge for the project reach (18,500 cfs) exceeds the capacity of the existing levee system throughout most of the lower Green River. To account for the impact of future levee system modifications, downstream tailwater conditions for the project reach were based upon preliminary FLO-2D modeling conducted by Northwest Hydraulics Consultants (NHC) for King County to support the ongoing Green River SWIF project. The SWIF modeling accounts for proposed levee system upgrades as well as water surface impacts, including overtopping, of the existing left bank levee between S. 200th and S. 212th streets. The HEC-RAS model was modified to provide a reasonable representation of the tailwater elevation at the S. 212th Street Bridge for the design event incorporating the proposed project features. The HEC-RAS model results for the proposed project water surface elevations are listed in Table 1.

Table 1. Design Water Surface Elevations for Proposed Project

Cross Sections	Design Water Surface Elevation (0.2% Chance Flood)	1% Annual Chance (100-year Flood Elevation)
River Mile (RM)	(ft – NAVD88)	(ft – NAVD88)
19.407	42.4	38.7
19.281	42.4	38.7
19.268	42.3	38.6
19.248	42.2	38.5
19.156	42.0	38.4
19.076	41.8	38.2
18.985	41.6	38.0
18.893	41.6	38.0
18.814	41.3	37.8
18.808	41.3	37.7
18.740	41.3	37.5
18.679	41.0	37.3
18.607	41.0	37.3
18.541	41.0	37.2
18.470	41.0	37.1
18.384	40.7	37.0
18.314	40.6	37.1
18.266	40.7	37.1

Cross Sections	Design Water Surface Elevation (0.2% Chance Flood)	1% Annual Chance (100-year Flood Elevation)
18.215	40.7	37.1
18.137	40.7	37.1
18.067	40.7	37.1
18.008	40.6	37.1
17.926	40.5	36.8
17.853	40.0	36.6
17.840	40.1	36.6
17.626	39.8	36.3
17.428	39.4	36.0
17.222	39.0	35.6

2.4 Floodwall

2.4.1 Floodwall Overview

From the perspectives of design, cost, maintenance and operations, levees are often preferred over floodwalls. However, floodwalls provide more design flexibility when setback constraints would otherwise result in levee footprint impacts to existing infrastructure. For this project, a floodwall is proposed to extend from the vicinity of the intersection of 228th Street and Lower Russell Road to the vicinity of the intersection of the PSE Corridor Trail and Lower Russell Road to accommodate existing infrastructure.

2.4.2 Top of Wall Elevation

The top of wall elevation is based on a combination of regulatory requirements, standard of care, and King County preferences. The top of wall elevations were set to provide a minimum of 3 feet of freeboard above the design water surface elevation.

2.4.3 Floodwall Design Criteria

Criteria used for the 30% Design of the floodwall sections are based on published federal technical guidance documents, including the following USACE Engineering Manuals (EMs). This includes design criteria for flood wall stability and strength.

- EM 1110-2-2502 Retaining and Flood Walls
- EM 1110-2-2100 Stability Analysis of Concrete Structures
- EM 1110-2-2104 Strength Design of Reinforced-Concrete Hydraulic Structures

2.4.4 Floodwall Design Recommendations

The proposed concrete floodwall is proposed to be a T-wall type, founded on shallow foundations (spread footings). Typical section illustrating the T-Type floodwall is provided in Appendix B. The foundations are proposed to be cast directly on a prepared subgrade, which is proposed to be free of loose material and compacted to a firm and unyielding condition. Clean, free-draining, granular fill is not recommended for the floodwall foundations due to under-seepage concerns.

2.4.5 Floodwall Sections

The floodwall begins at the embankment of S. 228th Street and crosses over the existing alignment of Lower Russell Road. The roadway grade will be raised up and over the T-wall sections at this intersection. The floodwall alignment generally parallels Lower Russell Road on the landside of the

Green River. The existing topography rises and falls at several locations along the corridor. The T-wall sections were proportioned to have generally two feet of soil cover over the top of the footings. The top of wall elevations were held at EL.45.6 and 44.6. The wall heights were determined considering these two criteria. The heights range in size from 6 foot to 13 foot stems with seven typical sections. The footing widths vary from 7 foot to 18 foot and thicknesses of 1 foot, 3 inches to 2 feet. All sections have a turned down “shear key” on the river side edges of the footings. This provides resistance to sliding as well as offers advantages for seepage control. The stem and footing sizes were proportioned using the load cases noted above with the top of wall case generally governing the design. Allowable bearing pressures were derived by the geotechnical team and were provided for use in the structural analysis. They considered the applicable factors of safety and limited settlement to less than 1 inch. The values ranged from 1,200 pounds per square foot (psf) to 2,000 psf. Steel reinforcing and other miscellaneous design details such as joint treatments will be developed during the final design stage. Typical sections illustrating the T-Type floodwalls are provided in the 30% design drawings, Sheet S-5 (Appendix A) and in Appendix B – Typical Floodwall Sections and Details.

2.5 Levee

2.5.1 Existing Flood Containment System

The existing flood containment system in the Project Area includes levees and revetments. Levee heights vary from approximately 3 to 8 feet. Top widths are approximately 12 to 30 feet. The landward slope is typically 3 to 6 horizontal (H) to 1 vertical (V) and the riverward slope is typically 1.5 to 2H:1V. The toe of the riverward slope of the levee is armored with rock. The levee crown is paved for the length of the levee. The levee was originally constructed as a farm levee and has been repaired in various locations over the years in response to erosion by scour. Recent repairs were done in the late 1990s at four locations and there is significant scour and damage to the levee toe and embankment near the Holiday Kennels (RM 18.6). The levee is owned and maintained by King County as part of the King County FCD. Deficiencies noted during USACE inspections have included: significant vegetation, encroachments, animal burrows, over-steepened slopes, depressions, cracking in the crown pavement, and minor erosion at a culvert outfall.

2.5.2 Proposed Setback Levee

Levee improvements include constructing a new levee extending from the vicinity of the intersection of the PSE Corridor Trail and Lower Russell Road to S. 212th Street. The top of levee embankment elevations are based upon providing a minimum of 3 feet of freeboard above the design water surface elevation to account for hydrologic and hydraulic uncertainties, plus 0.5 feet to account for construction tolerances and future project associated, long-term settlement of the foundation that is anticipated to result from weight of the new levee.

The crown width of the levee embankment is 16 feet. The embankment will have a cross slope of 2% to avoid water ponding on the embankment material at the levee crown. The levee embankment will have waterside and landside slopes of 1V:3H. Because of uncertainty regarding the availability of suitable embankment material, it is currently assumed that the embankment will have two zones consisting of common fill and core fill. The zone of common fill is also divided into two zones with the outer zone typically less compacted and the inner zone with the core defining the primary levee load bearing prism. A 6-inch layer of top soil will be placed on the levee embankment and seeded to promote the growth of grasses on the embankment slopes in order to reduce rill erosion. A 12-foot-

wide trail will be placed upon the levee crest, a portion of which is designated as a regional trail and paved. The trail will also serve as a levee patrol road in order to allow access for inspection, maintenance, and flood fighting operations. The levee easement will include a 15-foot maintenance zone extending from both the waterside and landside toes of the embankment. Typical sections for the proposed levee are found in the 30% design drawings, Sheets C1-6 and C1-7 (Appendix A) and in Appendix B – Typical Levee Sections and Details.

2.5.3 Levee Design Criteria

Criteria used for this project was based on published federal and King County regulations and technical guidance documents. In general, following the USACE criteria provides a sound basis for addressing the requirements of Code of Federal Regulations (CFR; 44CFR65.10) for levee geometry, seepage, slope stability, levee settlement, and levee construction materials, as well as requirements for geotechnical site investigations, seepage analyses, slope stability analyses, and settlement analyses. Design criteria presented by King County were also employed as directed. More detail on design criteria can be found in associated project documents.

2.5.4 Seepage Analyses

The seepage analyses were performed assuming steady-state conditions and using the finite element analysis groundwater module within the computer program SLIDE (Rocscience 2013). The seepage analysis models were constructed with a constant head boundary on the waterside of the levee equal to the Design Water Surface Elevation (DWSE), a no flow boundary along the bottom edges of the model, potential seepage surfaces along the landside ground surface of the levee, and a constant head boundary equal to the ground surface elevation along the landside edge of the model. To reduce the potential for numerical errors due to boundary effects, the seepage models were extended 2,000 feet landward from the centerline of the river.

The results for the seepage analyses all show maximum exit/uplift gradients of less than 0.5 near the ground surface on the landside toe of the levees. These results indicate that the preferred alignment and proposed flood protection system is generally not at risk of significant through seepage or under seepage for the conditions evaluated at the section locations considered. Seepage berms or subsurface cutoff walls do not appear to be required based on the results of these analyses.

2.5.5 Slope Stability Analyses

Slope stability analyses for the Project were conducted using the computer model SLIDE, which uses 2-D limit equilibrium methods to analyze slope stability. The SLIDE program performs slope stability computations based on the modeled cross section conditions and calculates a Factor of Safety (FS) against slope failure, which is defined as the ratio of the resisting forces to the driving forces acting on a soil mass. A FS of 1 indicates a “just-stable” condition, and a FS less than 1 would indicate unstable conditions. Spencer’s analysis method was used as the primary analysis in SLIDE as it satisfies both moment and force equilibrium criteria for the potential sliding soil mass.

In accordance with guidance presented in USACE documents EM 1110-2-1913, Design and Construction of Levees and EM 1110-2-1902, Slope Stability, four analysis cases were evaluated for levee stability including: end of construction, static (steady-state), rapid drawdown, and seismic.

2.5.6 Levee Settlement

The Project Area is underlain by loose and soft alluvium sediments that are prone to settlement under new surcharge loads (levee embankments) and as a result of liquefaction during earthquakes.

There are also organic-rich sediment layers underlying the Project Area that will generate long-term secondary compression and settlement as the organics continue to decompose. In general, the implications of settlement for the Project are summarized as follows:

- Short-term static settlement (primary consolidation) can be expected during the placement of fill for the new setback levee embankments. It is anticipated that between 0.5- and 1-foot of primary consolidation will occur in the northern third of the Project Area, with as much as 0.5 to 1.5 feet of primary consolidation in the middle third of the Project Area. The southern third of the Project Area and flood protection system will consist of a floodwall. The majority of the primary consolidation will occur as the embankment fill is placed and within one to two months after the start of fill placement.
- Long-term static settlement (secondary compression) can be expected to occur slowly and throughout the Green River Valley, including in the Project Area. Secondary compression is influenced by surcharge loads and will occur in a more concentrated fashion beneath the levee embankments when compared to the greater valley. It is anticipated that between 0.5 and 1-foot of secondary compression will occur within 20 years after construction of the project. An allowance for 0.5-foot of secondary compression will be accounted for in the design of the levee embankments.
- Seismic settlement as a result of liquefaction of the loose and saturated sediments underlying the Green River Valley, including the Project Area, during the 100-year recurrence interval design earthquake can be expected on the order of 0 to 0.66 feet. Since the seismic settlement is expected to occur across the valley, limited differential settlement is expected as a result of seismic settlement across the greater Project Area.

2.5.7 Levee Construction and Earthwork Considerations

The foundation of the levee will be cleared and grubbed to remove objectionable above-ground material and obstructions, such as vegetation, structures, and debris. The foundation will then be stripped to a depth of 10 inches to remove low-growing vegetation, organic topsoil, and other objectionable material. The cost estimate assumes 5 percent of the levee footprint will need over-excavation of stripping depth of up to 24 inches.

An inspection trench will also be constructed as necessary to identify any unacceptable underground features such as abandoned utilities, pockets of unsuitable material, or other debris, and to confirm that adverse seepage conditions are not present beneath the levees as site conditions warrant. The depth of the inspection trench is proposed to be 6 feet. The trench is proposed to be backfilled with compact, relatively low permeability fill. The extent of trench excavation and specifications for material type and placement will be determined in the next phase of the project.

The levee embankment material will be dependent on the determined feasible sources for material and their suitability with respect to the above seepage and stability requirements for the project. In general, levee embankment core fill is proposed to be constructed of material that has 20 to 50 percent fines (material passing the # 200 sieve) and 100 percent passing the 4-inch sieve. Material used for low permeability core fill is proposed to have a maximum hydraulic conductivity of 10^{-4} cm/sec.

Borrow material may also be derived from on-site sources, such as re-used material from portions of the planned habitat excavations, scour protection excavations, and floodwall excavations. It is

estimated that 30 percent of the soil derived from dry excavation activities for the project may be suitable for use as common fill for the project. Soil derived from excavations in the saturated and wet zones are anticipated to be unsuitable for use as fill on the project due to the high organic content, elevated moisture content, and high clay content of these soils.

2.6 Roads

2.6.1 Overview

The design configuration and requirements for Lower Russell Road has been determined by King County and the City of Kent. The existing roadway facility connects between S. 212th Street to the north and S. 228th Street to the south and accesses multiple businesses and Van Doren’s Landing Park. The future condition will support access to a relocated park, a system of paved and gravel trails, and a recreational hand-carry boat launch. Through traffic will not be present on Russell Road as the connection to S. 212th Street will be closed off and the road terminated at the new park. The roadway design is a byproduct of the preferred alternative of the levee system. Only sections of the roadway that need to be rebuilt are included in the design. The existing pavement and roadway section is being left in place where possible.

The road cross section is similar to the existing road cross section and was developed through an iterative coordination effort between consultant staff, County staff, and City of Kent staff. A portion of the existing Lower Russell Road will be elevated just north of its intersection with S. 228th Street to ramp over the new proposed floodwall. The ramp avoids the extra cost, maintenance, and operational needs of a floodgate across the road. Between the PSE Corridor Trail and the relocated park, a new road will be constructed with the existing road converted to become part of the regional Green River Trail. The typical roadway section is found in the 30% design drawings, Sheet CP-13 (Appendix A) and in Appendix B – Street Improvements Typical Sections.

2.6.2 Road Design Criteria

Criteria used in development of the roadway designs is based on published federal, state, county, and municipal regulations, standards, and guidance manuals listed in Table 2. Pavement design for the roadway cross section has been designed per recommendations derived from the geotechnical study. The pavement section is proposed to consist of 3 inches of hot mix asphalt (HMA) overlying 8 inches of crushed surfacing base coarse (CSBC). The proposed pavement section will be revisited during final design to verify adequacy.

Table 2. Roadway Design Guidance Documents

Design Guidance Document	
1)	City of Kent Design and Construction Standards, 2009
2)	King County Road Design and Construction Standards, 2007
3)	WSDOT Design Manual M 22-01.11, July 2014
4)	WSDOT Roadside Manual M 25-30.02, June 2014
5)	WSDOT Local Agency Guidelines (LAG) Manual M 36-63.25, April 2014
6)	FHWA Manual on Uniform Traffic Control Devices (MUTCD), January 2009
7)	AASHTO A Policy on Geometric Design of Highways and Streets, 6th Edition, 2011
8)	Department of Justice, ADA Standards for Accessible Design, 2010
9)	Oregon State Marine Board, Design Guidelines for Recreational Boating Facilities, 2011

2.6.3 Floodwall Crossing near S. 228th Street

The levee floodwall extends along the south portion of the project area and must connect to the abutment and bridge structure at S. 228th Street to create a continuous protection system in the corridor. This requires the facility to cross the roadway at some point. To facilitate the crossing of the roadway by the flood control structure two options were analyzed. The first option was a floodgate structure that can be raised during storm events to connect the two portions of the floodwall. This option requires continual operation, additional maintenance and is more expensive. The benefit would be that the existing roadway prism could be left in place in its existing configuration. The second and selected option raises the roadway to ramp up and over the floodwall. This option eliminates the need for a floodgate and imbeds the floodwall into the roadside fill slopes. Notable features that are being replaced with the road crossing includes: the existing guardrail and signage, the pavement surface, and the storm water flow paths and facilities along the roadside.

2.6.4 PSE Corridor Trail

The PSE corridor is not an existing roadway but a trail. The floodwall/levee work requires relocating the entrance to the City of Kent Nursery and the emergency vehicle secondary access to the TIAA-CREF property to the PSE corridor trail. To accommodate access to the two buildings and to minimize locations where the levee system has crossings, the access was consolidated to a single location. A short section of the PSE corridor roadway will essentially become a trail/shared driveway connection for the two businesses. The shared driveway/trail has been designed up ramp up and over the floodwall to avoid the need for a floodgate. Driveways into the businesses were designed using standard City of Kent guidelines for grade. Turning templates were run for all directions of travel to verify that the design could accommodate a WB-67 truck (the largest design vehicle). The location of the roadway and grades were designed to avoid any impacts to the PSE transmission towers.

2.6.5 Van Doren's Landing Park Entrance

To provide access to the new park and accompanying parking lot, Russell Road is being revised to break-off from its existing alignment at the junction with the PSE corridor trail and head further east adjacent to the proposed levee. The roadway design width is similar to the existing road.

2.6.6 Russell Road and S, 212th Street Intersection

The existing S. 212th Street and Russell Road intersection allows right-in / right-out movements to and from Russell Road. This location has an accident history and there are sight distance concerns due to the grades and configuration of the two roads where they intersect. The intersection will be eliminated with the removal of Russell Road. The levee trail will connect to S. 212th Street for maintenance vehicle and emergency vehicle access but not for general public vehicular use. To accommodate the new levee location and access point revision, the sidewalk on the bridge is being extended east and new curb ramps constructed to provide ADA compliant access for pedestrians. Bollards were designed for the levee junction to restrict unauthorized vehicle access and a sign is proposed to be installed on S. 212th Street alerting drivers to the emergency access only condition.

2.7 Stormwater Management

2.7.1 Overview of Existing Stormwater System in the Proposed Project Area

The existing stormwater system collects and conveys stormwater runoff to two drainage basins; the Green River and the GRNRA and the City's Valley Regional Detention Facility. Based on the topography, the boundary between the two drainage basins is located approximately 15 feet east of

Lower Russell Road. The area west of the line either infiltrates or is conveyed to the Green River. The area to the east of the line either infiltrates or is conveyed to the GRNRA via concentrated overland flow. The existing stormwater system primarily consists of grass lined ditches adjacent to Russell Road and a few small formal drainage systems that consist of catch basins and pipes that collect and convey stormwater runoff from the parking lot areas. Stormwater runoff from Lower Russell Road typically sheet flows in a dispersed manner to the roadside ditches or vegetated areas that either infiltrate or convey the stormwater downstream via the ditch and culvert system. There are no known stormwater flow control or water quality facilities on the project site. Review of the available base maps and field observations indicate that most of the roadside ditches do not have formal conveyance system that discharge directly to either the Green River or the GRNRA. Therefore, it is assumed that a large majority of the stormwater infiltrates on site.

The project areas where stormwater runoff is collected and conveyed from the site through formal culverts, or pipe and catch basin systems that have been identified at this stage, include the following:

- The portion of Lower Russell Road and adjacent vegetated areas between South 228th Street and the bike/pedestrian trail that crosses under the S. 228th Street Bridge, is conveyed through an existing culvert that crosses under S. 228th Street (from north to south). Although the southern end of the pipe has not been located at this stage, it is believed the stormwater continues through the wetland/forested areas and ultimately discharges to the Green River.
- Stormwater runoff from the Holliday Kennels property is conveyed directly to the Green River through an onsite pipe and catch basin system.
- Stormwater runoff from the main Van Doren's Landing Park parking lot, on the south side of the park, drains through a catch basin with an oil/water separator and through a 12-inch-diameter perforated pipe that was designed to allow stormwater to infiltrate. Any non-infiltrated stormwater continues to flow to the north to a small grass depression area to the north of the picnic shelter at the north end of the park. A piped system that includes a sheer grate manhole drains the grass area through the levee and discharges directly to the Green River. The sheer gate allows the system to be closed during a flood event, which prevents the flood water from flooding that area behind the levee. The grass area upstream of the levee provides a temporary storage area for the stormwater while the sheet gate is closed. Because the system does not include a flow control structure it is not classified as a detention facility. The field and small parking lot on the north side of the park also drain to this system.
- Stormwater runoff from the two parking lots on the east side of Russell Road north of Van Doren's Landing Park are collected through catch basin systems that discharge directly to the grass lined ditches on the east side of Lower Russell Road. As mentioned above, the ditches do not have formal piped or open channel connections to either the River or the GRNRA and are assumed to infiltrate on-site.
- Noble Pacific warehouse runoff drains overland to the front (west) and back (east) sides of the property. Drainage to back side of the property drains to the GRNRA and is presumed to mostly infiltrate. Drainage to the front of the property drains towards Russell Road and joins the drainage system for Russell Road. Most of the runoff is presumed to infiltrate.

2.7.2 Stormwater Design Criteria

The proposed project will be constructed within City of Kent right-of-way and will be subject to the City of Kent Stormwater Code and applicable standards. Stormwater conveyance and stormwater management facilities for the proposed project will be in accordance with the following codes and standards:

- City of Kent Municipal Code, Chapters 7.05, 7.06, and 7.07
- 2009 City of Kent Design and Construction Standards, Section 5 Standards of Storm drainage Systems, September 2009 (Kent 2009)
- City of Kent Surface Water Design Manual, May 2002 (Kent 2002)
- LID Technical Guidance Manual for Puget Sound, December 2012 (WSU PSP 2012)

2.7.3 Stormwater Improvements

In general, the project will maintain the existing storm drainage system where possible. In some locations, the proposed project improvements will require new stormwater infrastructure to be constructed to manage the stormwater from the site in compliance with the applicable codes and standards. It is expected that flows from the Project Area west of the new levee alignment will be directed to the Green River. Areas east of the new alignment will be directed towards the City's Valley Regional Detention Facility. It is expected that the proposed stormwater improvements will consist of roadside ditches, crossing culverts, biofiltration swales, vegetated filter strips, rain gardens, and erosion control measures. Preliminary assessment of the Core Requirements and coordination with the City of Kent indicates that the project will be required to provide water quality facilities for the new pollution generating surfaces.

2.8 Ecological Habitat (Riparian and Aquatic)

2.8.1 Habitat Restoration Objectives

The habitat restoration objectives for the project are as listed in Section 1.3 and allow the project to be self-mitigating for habitat impacts. The opportunities to provide these habitat objectives vary throughout the Project Area; therefore, the habitat design varies between three portions of the Project Area: Area A (north), Area B (middle), and Area C (south). In Area A, the levee setback will be the widest and provides the largest potential habitat area (approximately 19 acres). In Area B, the levee setback allows for restoration of approximately 12 acres in the current location of Van Doren's Landing Park and adjacent properties. In Area C, the levee will be replaced with a floodwall which will not widen the habitat corridor. The habitat objectives for each area are as follows:

- Area A
 - Aquatic rearing habitat for juvenile salmonids during the January 1 through June 30 spring rearing season (primary objective)
 - Complex, fully functioning riparian habitat (primary objective)
 - High flow refuge habitat (secondary objective)
- Area B
 - High flow refuge habitat accessible during flows experienced nearly every year (above approximately 4,000 cfs) (primary objective)
 - Complex, fully functioning riparian habitat (primary objective)
- Area C
 - Complex, fully functioning riparian habitat (primary objective)

- Improved aquatic edge habitat (secondary objective)

The constructed habitat is expected to evolve in response to river processes within Area A and to a lesser extent Area B. The project will remove bank armoring from the right bank and excavate areas to be more available for river processes and flow inundation. Post construction habitat adjustments include scour of exposed riverbanks on outside bends and sediment deposition. The possibility of river channel adjustment into Area A also exists. Scour protection along the eastern boundary of Area A will protect the levee from and set boundaries on the extent of future channel migration. The site is anticipated to be managed adaptively rather than constrained to constructed conditions. The integrated project design and post construction management approach are consistent with the project's goals.

2.8.2 Habitat Design Descriptions

2.8.2.1 Elements Common to All Areas

The placement of instream and floodplain wood and planting of riparian vegetation are key habitat restoration elements that are common to all three areas. Large wood will be placed in jams and as individual pieces to serve multiple functions, including to increase habitat complexity through localized scour and deposition, add instream structure over a range of flows to provide thermal and hiding cover and reduce velocities, increase prey production, and redirect flows to reduce scour along the setback levee. Native trees and shrubs will be planted in 25 acres throughout the riparian corridor to serve multiple functions, including shade to aquatic areas, organic matter input (leaves and branches) to promote prey productivity, terrestrial-origin prey production, future wood recruitment to the river, instream structure to reduce velocities during higher flows, and habitat for birds and other wildlife. Plantings will extend down to about the ordinary high water (OHW) and include species that can survive frequent inundation and provide shade in the near-term while trees grow.

2.8.2.2 Habitat Restoration Area A: North Aquatic Habitat

The design of this approximately 19-acre area includes spring rearing and high flow refuge habitat for salmonids and riparian plantings. About 16 acres of channel margin rearing habitat for salmon fry will be created by excavating the existing floodplain down to an elevation that is inundated annually during the spring rearing season. This low velocity habitat prolongs spring rearing in the river by reducing the likelihood that young fish will be carried out of the river prematurely during high flows. Fish that rear longer in the river are bigger when they migrate to saltwater, and these larger fish are more likely to survive. A large island and several peninsulas will remain so that trees can be planted there to provide shade to the river while minimizing sedimentation commonly observed at narrow channel inlets and outlets. The island and peninsulas will have gently sloped banks to provide shallow slow water edge habitat for fish across a range of river flow levels. Logjams and wood clusters of various sizes will be installed within the newly created channel margin and floodplain, and individual logs will be installed riverward of the central island. A total of about 10 acres of riparian forest will be planted within the 19-acre site.

2.8.2.3 Habitat Restoration Area B: Existing Van Doren's Landing Park Flood Refuge

The design of this approximately 12-acre area includes high flow refuge habitat for salmon fry, riparian plantings, and trails for passive recreation. The approximately 4.3-acre flood refuge swale will be backwatered at about 4,000 cfs (a high flow experienced nearly every year), and receive

through flow at about 9,000 cfs (the 2-year recurrence flood). This area will also provide high flow refuge habitat at larger, less frequently occurring flow events, and will be planted with native trees and shrubs. Individual logs will be installed at the toe of the bank at the north end of the swale to provide cover and shallow, slow water for rearing salmon fry. An additional 200-foot-wide riparian corridor will be planted along the entire river bank (approximately 1,900 linear feet) for a total of about 12 acres of riparian planting in Area B.

2.8.2.4 Habitat Restoration Area C: South Riparian and Channel Edge

This approximately 2,200 linear feet portion of the project site is most constrained by existing buildings and infrastructure. About 3.4 acres of riparian corridor will be planted between the river bank and existing Lower Russell Road, varying in width between about 80 and 120 feet. Individual logs will be installed at the toe of the bank along the inside bend to provide cover and shallow, slow water for rearing salmon fry.

2.8.3 Design Techniques Proposed to Achieve Objectives

This section identifies the design techniques proposed to achieve the habitat objectives. Through the design process in the next phase of the project, additional techniques may be incorporated into the design.

2.8.3.1 Excavation

River banks and upland areas are proposed to be excavated to increase the area inundated at different river stages. The excavation will also be designed to increase shoreline length at certain river stages and increase the availability of shallow edge habitat. The design will depend on observed or modeled information on river stage frequencies at different times of the year and how those water levels may change with the excavation. Slope grading varies. Within Area A and below the OHW, the slopes are typically designed with 6H:1V slopes or shallower with the expectation that hydraulic forces will reshape the edges to provide more slope variability. This design method will be used along with other techniques to provide high-functioning aquatic habitat conditions.

2.8.3.2 Large Wood Placement

Large wood clusters of various sizes, designs, and placement locations relative to the thalweg are included to provide physical habitat structure for salmonids, stabilize habitats, induce pool scour, and encourage redirection of flow paths (either toward or away from banks). Single logs can be used to provide more habitat structure, but have minimal effects on the river processes. Wood clusters will be placed at locations that become inundated at different river stages to provide habitat structure over a range of flows. Wood clusters will be comprised of large wood, with additional racking of smaller material to provide these functions. As a general rule, logs with rootwads attached function better than logs without rootwads. Depending on the forces acting on the wood clusters, a variety of anchoring techniques can be employed including using piles and/or boulder ballast with chain and/or cabling.

2.8.3.3 Riparian and Riparian Buffer Vegetation

Riparian and riparian buffer vegetation is proposed to be incorporated into the design in a manner consistent with existing USACE and King County guidance. For habitat functions, the riparian planting will use exclusively native vegetation and emphasize the ability to shade the river in the short and long term. Restoration design within the riparian and riparian buffer areas is first prioritizing the riparian shading potential through the use of a broad canopy trees. However, given the projects'

direct relationship with Van Doren's Landing Park riparian space, replanting is being crafted with adjacent open spaces, view sheds and trails in mind. The interface between park and habitat areas is not proposed to serve as the primary driver of vegetation type selection; however this aspect will be an influence on how vegetation types are being sculpted within the riparian buffer.

2.9 Scour Countermeasures

2.9.1 Scour Protection Overview

Scour protection has been incorporated into the proposed project based on the following criteria:

- Incorporate scour protection, where necessary, by accounting for channel migration potential such that the need to add, replace, or repair scour protection within 30 years of project construction will be low.
- In the case of the north habitat area (Area A), scour protection is being installed now where channel migration 30+ years out may require scour protection to protect the levee. This habitat area is expected to become highly valued and consequently challenging to conduct future work. To avoid future challenges associated with habitat impacts (permitting difficulties, mitigation costs) the scour protection measures considered a longer timeframe than 30 years.

Different types of scour protection measures were investigated based on several considerations including: 1) keeping work outside the summer low flow channel to minimize impacts and facilitate permitting, 2) taking into account the estimated scour depth, and 3) maintaining space between the river channel and the protected slope. Where space is available, flow deflectors (barbs) are anticipated. Where space is constrained, a launchable rock toe and rock along the lower slope is the assumed scour protection method.

2.9.2 Proposed Scour Protection

Scour protection will be constructed along the eastern embankment of the proposed northern habitat area and the transition back to the existing main channel below (south of) the S. 212th Street Bridge. Scour mitigation measures are designed to limit the migration of the channel thalweg along the proposed eastern embankment slope toe and reduce critical infrastructure failure risk. No scour protection is proposed elsewhere due to the setback distance from the river, channel migration potential did not meet the County's scour design criteria. Large woody clusters are integrated into the scour protection plan but are not integral to reduction of scour risk. Barb flow deflectors and riprap revetment were selected as the preferred scour mitigation measures for the northern approximate 1,700 feet of the project reach.

2.9.2.1 Barbs

Barbs are provided through an approximately 1,300 foot reach of the proposed northern habitat area from approximately 1,700 feet south of S. 212th Street to approximately 400 feet south of S. 212th Street. Barbs are trapezoidal-shaped, low-profile, linear structures that extend upstream and slope downward away from the protected bank. They are designed to function in series and redirect flow toward the river channel unlike deflective structures that harden a bank (e.g. rock revetment) or retarding structures that slow velocities in the vicinity of the structure (e.g. piling, bioengineering). Unlike traditional rock revetment, barbs require less material, promote vegetated river banks, create scour holes away from the protected bank, and result in a variety of flow conditions for fish habitat.

Barbs are designed to protect the outside-bank region of a bend in three ways:

- Disrupting velocity gradients in the near-bank region.
- Deflecting bank scouring secondary currents towards the channel center.
- Shifting the thalweg (deepest and swiftest portion of the channel) away from the bank towards the center of the channel.

Barbs, for this project, will be designed based on guidance provided in the following documents:

- Federal Highway Administration (FHWA) Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance, dated September 2009
- NRCS Kansas Engineering Technical Note No. KS-2 (Revision 1), dated January 23, 2013

All barbs are located in the northern habitat area (Area A) and are designed to start overtopping with flows in excess of the mean summer flow (14 feet elevation). Each barb is oriented 45 degrees upstream of the adjacent habitat embankment, directing flows away from the downstream banks. A total of 8 barbs are provided along the approximate 1,300 foot reach. Barb lengths avoid impacts to existing channel banks, allow a smooth flow path through the habitat areas, and limit the overall number of structures required to adequately protect critical infrastructure. Barbs are typically constructed of rock (e.g. barbs on Reddington Levee Setback project). In final design the barbs design and layout will be refined based on the river's anticipated geomorphic response to project grading, habitat enhancement and role for wood, scour potential and risk.

2.9.2.2 Rock Riprap Revetment

A riprap revetment with a section of rock launching toe is provided along the KOA campground site and habitat Area A grading transition back to the existing channel. Riprap revetment extends along a 200 foot reach from approximately 350 feet south of 212th Street to approximately 150 feet south of 212th Street. Riprap was provided in this space constrained area to protect critical infrastructure from erosion caused by potential migration of the main channel thalweg and flow transition back into the existing channel under 212th Street. A riprap launching toe was included for a portion of the revetment to provide protection to the predicted scour depth, approximately 9 feet below the existing channel thalweg elevation of 10 feet.

Riprap revetment and launching toe were designed based on guidance provided in the following documents:

- Guidelines for Bank Stabilization Projects in the Riverine Environments of King County, dated June 1993
- FHWA HEC 23 Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance, dated September 2009
- USACE Hydraulic Design of Flood Control Channels, dated June 1994

Riprap revetment will extend from the ordinary high water elevation of 19 feet down to elevation 6 feet. Elevation 6 feet is eight feet below the 500 cfs summer low flow elevation at roughly elevation 14 feet and anticipated groundwater surface. Eight feet is the assumed maximum, feasible excavation depth assumed for the placement of rock under water. Riprap revetment is sized for the 100-year flow event using USACE guidance and the riprap sizing software ChanIPro. Per discussions with King County, FHWA gradations were used in computations to size riprap. Assuming

a factor of safety of 2, FHWA Class 2 riprap gradation was defined for the revetment and launching toe. A higher factor of safety was used to account for hydraulic uncertainty and better match existing riprap along the river. Riprap sizing will be refined in subsequent design phases based on refinements to hydraulic modeling.

A riprap launching toe is designed along the riprap revetment. Extents of launching toe along the revetment were defined to avoid grading impacts to the existing banks below mean summer flow elevations of 14 feet and avoid/minimize in-water work. FHWA Class 2 riprap is specified for the launching toe and assumes a self-launching slope of 2 horizontal to 1 vertical, per USACE guidance. An additional 50% riprap volume is provided in the launching toe to account for uncertainties associated with launching of rock to the 100-year scour elevation. The launching toe thickness varies between 3-8 feet. Smaller thickness is preferred by the County where feasible to maximize the effectiveness of launch rock and allow placement of large woody debris along the top of rock at lower elevations without encroaching in to the river channel. All riprap revetment and launching toe construction excavation will be backfilled to proposed habitat elevations, effectively burying the launch rock and the majority of the riprap.

2.10 Recreation

2.10.1 Overview

The project's recreational components (under Alternative 4B) include the relocation of Van Doren's Landing Park, completing a missing link of the regional Green River Trail from S. 212th Street to the PSE corridor trail and secondary (pervious) trails through habitat areas. The City of Kent has added additional amenities to be funded by the City (see Section 2.10.6 below).

2.10.2 Van Doren's Park Relocation

The largest element of the project is the relocation of Van Doren's Landing Park eastward, away from the river, to the other side of existing Russell Road. The relocation of the park is being proposed in order to add habitat along the river and remove obstacles for future habitat enhancement work. The existing park (parcels 102204-9196 and -9176) is a total of 9.49 acres, 7.35 acres of which have Washington Recreation and Conservation Office (RCO) funding obligations. The existing park is adjacent to the Green River with 1,200 feet of riverfront. The City has another 0.31 acre park (Anderson Park) within the project site (parcel 112204-9014) that will be removed as well.

The relocated park will have reduced river frontage and reduced access due to the elimination of Russell Road north of the park to S. 212th Street. Access to the park from S. 228th Street via Russell Road will remain. To mitigate for moving the majority of the park away from the river (one of the park's most prominent features) and the loss of the safety and convenience of Russell Road as a through street, the relocated park has been designed to not just replace the existing facilities with new ones, but improved facilities.

The new Park is intended to be an attractive and compelling destination with features to attract park users year-round. The goal is to provide amenities designed for the current park users: families with children and large groups looking for an enjoyable picnic space. Another important goal for the new park is to maintain a connection to the river and to the historical significance of the site. Proposed park elements include:

- 10 acres in size
- Larger restroom
- 3 picnic shelters (one more than currently exists)
- Larger multi-purpose play field
- Horseshoe pits
- Watercraft launch for hand carry boats (located outside park boundary)
- Parking area for 80 cars
- Multiple playgrounds for varying age groups

The park will be located riverward of the proposed levee. However, a significant portion of the park will be 2 – 3 feet above the 1% annual chance (100-year) flood event to protect the restroom, playgrounds, parking lot and grassy play area.

The relocation of the park will require a conversion of the original 7.35 acres of park the RCO helped fund. The conversion will require that the property be at least the same size and value to meet State and Federal conversion requirements. The RCO must agree to the conversion before the park can be relocated. While the conversion process can be complicated to navigate, King County has successfully converted properties previously (e.g. 2013 Reddington Levee Setback project in Auburn). The estimated cost to complete the conversion is included in the project's cost estimate.

2.10.3 Trail Network

The other recreational element of the project is the construction of trails, both a relocation of the regional Green River Trail and addition of secondary gravel/mown trails. The existing regional Green River Trail from S. 212th Street will be relocated off of Russell Road south to the PSE corridor trail (the City of Kent will fund the separation of a regional trail to S. 228th Street as discussed below). The regional trail will have an asphalt surface and runs adjacent to the relocated park and also on top of a portion of the new setback levee (see Figure 2).

To provide more recreational value and an insight in to the habitat restoration that will take place in the old park site, the project will construct a series of gravel/mown trails. These trails are meandering and are designed to match the contours of the natural area.

2.10.4 Green River Natural Resources Area (GRNRA)

The GRNRA is an important natural open space and significant project elements are found within its boundaries. The boundaries of the GRNRA will be adjusted as part of this project as mitigation for project impacts. GRNRA impacts are primarily due to additions of hard surfaces (e.g. asphalt trails) and the relocated park. These are impacts that will not meet the original grant funding restrictions to purchase the GRNRA (shoreline public use, passive recreation purposes and habitat conservation). The project is intended to be self-mitigating. The boundary of the GRNRA will be adjusted westward to encompass upland and riparian habitat areas created as part of this project and maintain its current size. The boundary adjustment will be determined as the project proceeds through final design.

2.10.5 Hand Carry Boat Launch

There is an existing asphalt and concrete hand carry boat launch within Van Doren's Landing Park. The boat launch has been eroded by river scour, compromising its usefulness. Along with the

relocation of Van Doren's Landing Park, this boat launch will be removed and relocated to an area less prone to scour.

The boat launch is proposed to be relocated to the northern portion of the first large bend in the Green River downstream of S. 228th Street. The proposed relocated boat launch is currently designed as a gravel launch accessible by foot traffic and as needed by the City of Kent rescue personnel. Guidance for the design of the launch width and grade was obtained from the Oregon State Marine Board design guidelines. As the design progresses to the next phase, further discussions on the surfacing material for the relocated boat launch is warranted. The design guidelines provide a listing of positive and negative lessons learned for both gravel and concrete surfaces.

The proposed new boat launch location is half a mile south of the nearest parking lot. To accommodate users, the 30% design includes a gravel parallel parking area adjacent to Russell Road. The parking area is located on the outside of the curve to prevent sight distance issues that could arise from objects located to the inside of the curve and avoids impacting existing power poles. The pullout parking area will have space for 3-4 cars. The design places bollards at the end of the parking area before the trail to the boat launch to prevent unauthorized vehicles from using the hand carry launch. The bollards are removable allowing emergency vehicles the opportunity to utilize the launch if necessary.

2.10.6 City of Kent Added Amenities

The City of Kent has planned other recreational amenities along this stretch of public land adjacent to the Green River for inclusion as part of the project. These additional features include:

- A trailhead on the south end of the project site near the S. 228th St Bridge.
- A new section of Green River Trail separated from Russell Road between S. 228th Street Bridge and the PSE corridor trail.
- Enhancements to the junction of Russell Road and the PSE corridor trail.
- An observation tower similar to the existing tower in the Green River Natural Resources Area.
- A small rest area with a bench at the north end of the project at the S. 212th St Bridge and regional trail connection.

The design and construction of these features, while a part of the Lower Russell Road Levee Setback project, will be funded by the City of Kent. The City of Kent provided the cost estimate for these additional features (Appendix C) and prepared layout drawings of these additional features (Appendix A).

2.11 Utilities

Various utilities and encroachments are located in the proposed footprint of the setback levee. These include fences, water and sewer lines, power poles and overhead transmission lines, buildings, and other items. Utility relocation design including specifications and cost estimate will be performed by others through King County.

Water Main: The City of Kent has a trunk water main (12 inch DIP) along the entire length of Russell Road. In locations where the project impacts (removes) the road, the water main will need to be relocated.

Sanitary Sewer: The flood protection system alignment crosses sewer pipelines in two locations between the PSE corridor and Noble Pacific property. The assumption is that the pipes at these two crossings will need to be replaced.

PSE Electric Utility along Lower Russell Road: In locations where Lower Russell Road will be removed, the utility (largely overhead power) will need to be relocated to continue serving remaining customers. Relocation, in-kind, of the PSE electrical utility is assumed to be a PSE expense under its franchise agreement with the City of Kent. However, there is a City of Kent ordinance that requires that PSE go underground when three or more spans are affected (which this project will). If that were to be required for this project, then the City would have to pay a significant portion (~75%) of the total relocation cost. That cost has been included as part of the project cost estimate assuming going underground will be required.

The City of Kent is currently planning for the installation of a pump station and 42-inch-diameter pipeline to convey runoff from the GRNRA lagoon located east of the project under the proposed levee and discharge into the Green River. The outlet of the pipeline is tentatively planned in the general vicinity of the north side of Van Doren's Landing Park. King County and City of Kent are coordinating on an agreeable discharge location to avoid significant conflicts. The design and operation of the pump station is expected to comply with current Green River Pump Operations Procedures Plan (POPP). Design of the pipeline and construction will need to be coordinated with King County and the Lower Russell Road design team.

2.12 Real Estate

The proposed project requires private property acquisition, including:

- KOA Campground - Partial acquisition of the property.
- Gagliardi (Holiday Kennel) - Two parcels, including the Holiday Kennels business.
- Noble Pacific Warehouse.

In addition, the City of Kent previously acquired four residential properties between the City's Nursery and the Noble Pacific Warehouse. The City's Van Doren's Landing Park will be relocated. A RCO Conversion will be needed as part of this relocation but no additional Real Estate acquisition is required. The Green River Natural Resource Area will have its boundaries adjusted as a part of this proposed project but this boundary adjustment will still meet the original GRNRA grant funding mandate.

2.13 Operation and Maintenance

2.13.1 Operations

The proposed setback levee and floodwall project will result in a passive flood risk management system. Lower Russell Road and the PSE Corridor Trail will be raised to ramp over the floodwall crossings to avoid the need for flood gates. As such the proposed project has no features which require active operation on a recurring or emergency basis. The County will establish the protocol for

levee and floodwall patrols during flood events. The City of Kent will be responsible for alerting the public and closing Van Doren's Landing Park and Lower Russell Road during flood events.

2.13.2 Maintenance

As Owner/Operator of the proposed setback flood risk management system, the County will ensure that an Operation and Maintenance Manual describing maintenance requirements for the floodwall and levee will be developed and implemented. The maintenance activities could include removing woody vegetation, maintenance of grass cover, maintenance of patrol roads, inspection of animal boring or other anomalies, verification of channel/floodplain capacity, and monitoring of settlement. King County and the City of Kent will be responsible for operation and maintenance of their respective non-flood related elements of the project.

3.0 Estimate of Probable Cost

3.1 Purpose

This estimate of probable cost is provided to determine anticipated budget requirements and the progress of the design within said budget. The preferred Alternative 4B project costs are presented in Table 3 below and an itemized cost estimate is found in Appendix C. The cost estimate includes 20% for contingencies and 27% for engineering, legal, and administration. Two cost estimates are presented in Table 3 differing by assumed construction year start and resulting projected inflation impact on cost.

Table 3. Total Estimated Alternative 4B Project Costs based on construction year start

Lower Russell Road Levee Setback Project	Total Estimated Project Cost of Alternative 4B	
	2017 Construction	2018 Construction
Site Removals and General Cost	\$1,204,446	\$1,229,742
Erosion and Sediment Control Cost	\$819,922	\$837,142
Levee Cost	\$2,335,092	\$2,384,133
Structural Floodwall Cost	\$6,033,104	\$6,159,812
Public Utilities Cost	\$1,018,565	\$1,039,957
Roadway Cost	\$831,776	\$849,245
Scour Cost	\$2,142,579	\$2,187,578
Habitat Restoration	\$14,197,559	\$14,521,651
Van Doren's Landing Park Relocation	\$4,940,906	\$5,044,675
PSE Utility Relocations	\$1,073,016	\$1,095,551
Real Estate Acquisitions	\$7,000,000	\$7,000,000
Cultural resources Investigations	\$700,000	\$700,000
RCO Conversions	\$100,000	\$100,000
Total Russell Road levee Setback (Alternative 4B) Cost (rounded up)	\$42,397,000	\$43,150,000

Presented in Table 4 below is the total cost of additional elements funded by the City of Kent. The City of Kent provided the cost estimate for these additional features. See Appendix C for an itemized cost estimate of these additional features.

Table 4. Total Estimated Additional City of Kent Costs based on construction year start

Lower Russell Road Levee Setback Project	Additional City of Kent Cost	
	2017	2018
Van Doren's Landing Park and Adjacent Areas Master Plan Elements beyond Alternative 4B (rounded up)	\$793,000	\$810,000

The combined total project cost is estimated at \$43,190,000 (2017 construction start) or \$43,960,000 (2018 construction start).

3.2 Estimate Basis

This cost estimate is considered to be in the Conceptual Phase (30% Design) or Class 3 Estimate as defined by the Association for the Advancement of Cost Engineering International (AACE). The expected accuracy range according to these standards is a low of -15%; and high +20% which is the recommended accuracy range recommended for General Construction according to AACE Publication 56R-08. This cost estimate has been prepared from the information available at the time of preparation. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project scope, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. The estimate is based on material, equipment, and labor pricing as of October 2015 and as such, the prices are subject to variation. Annual construction inflation of 2.5% has been assumed in the development of the cost estimate.

The greatest sensitivity, uncertainty, with the cost estimate outside of unforeseen scope changes, inflation factors, and the competitiveness of the bidding environment is the cost for excavation and the handling (placement/disposal) of the excavated material due to the very high volume of material proposed to be excavated as a part of this project. For purposes of this estimate, it is assumed that a competitive bid environment will exist and that unit prices bid for the excavation and handling of the excavated material will be similar to the unit prices bid for other recent projects in the area involving significant earthwork.

The construction cost estimate also includes a 20 percent construction contingency allowance. A sales tax of 9.5 percent has been added to the construction cost subtotal to develop the total estimated construction cost. The 27% for engineering, legal, and administration (based on construction cost) can be further broken down into:

- 6% for administration, legal, and planning
- 12% for engineering and design
- 1% for construction survey
- 8% for construction management

These percentages are based upon cost experienced by the County for similar projects.

3.3 Estimate Methodology and Assumptions

This estimate has utilized the bottom up method of pricing derived from cost data resources, except for cost estimates provided by the City of Kent (Berger Partnership). Where applicable, costing was augmented with preliminary costing from suppliers.

The list of assumptions included in this 30% design estimate is as follows:

- Levee core fill will be imported material.
- Levee common fill will be native material excavated from the habitat restoration area.
- Van Doren's Landing Park fill will be native material excavated from the habitat restoration area.
- Utility Trench backfill and pipe bedding will be native material.

- Revegetation planting will be watered by water truck for 18 weeks during summer months for one year.
- Contractor Markups are included in estimate prices.
- Project will be bid competitively with a minimum of 4 to 5 bidders.

3.4 Cost Resources

The following is a list of the various cost resources used to development this estimate:

- Modified (Seattle) RS Means Construction Cost Data with Assemblies, 2015 database
- Washington State Labor Table
- Engineering News Record
- HDR Engineering
- Berger Partnership
- Preliminary Supplier Quotes
- Estimator's judgment
- Other Historical Cost Data

4.0 Coordination and Permits

4.1 Environmental Coordination and Permits

The proposed flood protection system alignment was developed to meet the project objectives after determining site constraints and opportunities in coordination with the City of Kent, the Muckleshoot Indian Tribe and other stakeholders. Environmental coordination is critical on a project such as this. Environmental input was sought for this project through the Green River SWIF; Public Meetings; Facilitated Design Workshops; and Habitat Working Group Meetings. Permits required include Federal; State; and City of Kent. A listing of potential permits is as follows:

Federal:

- US Army Corps Section 404
- US Army Corps Section 10
- US Army Corps Section 408
- Section 7 - Endangered Species Act compliance
- Section 106 – National Historic Preservation Act

State of Washington:

- Department of Ecology 401 Water Quality Certification
- Department of Ecology NPDES Construction Stormwater General Permit
- Department of Fish and Wildlife – Hydraulic Permit Approval
- Department of Natural Resources – Aquatic Lands Lease
- Department of Recreation and Conservation Office – Coordination and Approval
- SEPA compliance

Local:

- City of Kent Land Use/Site Development Permit/Shoreline Substantial Development Permit
- City of Kent Critical Area Modification Permit
- City of Kent Construction-Related Permits – demolition, clear and grade
- City of Kent Flood Plain Development Permit
- City of Kent Building Permits – structural, civil, utility, fire

4.2 Cultural Resources

A cultural resources review of the project area and vicinity identified the presence of one historic archaeological site and one historic site in the project area, and the potential presence of two ethnographic Indian village sites. Maddocksville, the historic archaeological site, is in the project area, but its boundaries have not been defined. The historic site is documented as a point feature in the project area, but the presence and extent of associated archaeological materials are unknown. The precise location of the two ethnographic Indian village sites is not known and the presence and extent of associated archaeological materials at each are unknown. The significance (eligibility for listing in the National Register of Historic Places) of the known and potential archaeological sites has not been determined. The review also identified a number of historic above-ground resources,

including the Lower Russell Road Levee and Lower Russell Road that must be recorded and evaluated for significance. It is anticipated that the levee and road would be determined Not Eligible for inclusion in the National Register of Historic Places (NRHP). The next phase of the project will initiate the process for identifying, evaluating, and mitigating any adverse effects to archaeological resources. That process is as follows:

- Near-Surface Survey
- Testing/Evaluation - required only if the near-surface survey discovers archaeological resources, otherwise skip to last bullet
- Data Recovery - required only if testing/evaluation results in determination of eligibility
- Develop an archaeological resource monitoring plan (ARMP) and an inadvertent discovery plan (IDP)

4.3 FEMA No-Rise Compliance

FEMA has published regulatory water surface profiles for the Green River. The FEMA Baseline Model represents existing conditions, and provides the baseline for determination of LRRP impacts to FEMA regulatory (100-year) Base Flood Elevations (BFE). The proposed project seeks to attain “No-Rise” in FEMA regulatory (100-year) flood levels, including the base flood water surface elevation and the floodway water surface elevation. Preliminary results after running new models that represents the proposed project shows a localized, less than or equal to 0.2 feet, increase in water surface elevations to the existing conditions Base Flood Elevation within the habitat restoration areas and a decrease in water surface elevations of up to 0.5-feet in the reach upstream of the habitat area. The increase in water surface elevation is likely due to the result of slower velocities within the expanded flow area provided by the excavated habitat area. The project will not increase BFEs outside of the project reach or outside public property. Additional analysis will be completed during the next phase of the project in order to refine estimates of project impact and to determine regulatory compliance.

5.0 Proposed Project Schedule for Final Design and Construction

The current focus of the project is to move forward with final design starting in February 2016 so that a construction contract can be bid and awarded in a timeframe to facilitate the start of field construction work in April 2018, shortly after the end of the flood season. Once construction of the new flood protection system starts it must be substantially complete before the start of the next flood season on November 1st. The completion of construction of all of the various new and relocated Park elements may have a later substantially complete date. It is estimated that all the work under the construction contract would be complete and the project would be closed out by the summer of 2019.

A tentative project Design and Construction schedule is shown in Table 5 below based upon the assumption of a 2018 construction start. The schedule is reasonable for achieving 2018 construction but still requires timely progress on property acquisition, no significant findings regarding cultural resources, no unexpected permitting delays, and the timely progression and completion of design.

Table 5. Tentative Project Design and Construction Milestone Schedule

Activity	Milestone Date
Accept 30% Design Report	January 22, 2016
FCD Authorize Final Design	February 16, 2016
Complete 60% Design and Apply for USACE Permit	September, 2016
Complete Final Design	November, 2017
Advertisement for Construction Bids	December, 2017
Award Construction Contract	March, 2018
Begin Construction	April, 2018
Construction of New Flood System Complete	October, 2018
All Construction Substantially Complete	April, 2019
Final Acceptance	May, 2019

6.0 References

There are two types of references for this project: design criteria documents and other reference documents. The design criteria documents are guidelines developed by regulatory agencies; other reference documents consist of other consultants reports that contain information utilized in the project.

6.1 Design Criteria Documents

6.1.1 US Army Corps of Engineers (USACE) Engineer Circular (EC)

USACE. Process for the National Flood Insurance Program (NFIP) Levee System Evaluation, EC 1110-2-6067, August 31, 2010.

Engineer Manuals (EM)

USACE. Hydraulic Design of Flood Control Channels, EM 1110-2-1601, June 30, 1994.

USACE. Geotechnical Investigations, EM 1110-1-1804, January 1, 2001.

USACE. Seepage Analysis and Control for Dams, EM 1110-2-1901, April 30, 1993.

USACE. Slope Stability, EM 1110-2-1902, October 31, 2003.

USACE. Settlement Analysis, EM 1110-2-1904, September 30, 1990.

USACE. Instrumentation of Embankment Dams and Levees, EM 1110-2-1908, June 30, 1995.

USACE. Design & Construction of Levees, EM 1110-2-1913, April 30, 2000.

USACE. Conduits, Culverts, and Pipes, EM 1110-2-2909, March 31, 1998.

USACE. Retaining and Flood Walls, EM 1110-2-2502, September 29, 1989.

USACE. Strength Design for Reinforced-Concrete Hydraulic Structures, EM 1110-2-2104, June 30, 1992.

USACE. Design of Sheet Pile Walls, EM 1110-2-2504, March 31, 1994.

Engineer Regulations (ER)

USACE. Quality Management, ER 1110-1-12, September 30, 2006.

USACE. Planning Guidance Notebook, ER 1105-2-100, June 30, 2004.

USACE. Flood Control Operations & Maintenance Policies, ER 1130-2-530, October 30, 1996.

USACE. Engineering and Design for Civil Works Projects, ER 1110-2-1150, August 31, 1999.

Engineer Technical Letters (ETL)

USACE. Design Guidance for Levee Under-seepage. ETL 1110-2-569. May 1, 2005.

USACE. Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures. ETL 1110-2-583. April 30, 2014.

6.1.2 Other Agencies

Federal Emergency Management Agency (FEMA). Requirements of 44 CFR Section 65.10: Mapping of Areas Protected by Levee Systems. March 2007.

FEMA. Title 44 Emergency Management and Assistance. Chapter 1, Federal Emergency Management Agency Part 65 – Identification and Mapping of Special Hazard Areas. October 1, 2002.

FEMA. Guidance on Levee Certification for the National Flood Insurance Program. March 25, 1997.

6.2 Other Reference Documents

Rocscience. 2013. Slide 6.023 Analysis Program. July 2013.

7.0 Acronyms and Abbreviations

AACE	Association for the Advancement of Cost Engineering International
AASHTO	American Association of State Highway and Transportation Officials
ARMP	Archeological Resource Monitoring Plan
Aspect	Aspect Consulting, LLC
BFE	Base Flood Elevation
CFR	Code of Federal Regulations
CFS	cubic feet per second
Confluence	Confluence Environmental Company
CSBC	Crushed Surface Base Course
DIP	Ductile Iron Pipe
DWSE	Design Water Surface Elevation
EC	Engineer Circular
Ecology	Washington State Department of Ecology
ELJ	engineered log jam
EM	Engineer Manual
ER	Engineer Regulation
ETL	Engineer Technical Letter
FCD	Flood Control District
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FS	Factor of Safety
FT	Foot or Feet
GRNRA	Green River Natural Resources Area
H	horizontal
HDR	HDR Engineering, Inc.

HEC-RAS	Hydrologic Engineering Centers River Analysis System
HMA	Hot Mix Asphalt
IDP	Inadvertent Discovery Plan
In	Inch
KOA	Kampgrounds of America
LAG	Local Agency Guidelines
LID	Low Impact Development
LRRP	Lower Russell Road Levee Setback Project
MUTCD	Manual on Uniform Traffic Control Devices
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
NHC	Northwest Hydraulic Consultants
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
POPP	Pump Operations Procedures Plan
PSE	Puget Sound Energy
PSF	Pounds per Square Foot
RCO	Recreation and Conservation Office
RM	River Mile
STA	station
SWIF	System Wide Improvement Framework
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
V	vertical
WSDOT	Washington State Department of Transportation
WSE	Watershed Sciences and Engineering

Appendix A

Lower Russell Road Levee Setback Project

30% Preliminary Design

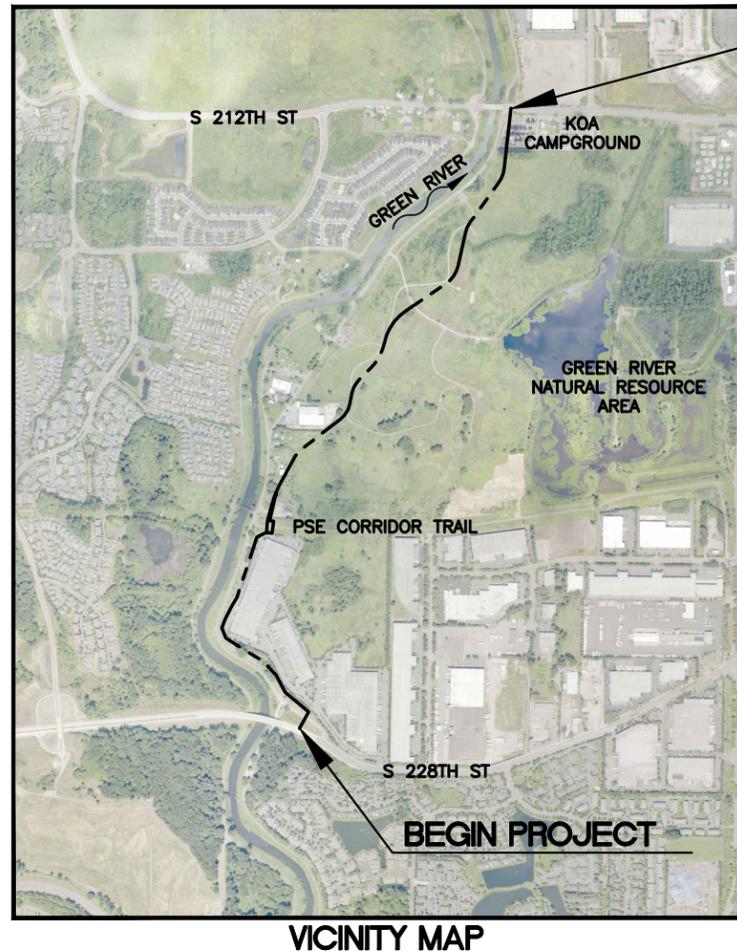
Cover, Vicinity Map, and Drawing Index Sheet

(Complete Drawing Set is a Separate Attachment Due to Size)

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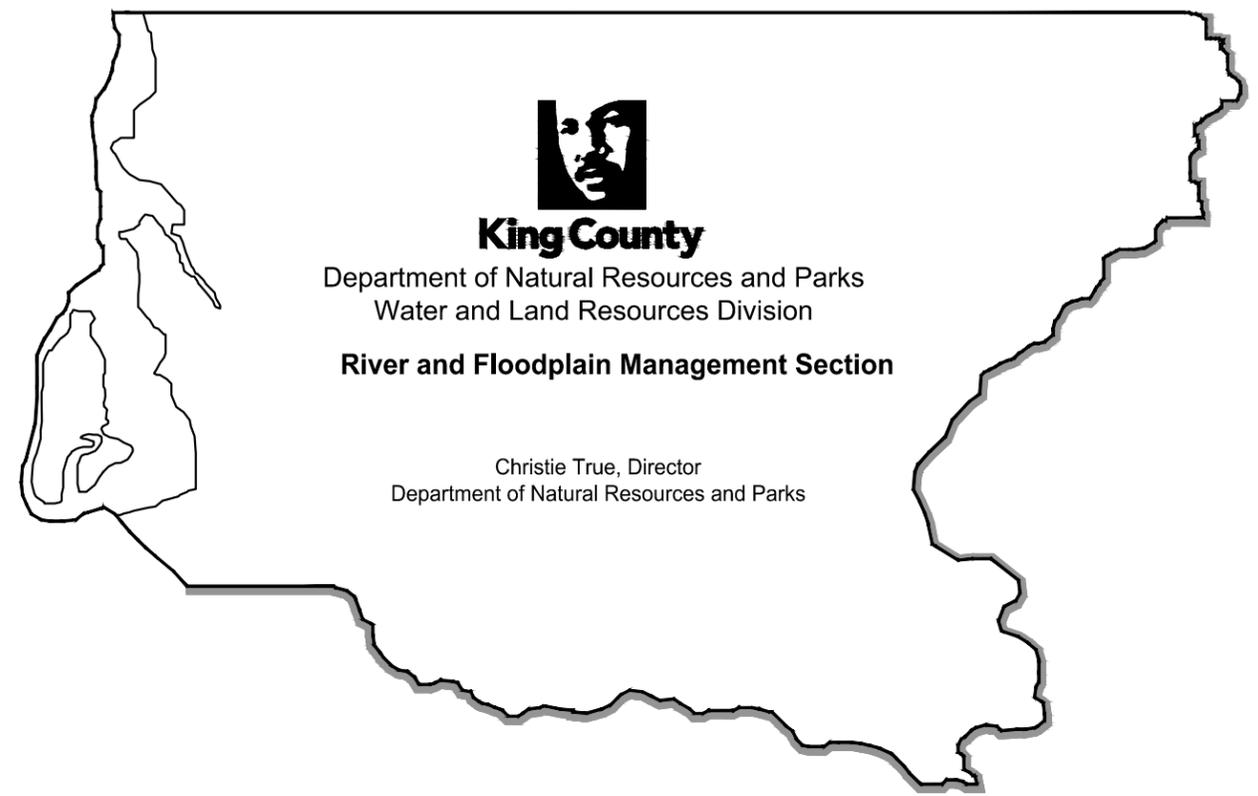
DRAWING INDEX

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G-2	LEGEND
G-3	ABBREVIATIONS
G-4	PROJECT OVERVIEW
G-5	LEVEE AND FLOODWALL SITE PLAN AND KEY MAP
G-6	HABITAT EXCAVATION SITE PLAN AND KEY MAP
G-7	SITE REMOVALS/DEMOLITIONS AND CLEARING KEY MAP
G-8	CONTROL LINE PLAN AND CURVE TABLES
G-9	CONSTRUCTION LIMIT PLAN AND TABLES
G-10	CONSTRUCTION LIMIT PLAN AND TABLES
G-11	HAUL ROUTES, STAGING AREAS AND TRAFFIC CONTROL
V-1	SURVEY CONTROL MAP
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CE-3	TEMPORARY EROSION AND SEDIMENT CONTROL PLAN 3
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CD-2	SITE REMOVALS/DEMOLITION AND CLEARING 2
CD-3	SITE REMOVALS/DEMOLITION AND CLEARING 3
CD-4	SITE REMOVALS/DEMOLITION AND CLEARING 4
CD-5	SITE REMOVALS/DEMOLITION AND CLEARING 5
CD-6	SITE REMOVALS/DEMOLITION AND CLEARING 6
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CD-10	SITE REMOVALS/DEMOLITION AND CLEARING 10
CD-11	SITE REMOVALS/DEMOLITION AND CLEARING 11
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C1-2	PROPOSED LEVEE PLAN AND PROFILE, STA 10+00 TO 20+00
C1-3	PROPOSED LEVEE PLAN AND PROFILE, STA 20+00 TO 30+00
C1-4	PROPOSED LEVEE PLAN AND PROFILE, STA 30+00 TO 40+00
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CU-4	STORM DRAIN IMPROVEMENTS, PLAN AND PROFILE
CU-5	STORM DRAIN IMPROVEMENTS, PLAN AND PROFILE



VICINITY MAP
NTS

END PROJECT



King County
Department of Natural Resources and Parks
Water and Land Resources Division
River and Floodplain Management Section

Christie True, Director
Department of Natural Resources and Parks

SHEET DESCRIPTION

CU-6	WATER AND SEWER, PLAN AND PROFILE
CU-7	WATER AND SEWER, PLAN AND PROFILE
CU-8	WATER AND SEWER, PLAN AND PROFILE
CU-9	PSE OVERHEAD POWER
CU-10	PSE OVERHEAD POWER
S-1	PROPOSED FLOODWALL PLAN AND PROFILE, STA 0+00 TO 8+00
S-2	PROPOSED FLOODWALL PLAN AND PROFILE, STA 8+00 TO 17+00
S-3	PROPOSED FLOODWALL PLAN AND PROFILE, STA 17+00 TO 27+00
S-4	PROPOSED FLOODWALL PLAN AND PROFILE, STA 27+00 TO 28+96
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S-6	TYPICAL FLOODWALL SECTIONS AND DETAILS 2
X-1	EARTHWORK TABULATION
X-2	VOLUME SUMMARY BALANCE
L-1	LANDSCAPE PLAN 1
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L-3	LANDSCAPE PLAN 3
L-4	LANDSCAPE PLAN 4
L-5	LANDSCAPE PLAN 5
L-6	LANDSCAPE PLAN 6
L-7	LANDSCAPE PLAN 7
L-8	LANDSCAPE DETAILS
L-9	LANDSCAPE DETAILS
L-10	LANDSCAPE DETAILS

LOWER RUSSELL ROAD LEVEE SETBACK PROJECT

30% PRELIMINARY DISTRIBUTION SET

WLRD	XX	-	-2015
From Dept.	Distributing Engineers	Return On/Before	
To Dept.	Approving Reviewer	Initial & Date	

NOTE: SCREENED SHEETS NOT IN 30% SUBMITTAL

**CALL 2 WORKING DAYS
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1-800-424-5555
(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)



Know what's below.
Call before you dig.

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CONTRACT No.	---	---

**30%
PRELIMINARY DESIGN
1/22/16**

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Water and Land Resources Division
River and Floodplain Management Section
Christie True, Director

LOWER RUSSELL RD LEVEE SETBACK PROJECT
COVER, VICINITY MAP AND INDEX

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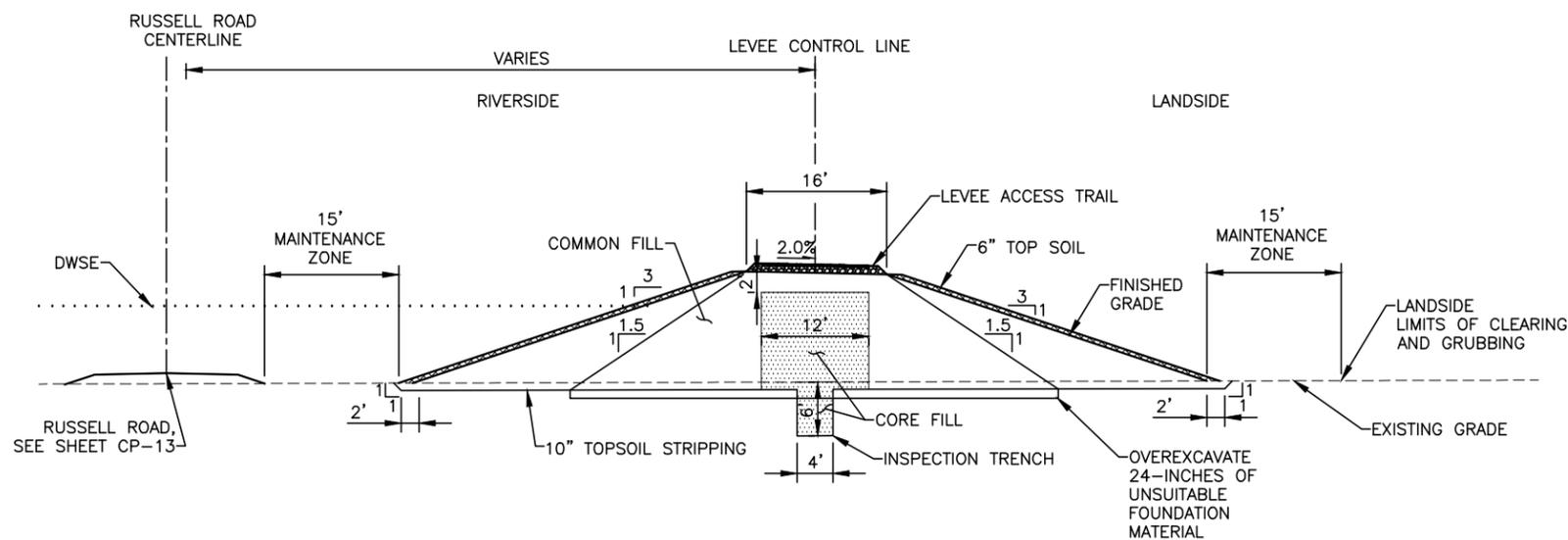
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Appendix B

Lower Russell Road Levee Setback Project

Typical Cross Sections

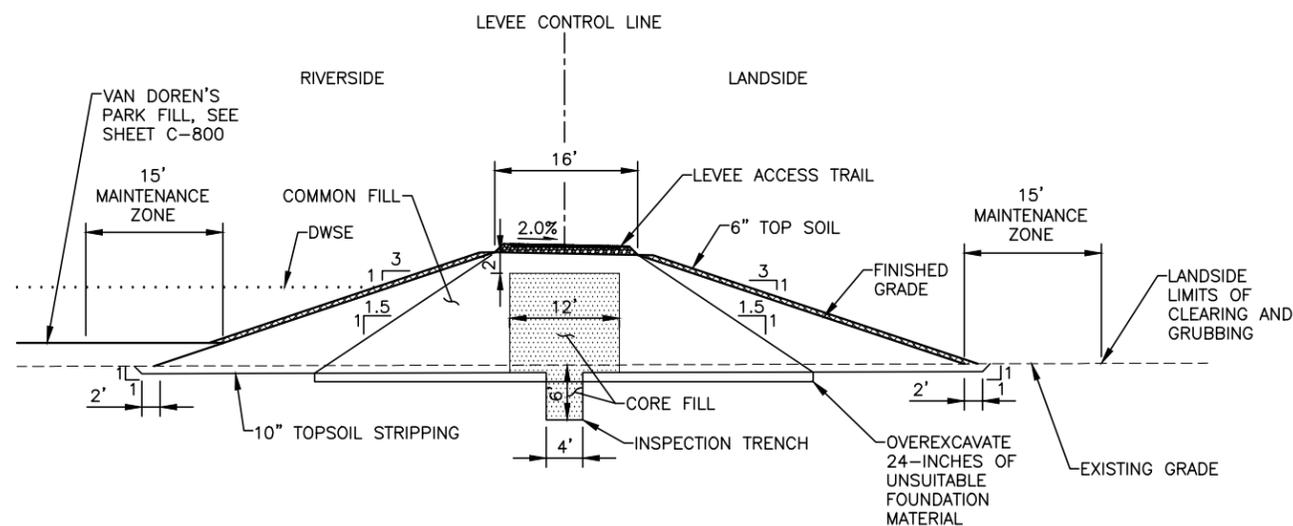
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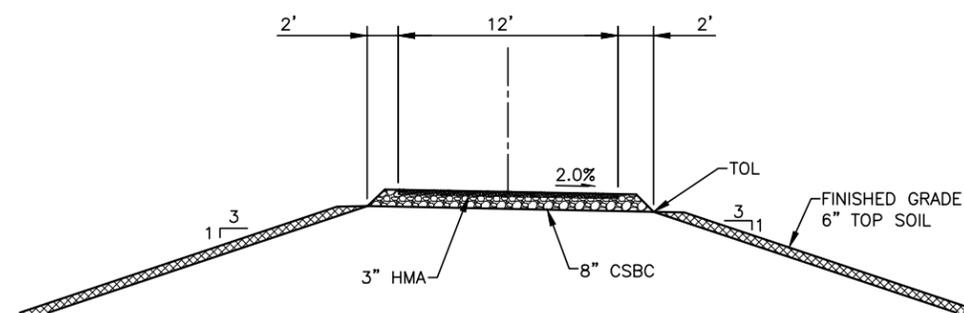
TYPICAL LEVEE SECTION - STA 0+00 TO 10+00
NTS

NOTES:

1. WATERSIDE LIMITS OF CLEARING AND GRUBBING WOULD EXTEND TO LIMITS OF HABITAT EXCAVATION AND ARE NOT SHOWN.



TYPICAL LEVEE SECTION - STA 10+00 TO 21+50
NTS



LEVEE ACCESS TRAIL TYPICAL SECTION
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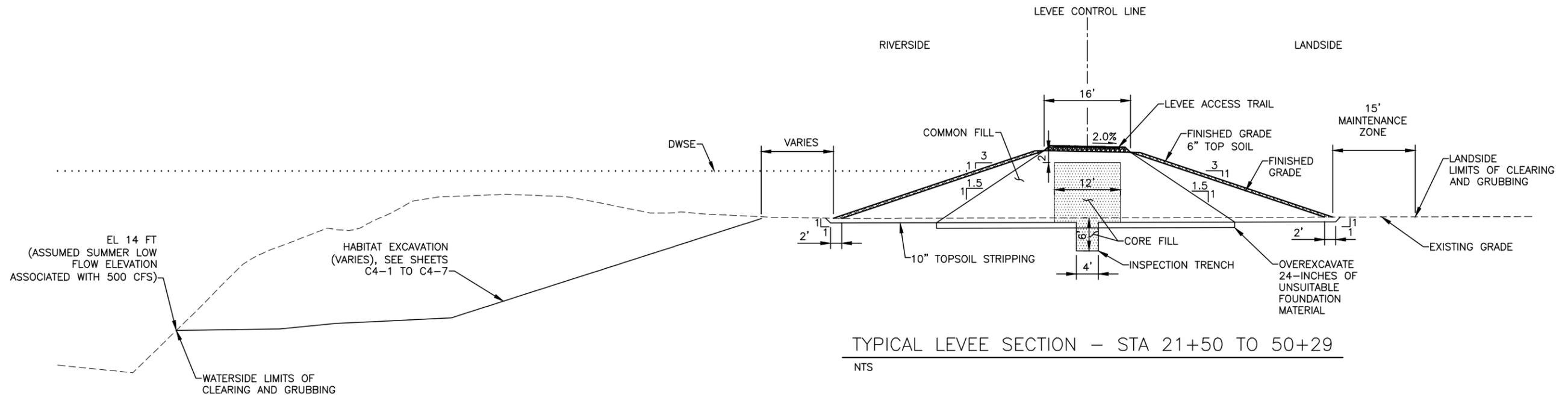
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Water and Land Resources Division
River and Floodplain Management Section
Christie True, Director

LOWER RUSSELL RD LEVEE SETBACK PROJECT
**TYPICAL LEVEE SECTIONS
AND DETAILS 1**

SHEET
OF
SHEETS
C1-6



**CALL 2 WORKING DAYS
BEFORE YOU DIG**
1-800-424-5555
(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)

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Call before you dig.

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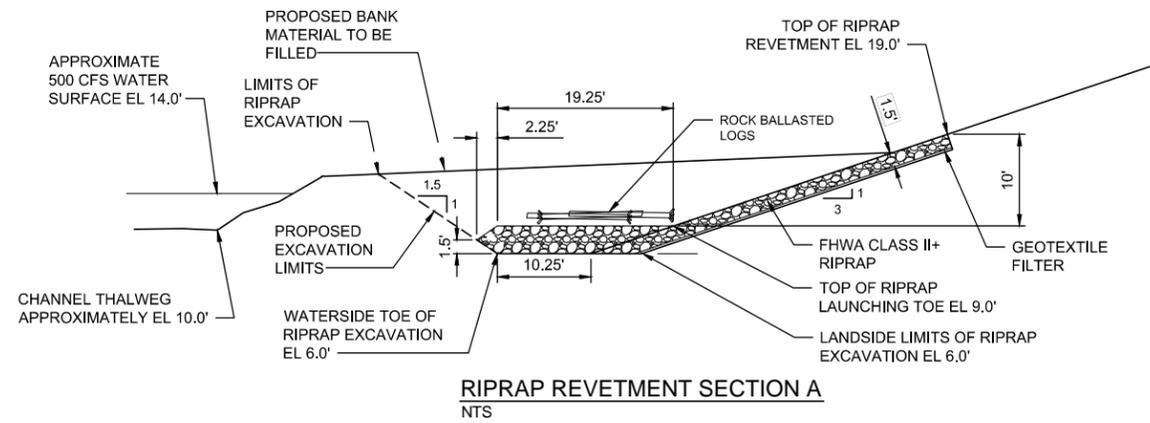
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PROJECT No. _____
CONTRACT No. _____

**30%
PRELIMINARY DESIGN
1/22/16**

King County
Department of Natural Resources and Parks
Water and Land Resources Division
River and Floodplain Management Section
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LOWER RUSSELL RD LEVEE SETBACK PROJECT
**TYPICAL LEVEE SECTIONS
AND DETAILS 2**

SHEET
OF
SHEETS
C1-7



CALL 2 WORKING DAYS
BEFORE YOU DIG
1-800-424-5555
(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)

Know what's below.
Call before you dig.

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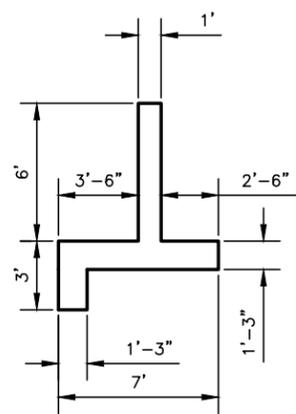
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1/22/16**

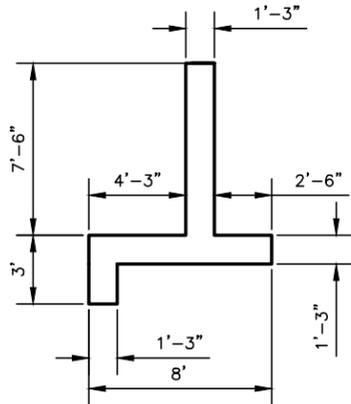
King County
Department of Natural Resources and Parks
Water and Land Resources Division
River and Floodplain Management Section
Christie True, Director

LOWER RUSSELL RD LEVEE SETBACK PROJECT
RIPRAP REVETMENT DETAILS

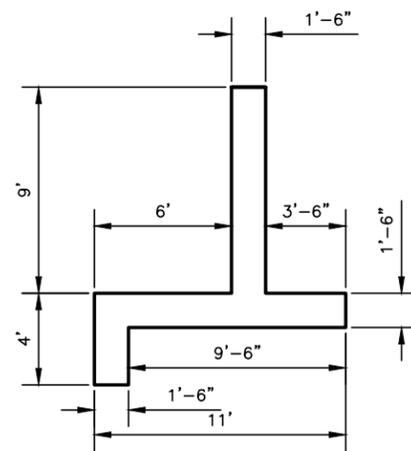
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SHEETS
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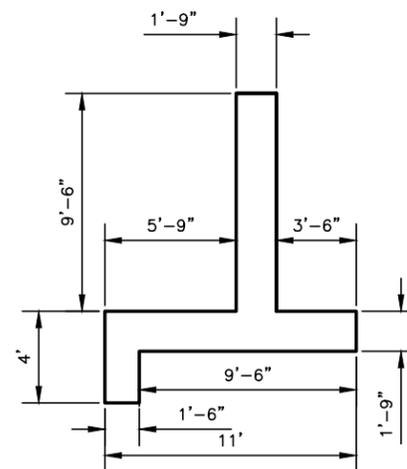
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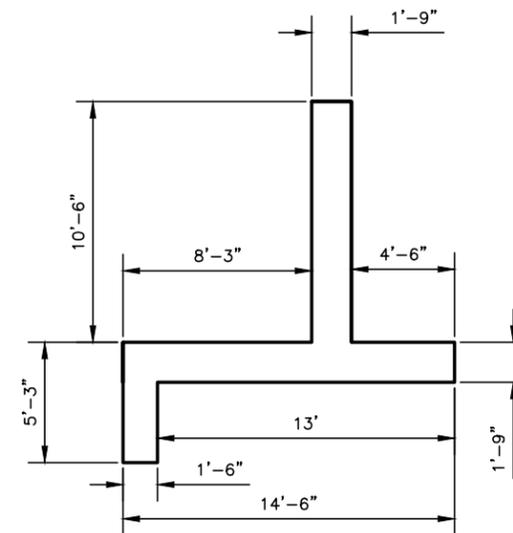
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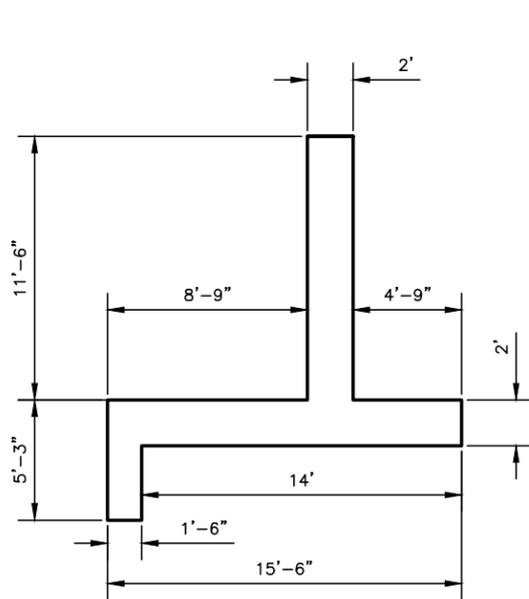
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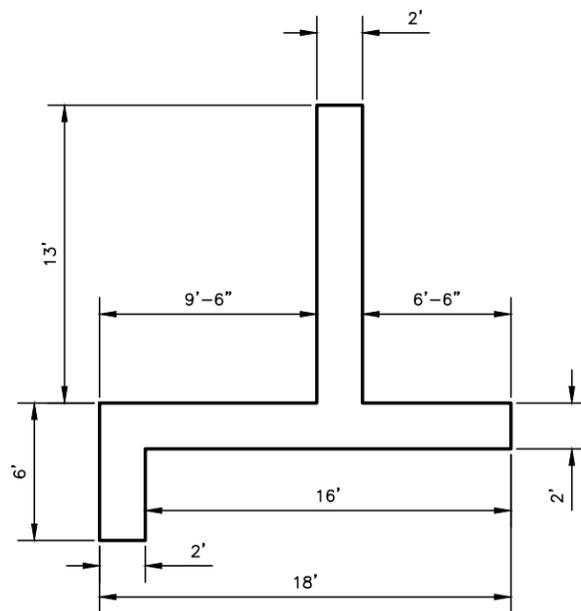
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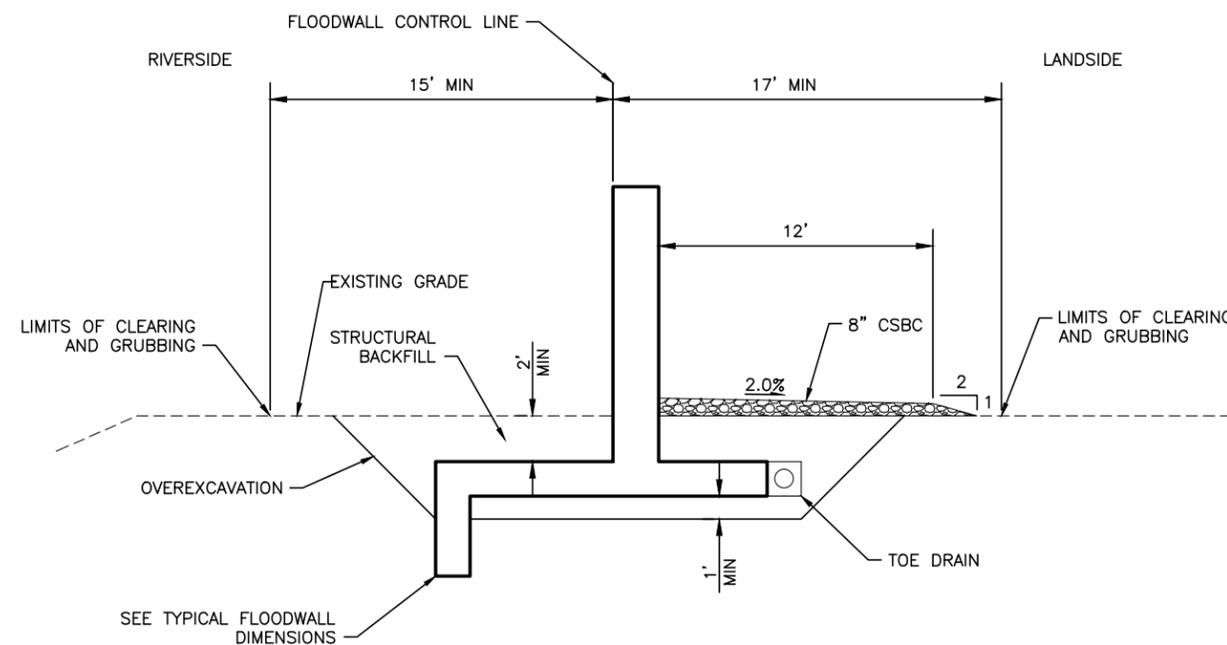
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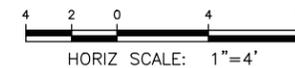
TYPE 6



TYPE 7



TYPICAL FLOODWALL SECTION
NTS



**CALL 2 WORKING DAYS
BEFORE YOU DIG**
1-800-424-5555
(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)

811
Know what's below.
Call before you dig.

SURVEY JOB NO./SOURCE:	---	---					
CHECKED:	---	---					
CAD ENTERED:	---	---					
DESIGNED:	---	---	NUM.	REVISION	BY	DATE	
CHECKED:	---	---					
SUPERVISOR:	---	---					
			NUM.	RECORD CHANGES APPROVED	BY	DATE	

FUNDING: _____
PROJECT No. _____
CONTRACT No. _____

**30%
PRELIMINARY DESIGN**
1/22/16

King County
Department of Natural Resources and Parks
Water and Land Resources Division
River and Floodplain Management Section
Christie True, Director

LOWER RUSSELL RD LEVEE SETBACK PROJECT
**TYPICAL FLOODWALL SECTIONS
AND DETAILS 1**

SHEET
OF
SHEETS
S-5

Appendix C

Lower Russell Road Levee Setback Project

Detailed Engineer's Opinion of Costs

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 King County		Project Name		King County - Lower Russell Road Setback Levee	
		Date		January 15, 2016	
		Customer		King County DNRP	
		Design Phase Description		30% Design Development Estimate	
ESTIMATE DESCRIPTION - 2017 CONSTRUCTION START				30% Design Development Opinion of Probable Cost	
Bid Item No.	Item Description	Units	Unit Price	Alternative 4B - Proposed Project Quantity	Alternative 4B - Proposed Project Total Amount
PART 1 - SITE REMOVALS AND GENERAL					
1000	Mob/Demob (% of Site Removal Bid Item Costs)	LS	3%	1.0	\$ 20,171
1005	Minor Work Allowance	AL	\$ 20,000.00	1.0	\$ 20,000
1010	Excavator with Operator	HR	\$ 250.00	20.0	\$ 5,000
1015	General Laborer	HR	\$ 60.00	40.0	\$ 2,400
1020	Foreman with Truck	HR	\$ 115.00	20.0	\$ 2,300
1025	Plastic Construction Fence (High Visibility Fence)	LF	\$ 3.25	9,000.0	\$ 29,250
1030	Demolition of Noble Pacific Property	LS	\$ 100,000.00	1.0	\$ 100,000
1035	Demolition of Holiday Kennels	LS	\$ 100,000.00	1.0	\$ 100,000
1040	Demolition of House & Garage on Gagliardi Property	LS	\$ 30,000.00	1.0	\$ 30,000
1045	Clearing and Grubbing	AC	\$ 2,500.00	76.0	\$ 190,000
1050	Remove Tree	LS	\$ 34,400.00	1.0	\$ 34,400
1055	Salvage Tree	EA	\$ 500.00	30.0	\$ 15,000
1060	Remove Guardrail	LF	\$ 3.00	605.0	\$ 1,815
1065	Salvage and Replace Split Rail Fence	LF	\$ 10.00	590.0	\$ 5,900
1070	Remove Fence	LF	\$ 3.00	8,150.0	\$ 24,450
1075	Salvage and Reinstall GRNRA Gates	EA	\$ 800.00	2.0	\$ 1,600
1080	5 ft Chain Link Fence	LF	\$ 20.00	4,480.0	\$ 89,600
1085	Remove Bollard	EA	\$ 50.00	13.0	\$ 650
1120	Field Office	LS	\$ 20,000.00	1.0	\$ 20,000
PART 1 - SITE REMOVALS AND GENERAL SUBTOTAL					\$ 692,536
			<i>+Construction Inflation Adjustment (% per year for 2017 const.)</i>	2.50%	\$ 35,060
			<i>+Construction Contingency</i>	20%	\$ 138,507.19
Part 1 Construction Cost Pretax Subtotal					\$ 866,103
			<i>+WA State Sales Tax</i>	9.5%	\$ 82,280
TOTAL PART 1 - SITE REMOVALS AND GENERAL CONSTRUCTION COST					\$ 948,383
			<i>+Engineering, Legal, Administration</i>	27%	\$ 256,063
TOTAL PART 1 - SITE REMOVALS AND GENERAL COST					\$ 1,204,446
PART 2 - EROSION AND SEDIMENT CONTROL					
2000	Mob/Demob (% of Site Removal Bid Item Costs)	LS	3%	-	\$ 13,731
2005	Construction Entrance, Rock	TN	\$ 30.00	140.0	\$ 4,200
2010	Construction Entrance, Grate	EA	\$ 4,000.00	2.0	\$ 8,000
2015	Water For Dust Control (1,000 Gallon)	1000 GAL	\$ 50.00	1,500.0	\$ 75,000
2020	Silt Fence	LF	\$ 5.00	11,530.0	\$ 57,650
2025	Wood Slash Mulch Berm	LF	\$ 5.00	9,760.0	\$ 48,800
2030	Upland Native Seeding	AC	\$ 2,000.00	47.2	\$ 94,400
2035	Wet Native Seeding	AC	\$ 2,000.00	8.6	\$ 17,200
2040	Cat 2 Erosion Control Blanket with Natural Fiber Netting	SY	\$ 4.00	13,460.0	\$ 53,840
2045	Straw Mulch	TN	\$ 700.00	111.6	\$ 78,120

Lower Russell Road Levee Setback Project - Detail Breakdown of Engineer's Opinion of Costs - 2017 Construction Start

Bid Item No.	Item Description	Units	Unit Price	Alternative 4B - Proposed Project Quantity	Alternative 4B - Proposed Project Total Amount
2050	Plastic Covering	SY	\$ 3.50	3,000.0	\$ 10,500
2055	Hydraulic Mulch	TN	\$ 1,000.00	10.0	\$ 10,000
PART 2 - EROSION AND SEDIMENT CONTROL SUBTOTAL					\$ 471,441
			<i>+Construction Inflation Adjustment (% per year for 2017 const.)</i>		\$ 23,867
			<i>+Construction Contingency</i>		\$ 94,288
Part 2 Construction Cost Pretax Subtotal					\$ 589,596
			<i>+WA State Sales Tax</i>		\$ 56,012
TOTAL PART 2 - EROSION AND SEDIMENT CONTROL CONSTRUCTION COST					\$ 645,608
			<i>+Engineering, Legal, Administration</i>		\$ 174,314
TOTAL PART 2 - EROSION AND SEDIMENT CONTROL COST					\$ 819,922
PART 3 - LEVEE					
3000	Mob/Demob (% of Levee Bid Item Costs)	LS	3%	-	\$ 37,996
3005	Over Excavation, 10" Deep	CY	\$ 20.00	12,084.0	\$ 241,680
3010	Over Excavation, 2' Deep (5% of 10" Deep Over Excavation)	CY	\$ 20.00	846.0	\$ 16,920
3015	Inspection Trench Excavation	CY	\$ 12.00	3,850.0	\$ 46,200
3020	Levee Fill - Common Fill	CY	\$ 3.25	72,955.0	\$ 237,104
3025	Levee Fill - Core Fill	CY	\$ 22.00	21,176.0	\$ 465,872
3035	Salvage Topsoil	CY	\$ 8.50	11,529.0	\$ 97,997
3040	HMA CL. 1/2 IN. PG 64-22 (Levee Trail Only)	TN	\$ 85.00	810.0	\$ 68,850
3045	Crushed Surface Base Course (Levee Trail Only)	TN	\$ 22.00	5,910.0	\$ 130,020
PART 3 - LEVEE SUBTOTAL					\$ 1,342,638
			<i>+Construction Inflation Adjustment (% per year for 2017 const.)</i>		\$ 67,971
			<i>+Construction Contingency</i>		\$ 268,528
Part 3 Construction Cost Pretax Subtotal					\$ 1,679,137
			<i>+WA State Sales Tax</i>		\$ 159,518
TOTAL PART 3 - LEVEE CONSTRUCTION COST					\$ 1,838,655
			<i>+Engineering, Legal, Administration</i>		\$ 496,437
TOTAL PART 3 - LEVEE COST					\$ 2,335,092
PART 4 - STRUCTURAL FLOODWALL					
4000	Mob/Demob (% of Structural Bid Item Costs)	LS	3%	-	\$ 101,037
4005	Foundation Excavation	CY	\$ 12.00	9,968.0	\$ 119,616
4010	Toe Drain Crushed Rock	CY	\$ 62.00	134.5	\$ 8,339
4015	6" Diameter HDPE Toe Drain	LF	\$ 16.00	2,906.0	\$ 46,496
4020	Concrete Wall	CY	\$ 564.00	4,818.0	\$ 2,717,352
4025	Structural Backfill	CY	\$ 22.00	6,562.0	\$ 144,364
4030	Reinforcement	TN	\$ 1,821.00	169.0	\$ 307,749
4035	CSBC for O&M of Patrol Road	CY	\$ 22.00	1,090.0	\$ 23,980
PART 4 - STRUCTURAL FLOODWALL SUBTOTAL					\$ 3,468,933
			<i>+Construction Inflation Adjustment (% per year for 2017 const.)</i>		\$ 175,615
			<i>+Construction Contingency</i>		\$ 693,787
Part 4 Construction Cost Pretax Subtotal					\$ 4,338,334
			<i>+WA State Sales Tax</i>		\$ 412,142
TOTAL PART 4 - STRUCTURAL FLOODWALL CONSTRUCTION COST					\$ 4,750,476
			<i>+Engineering, Legal, Administration</i>		\$ 1,282,629
TOTAL PART 4 - STRUCTURAL FLOODWALL COST					\$ 6,033,104

Lower Russell Road Levee Setback Project - Detail Breakdown of Engineer's Opinion of Costs - 2017 Construction Start

Bid Item No.	Item Description	Units	Unit Price	Alternative 4B - Proposed Project Quantity	Alternative 4B - Proposed Project Total Amount
PART 5 - PUBLIC UTILITIES					
5000	Mob/Demob (% of Utility Bid Item Costs)	LS	3%	-	\$ 14,669.64
5005	Trench Safety System	LS	\$ 20,000.00	1.0	\$ 20,000
5010	Remove Buried Private Utilities at Facilities to be Demo'ed	LS	\$ 3,200.00	1.0	\$ 3,200
5015	Remove 12" DIP Water Main	LF	\$ 15.00	2,900.0	\$ 43,500
5020	Remove Hydrant	EA	\$ 725.00	9.0	\$ 6,525
5025	8" DIP Water Main	LF	\$ 55.00	3,400.0	\$ 187,000
5030	Connect to Existing Water Main	EA	\$ 1,500.00	5.0	\$ 7,500
5035	Hydrant	EA	\$ 5,000.00	5.0	\$ 25,000
5040	8" Bends	EA	\$ 350.00	6.0	\$ 2,100
5045	8" x 6" Tee	EA	\$ 1,000.00	4.0	\$ 4,000
5050	8" Gate Valve and Box	EA	\$ 1,500.00	6.0	\$ 9,000
5055	6" Gate Valve and Box	EA	\$ 1,100.00	4.0	\$ 4,400
5060	Remove 8" PVC Sewer Pipe	LF	\$ 15.00	700.0	\$ 10,500
5065	Remove 15" PVC Sewer Pipe	LF	\$ 15.00	250.0	\$ 3,750
5070	Abandon Sanitary Sewer Pipe	LF	\$ 7.00	700.0	\$ 4,900
5075	Remove Sanitary Sewer Manhole	EA	\$ 600.00	6.0	\$ 3,600
5080	8" PVC, SDR 35, Sewer Pipe	LF	\$ 35.00	700.0	\$ 24,500
5085	15" PVC, SDR 35, Sewer Pipe	LF	\$ 55.00	220.0	\$ 12,100
5090	4' Dia. Sanitary Sewer Manhole	EA	\$ 3,200.00	4.0	\$ 12,800
5095	Connect to Existing Sanitary Sewer Pipe	EA	\$ 1,200.00	2.0	\$ 2,400
5100	Remove 8" DIP Sanitary Sewer FM, CL 52	LF	\$ 15.00	500.0	\$ 7,500
5105	8" DIP Sanitary Sewer FM, CL 52	LF	\$ 100.00	500.0	\$ 50,000
5115	Remove Storm Pipe	LF	\$ 20.00	550.0	\$ 11,000
5120	Remove Storm Structures	EA	\$ 400.00	2.0	\$ 800
5125	SDMH 48 IN. DIAM	EACH	\$ 2,900.00	1.0	\$ 2,900
5130	12" RCP Storm Pipe, Class 5	LF	\$ 55.00	362.4	\$ 19,932
5135	18" RCP Storm Pipe, Class 5	LF	\$ 75.00	41.1	\$ 3,081
5140	Biofiltration Swale (4' wide base, 3:1 side slopes, 2' deep, 130' long)	EACH	\$ 14,700.00	3.0	\$ 44,100
5145	Vegetated Filter Strip	SF	\$ 5.35	7,000.0	\$ 37,450
5150	Quarry Spalls Dissipation Pad (3'x3'x1')	EACH	\$ 150.00	3.0	\$ 450
PART 5 - PUBLIC UTILITIES SUBTOTAL					\$ 585,658
			<i>+Construction Inflation Adjustment (% per year for 2017 const.)</i>	2.50%	\$ 29,649
			<i>+Construction Contingency</i>	20%	\$ 117,132
Part 5 Construction Cost Pretax Subtotal					\$ 732,438
			<i>+WA State Sales Tax</i>	9.5%	\$ 69,582
TOTAL PART 5 - PUBLIC UTILITIES CONSTRUCTION COST					\$ 802,020
			<i>+Engineering, Legal, Administration</i>	27%	\$ 216,545
TOTAL PART 5 - PUBLIC UTILITIES COST					\$ 1,018,565
PART 6 - ROADWAY					
6000	Mob/Demob (% of Roadway Bid Items)	LS	5%	-	\$ 22,348
6005	Traffic Control (% of Roadway Bid Items)	LS	2%	-	\$ 8,939
6010	HMA CL. 1/2 IN. PG 64-22	TN	\$ 85.00	1,670.0	\$ 141,950
6015	Crushed Surface Base Course	TN	\$ 22.00	3,100.0	\$ 68,200
6020	Common Borrow Incl. Haul	CY	\$ 3.25	6,216.0	\$ 20,202
6025	4" Paint Line	LF	\$ 3.00	4,380.0	\$ 13,140
6030	Permanent Signing	LS	\$ 5,000.00	1.0	\$ 5,000

Lower Russell Road Levee Setback Project - Detail Breakdown of Engineer's Opinion of Costs - 2017 Construction Start

Bid Item No.	Item Description	Units	Unit Price	Alternative 4B - Proposed Project Quantity	Alternative 4B - Proposed Project Total Amount
6035	Bollard Type 1	EA	\$ 500.00	8.0	\$ 4,000
6040	Bollards, Fixed	EA	\$ 300.00	10.0	\$ 3,000
6045	Remove Asphalt Pavement	SY	\$ 10.00	13,908.0	\$ 139,080
6050	Sawcut Asphalt Pavement	SY	\$ 2.20	1,850.0	\$ 4,070
6055	Remove Concrete Curb and Gutter	LF	\$ 5.00	1,080.0	\$ 5,400
6060	Remove Concrete Walk	SY	\$ 4.00	260.0	\$ 1,040
6065	Roadway Excavation Incl Haul	CY	\$ 22.00	1,210.0	\$ 26,620
6070	Cement Concrete Curb Ramp Type 1	SY	\$ 70.00	25.0	\$ 1,750
6075	Cement Conc. Sidewalk	SY	\$ 64.00	15.0	\$ 960
6080	Cement Conc. Traffic Curb and Gutter	LF	\$ 45.00	110.0	\$ 4,950
6085	Beam Guardrail Type 31	LF	\$ 34.00	180.0	\$ 6,120
6090	Plastic Stop Line	LF	\$ 12.00	60.0	\$ 720
6095	Raised Pavement Marker Type 1	HUND	\$ 305.00	0.5	\$ 153
6100	Raised Pavement Marker Type 2	HUND	\$ 615.00	1.0	\$ 615
PART 6 - ROADWAY SUBTOTAL					\$ 478,257
+Construction Inflation Adjustment (% per year for 2017 const.)			2.50%		\$ 24,212
+Construction Contingency			20%		\$ 95,651
Part 6 Construction Cost Pretax Subtotal					\$ 598,121
+WA State Sales Tax			9.5%		\$ 56,821
TOTAL PART 6 - ROADWAY CONSTRUCTION COST					\$ 654,942
+Engineering, Legal, Administration			27%		\$ 176,834
TOTAL PART 6 - ROADWAY COST					\$ 831,776
PART 7 - SCOUR					
7000	Mob/Demob (% of Scour Bid Items)	LS	3%	-	\$ 28,738.80
7005	Dry Excavation (Above Elev 21-ft) North	CY	\$ 12.00	13,534.0	\$ 162,408
7010	Saturated Excavation (Elev 14 to Elev 21-ft) North	CY	\$ 20.00	3,367.0	\$ 67,340
7015	Wet Excavation (Elev 6 to Elev 14-ft) North	CY	\$ 20.00	775.0	\$ 15,500
7020	Rock Revetment	LF	\$ 700.00	170.0	\$ 119,000
7025	Wood Structure (wood atop launchable toe)	EA	\$ 12,000.00	2.0	\$ 24,000
7030	Wet Excavation (Elev 6 to Elev 14-ft) Middle	CY	\$ 20.00	10,748.0	\$ 214,960
7035	Scour Protection Deflectors	EA	\$ 75,000.00	8.0	\$ 600,000
PART 7 - SCOUR SUBTOTAL					\$ 1,231,947
+Construction Inflation Adjustment (% per year for 2017 const.)			2.50%		\$ 62,367
+Construction Contingency			20%		\$ 246,389
Part 7 Construction Cost Pretax Subtotal					\$ 1,540,703
+WA State Sales Tax			9.5%		\$ 146,367
TOTAL PART 7 - SCOUR CONSTRUCTION COST					\$ 1,687,070
+Engineering, Legal, Administration			27%		\$ 455,509
TOTAL PART 7 - SCOUR COST					\$ 2,142,579
PART 8a - HABITAT RESTORATION (Habitat Areas A & C)					
8000	Mob/Demo		3%	-	\$ 215,660.33
8005	Remove Riprap (LV)	CY	\$ 45.00	1,718.0	\$ 77,310
8010	Turbidity Curtain, Type 2	LF	\$ 50.00	800.0	\$ 40,000
8015	Turbidity Curtain, Type 2 with Filter Screen Skirt	LF	\$ 50.00	800.0	\$ 40,000
8020	Turbidity Curtain Relocation	EA	\$ 1,000.00	16.0	\$ 16,000
8025	Riparian Revegetation	AC	\$ 15,000.00	13.6	\$ 204,012

Lower Russell Road Levee Setback Project - Detail Breakdown of Engineer's Opinion of Costs - 2017 Construction Start

Bid Item No.	Item Description	Units	Unit Price	Alternative 4B - Proposed Project Quantity	Alternative 4B - Proposed Project Total Amount
8030	Wood Structure (Individual)	EA	\$ 2,300.00	44.0	\$ 101,200
8035	Wood Structure (Floodplain)	EA	\$ 10,300.00	19.0	\$ 195,700
8040	Wood Structure (Small Channel)	EA	\$ 12,600.00	23.0	\$ 289,800
8045	Wood Structure (Large Channel)	EA	\$ 19,600.00	7.0	\$ 137,200
8055	Apex ELJ	EA	\$ 60,000.00	1.0	\$ 60,000
8050	Chain	LS	VARIABLES	1.0	\$ 81,500
8060	Salvage Topsoil	CY	\$ 8.50	14,431.0	\$ 122,664
8065	Dry Excavation (Above Elev 21-ft) Middle	CY	\$ 12.00	367,431.0	\$ 4,409,172
8070	Saturated Excavation (Elev 14 to Elev 21-ft) Middle	CY	\$ 20.00	70,706.0	\$ 1,414,120
PART 8a - HABITAT RESTORATION (Areas A & C) SUBTOTAL					\$ 7,404,338
+Construction Inflation Adjustment (% per year for 2017 const.)			2.50%		\$ 374,845
+Construction Contingency			10%		\$ 740,434
PART 8a Construction Cost Pretax Subtotal					\$ 8,519,616
+WA State Sales Tax			9.5%		\$ 809,364
TOTAL PART 8a - HABITAT RESTORATION CONSTRUCTION COST					\$ 9,328,980
+Engineering, Legal, Administration			27%		\$ 2,518,825
TOTAL PART 8a - HABITAT RESTORATION (Areas A & C) COST					\$ 11,847,804
PART 8b - HABITAT RESTORATION (Habitat Area B)					
8500	Mob/Demo		3%	-	\$ 42,771.56
8505	Remove Riprap (LV)	CY	\$ 45.00	712.0	\$ 32,040
8510	Turbidity Curtain, Type 2	LF	\$ 50.00	600.0	\$ 30,000
8515	Turbidity Curtain, Type 2 with Filter Screen Skirt	LF	\$ 50.00	600.0	\$ 30,000
8520	Turbidity Curtain Relocation	EA	\$ 1,000.00	9.0	\$ 9,000
8525	Riparian Revegetation	AC	\$ 15,000.00	12.0	\$ 180,000
8530	Saturated Excavation (South)	CY	\$ 20.00	2,015.0	\$ 40,300
8535	Salvage Topsoil	CY	\$ 8.50	12,101.0	\$ 102,859
8540	Dry Excavation (South)	CY	\$ 12.00	83,460.0	\$ 1,001,520
PART 8b - HABITAT RESTORATION (Habitat Area B) SUBTOTAL					\$ 1,468,490
+Construction Inflation Adjustment(% per year for 2017 const.)			2.50%		\$ 74,342
+Construction Contingency			10%		\$ 146,849
Part 8b Construction Cost Pretax Subtotal					\$ 1,689,681
+WA State Sales Tax			9.5%		\$ 160,520
TOTAL PART 8b - HABITAT RESTORATION (Area B) CONSTRUCTION COST					\$ 1,850,201
+Engineering, Legal, Administration			27%		\$ 499,554
TOTAL PART 8b - HABITAT RESTORATION (Area B) COST					\$ 2,349,755
PART 9a - VAN DOREN'S PARK RELOCATION (HDR Design Portion)					
9000	Mob/Demob (% of Site Removal Bid Item Costs)	LS	3%	-	\$ 20,730.71
9005	Remove Concrete Surface	SY	\$ 4.00	1,390.0	\$ 5,560
9010	Remove Asphalt Pavement	SY	\$ 3.00	8,880.0	\$ 26,640
9015	Remove Asphalt Trail	SY	\$ 3.00	3,230.0	\$ 9,690
9020	Remove Concrete Curb and Gutter	LF	\$ 5.00	2,370.0	\$ 11,850
9025	Remove Park Shelter/Pavilion (30ft x 36ft)	EA	\$ 10,000.00	2.0	\$ 20,000
9030	Demolition of Bathroom Facility (11ft x 27ft)	LS	\$ 15,000.00	1.0	\$ 15,000
9035	Remove Playground Area (41ft x 61ft)	LS	\$ 8,000.00	1.0	\$ 8,000
9040	Remove Drinking Fountain	EA	\$ 200.00	1.0	\$ 200
9045	Remove Irrigation System	LS	\$ 4,100.00	1.0	\$ 4,100

Lower Russell Road Levee Setback Project - Detail Breakdown of Engineer's Opinion of Costs - 2017 Construction Start

Bid Item No.	Item Description	Units	Unit Price	Alternative 4B - Proposed Project Quantity	Alternative 4B - Proposed Project Total Amount
9050	Remove Wood Park Entrance Sign	EA	\$ 500.00	1.0	\$ 500
9055	Remove Park Rules Sign	EA	\$ 200.00	1.0	\$ 200
9060	Remove Picnic Table	EA	\$ 50.00	34.0	\$ 1,700
9065	Remove Park Bench	EA	\$ 50.00	4.0	\$ 200
9070	Remove Trash Receptacle	EA	\$ 50.00	8.0	\$ 400
9075	Gravel Trail	TN	\$ 22.00	150.0	\$ 3,300
9080	Common Excavation	CY	\$ 20.00	16,140.0	\$ 322,800
9085	Park Fill - Common Fill	CY	\$ 3.25	50,475.0	\$ 164,044
9090	Topsoil Borrow	CY	\$ 12.00	8,070.0	\$ 96,840
PART 9a - VAN DOREN'S PARK RELOCATION (HDR Design Portion) SUBTOTAL					\$ 711,754
+Construction Inflation Adjustment (% per year for 2017 const.)			2.50%		\$ 36,033
+Construction Contingency			20%		\$ 142,351
Part 9 Construction Cost Pretax Subtotal					\$ 890,138
+WA State Sales Tax			9.5%		\$ 84,563
TOTAL PART 9a - VAN DOREN'S PARK RELOCATION (HDR Design Portion)					\$ 974,701
+Engineering, Legal, Administration			27%		\$ 263,169
TOTAL PART 9a - VAN DOREN'S PARK RELOCATION (HDR Design Portion) COST					\$ 1,237,870
PART 9b - VAN DOREN'S PARK RELOCATION (Berger Design Portion)					
9500	Mob/Demob (% of Site Removal Bid Item Costs)	LS	3%	-	\$ 62,015.03
9505	Art Relocation	Allow	\$ 8,000.00	1.0	\$ 8,000
9510	Concrete Pad - Picnic Shelter (3)	SF	\$ 5.00	1,728.0	\$ 8,640
9515	Concrete Pad - Picnic Table (15)	SF	\$ 5.00	675.0	\$ 3,375
9520	Concrete - Walkways	SF	\$ 6.00	27,310.0	\$ 163,860
9525	Concrete - Parking Curb	LF	\$ 15.00	1,761.0	\$ 26,415
9530	Concrete - Play Curb	LF	\$ 20.00	625.0	\$ 12,500
9535	Concrete - Accessible Ramps (Curb and Play Area)	EA	\$ 500.00	6.0	\$ 3,000
9540	Play Area Equipment (5 - 12 yo, 6308 SF)	Allow	\$ 150,000.00	1.0	\$ 150,000
9545	Play Area Equipment (2 - 5 yo, 2528 SF)	Allow	\$ 75,000.00	1.0	\$ 75,000
9550	Play Area Splash Pad (1749 SF)	Allow	\$ 100,000.00	1.0	\$ 100,000
9555	Site Furnishing - Restroom (3 w's, 3 m's, 25'x40')	EA	\$ 250,000.00	1.0	\$ 250,000
9560	Site Furnishing - Shelter (24x24)	EA	\$ 40,000.00	3.0	\$ 120,000
9565	Site Furnishing - Drinking Fountain	EA	\$ 2,000.00	1.0	\$ 2,000
9570	Site Furnishing - Bicycle Racks	EA	\$ 1,000.00	2.0	\$ 2,000
9575	Site Furnishing - Picnic Tables	EA	\$ 1,800.00	15.0	\$ 27,000
9580	Site Furnishing - Benches	EA	\$ 1,200.00	8.0	\$ 9,600
9585	Site Furnishing - Horseshoe Pit	EA	\$ 1,500.00	3.0	\$ 4,500
9590	Site Furnishing - Trail Bollard	EA	\$ 250.00	13.0	\$ 3,250
9595	Site Furnishing - Park Sign	EA	\$ 2,500.00	1.0	\$ 2,500
9600	Site Furnishing - Misc. Park Signs	EA	\$ 500.00	8.0	\$ 4,000
9605	Site Furnishing - Trash Receptacles	EA	\$ 850.00	8.0	\$ 6,800
9610	Electrical - Power Service	Allow	\$ 25,000.00	1.0	\$ 25,000
9615	Electrical - Site Receptacles	EA	\$ 550.00	4.0	\$ 2,200
9620	Electrical - Security lighting	EA	\$ 1,500.00	4.0	\$ 6,000
9625	Earthwork - Fine Grading	SF	\$ 0.30	140,000.0	\$ 42,000
9630	Asphalt paving- Parking	SF	\$ 4.00	31,158.0	\$ 124,632
9635	Asphalt paving- Pathway to visitor center	SF	\$ 4.00	352.0	\$ 1,408
9640	Parking stall striping	Allow	\$ 1,200.00	1.0	\$ 1,200
9645	Park Gate	EA	\$ 15,000.00	1.0	\$ 15,000

Lower Russell Road Levee Setback Project - Detail Breakdown of Engineer's Opinion of Costs - 2017 Construction Start

Bid Item No.	Item Description	Units	Unit Price	Alternative 4B - Proposed Project Quantity	Alternative 4B - Proposed Project Total Amount
9650	Irrigation - Planting areas (pop-up spray heads)	SF	\$ 2.00	15,660.0	\$ 31,320
9655	Irrigation - Lawn (rotors)	SF	\$ 1.25	349,127.0	\$ 436,409
9660	Irrigation - POC (DCVA, Master valve, vaults, etc.; assumes 2" connection)	Allow	\$ 7,000.00	1.0	\$ 7,000
9665	Irrigation - Controller	Allow	\$ 3,500.00	1.0	\$ 3,500
9670	Plant - Planting topsoil	CY	\$ 45.00	550.0	\$ 24,750
9675	Trees - evergreen	EA	\$ 300.00	30.0	\$ 9,000
9680	Trees - deciduous	EA	\$ 350.00	50.0	\$ 17,500
9685	Planting	SF	\$ 5.00	688.0	\$ 3,440
9690	Shrubs @ rain garden	SF	\$ 5.00	14,972.0	\$ 74,860
9695	Turf Grass Seeding	SF	\$ 0.15	349,127.0	\$ 52,369
9700	Mulch	CY	\$ 40.00	160.0	\$ 6,400
9705	Safety Surfacing - Poured in place surfacing	SF	\$ 20.00	5,293.0	\$ 105,860
9710	Safety Surfacing - Wood fiber surfacing	CY	\$ 40.00	122.0	\$ 4,880
9715	Stormwater drainage	Allow	\$ 50,000.00	1.0	\$ 50,000
9720	Sanitary sewer service	Allow	\$ 25,000.00	1.0	\$ 25,000
9725	Water service	Allow	\$ 15,000.00	1.0	\$ 15,000
PART 9b - VAN DOREN'S PARK RELOCATION (Berger Design Portion) SUBTOTAL					\$ 2,129,183
<i>+Construction Inflation Adjustment (% per year for 2017 const.)</i>			2.50%		\$ 107,790
<i>+Construction Contingency</i>			20%		\$ 425,837
Part 10 Construction Cost Pretax Subtotal					\$ 2,662,809
<i>+WA State Sales Tax</i>			9.5%		\$ 252,967
TOTAL PART 9b - VAN DOREN'S PARK RELOCATION (Berger Design Portion) CONSTRUCTION COST					\$ 2,915,776
<i>+Engineering, Legal, Administration</i>			27%		\$ 787,260
TOTAL PART 9b - VAN DOREN'S PARK RELOCATION (Berger Design Portion) COST					\$ 3,703,036
PART 10 - PSE UTILITY RELOCATION					
10000	Mob/Demob (% of Site Removal Bid Item Costs)	LS	3%	-	\$ 19,845
10005	Utility Trench and Conduit	LF	\$ 135.00	4,900.0	\$ 661,500
PART 10 - PSE UTILITY RELOCATION SUBTOTAL					\$ 681,345
<i>+Construction Inflation Adjustment (% per year for 2017 const.)</i>			2.50%		\$ 34,493.09
<i>+Construction Contingency</i>			20%		\$ 136,269
Part 10 Construction Cost Pretax Subtotal					\$ 852,107
<i>+WA State Sales Tax</i>			9.5%		\$ 80,950
TOTAL PART 10 - PSE UTILITY RELOCATION CONSTRUCTION COST					\$ 933,057
<i>+Engineering, Legal, Administration</i>			15%		\$ 139,959
TOTAL PART 10 - PSE UTILITY RELOCATION COST					\$ 1,073,016

Lower Russell Road Levee Setback Project - Detail Breakdown of Engineer's Opinion of Costs - 2017 Construction Start

Bid Item No.	Item Description	Units	Unit Price	Alternative 4B - Proposed Project Quantity	Alternative 4B - Proposed Project Total Amount
SUMMARY OF TOTAL PROJECT COSTS FOR ALTERNATIVE 4B (PARTS 1-10)					
PART 1 - SITE REMOVALS AND GENERAL SUBTOTAL				\$	692,536
PART 2 - EROSION AND SEDIMENT CONTROL SUBTOTAL				\$	471,441
PART 3 - LEVEE SUBTOTAL				\$	1,342,638
PART 4 - STRUCTURAL FLOODWALL SUBTOTAL				\$	3,468,933
PART 5 - PUBLIC UTILITIES SUBTOTAL				\$	585,658
PART 6 - ROADWAY SUBTOTAL				\$	478,257
PART 7 - SCOUR SUBTOTAL				\$	1,231,947
PART 8a - HABITAT RESTORATION (Areas A & C) SUBTOTAL				\$	7,404,338
PART 8b - HABITAT RESTORATION (Habitat Area B) SUBTOTAL				\$	1,468,490
PART 9a - VAN DOREN'S PARK RELOCATION (HDR Design Portion) SUBTOTAL				\$	711,754
PART 9b - VAN DOREN'S PARK RELOCATION (Berger Design Portion) SUBTOTAL				\$	2,129,183
PART 10 - PSE UTILITY RELOCATION SUBTOTAL				\$	681,345
Parts 1 - 10 Subtotal				\$	20,666,520
+Construction Inflation Adjustment (% per year for 2017 const.)			2.50%	\$	1,046,243
+Construction Contingency *			10% - 20%	\$	3,246,021
Construction Cost Subtotal				\$	24,958,784
+WA State Sales Tax			9.5%	\$	2,371,085
PARTS 1 - 10 Construction Cost Total (rounded up)				\$	27,329,900
Real Estate Acquisition				\$	7,000,000
Cultural Resources				\$	700,000
RCO Conversion				\$	100,000
Admin, Legal and Planning (% of Construction Cost)			6%	\$	1,639,794
Engineering and Design (% of Construction Cost Total) **			12%	\$	3,167,621
Construction Survey (% of Construction Cost Total)			1%	\$	273,299
Construction Management (% of Construction Cost Total)			8%	\$	2,186,392
TOTAL PROJECT COSTS for Alternative 4B (rounded up)				\$	42,397,000

Constriction Inflation Adjustment Computations:

2017 Assumed Cost Year

2015 Cost Est Yr Basis

Inflation rate of 2.5% per year from 2015 to mid-Point of Construction

* Construction Contingency for Part 8 is 10% due to amount of excavation. All other Parts have 20% Construction Contingency.

** No Engineering and Design Costs are included for Part 10 as it is assumed that PSE will do the engineering and design work.

Lower Russell Road Levee Setback Project - Detail Breakdown of Engineer's Opinion of Costs - 2017 Construction Start

Bid Item No.	Item Description	Units	Unit Price	Alternative 4B - Proposed Project Quantity	Alternative 4B - Proposed Project Total Amount
PART 9c - KENT PARK MASTER PLAN ELEMENTS BEYOND ALT. 4B (Berger Estimate)					
9400	Mob/Demob (% of Site Removal Bid Item Costs)	LS	3%	-	\$ 13,277
9405	Observation Tower	Allow	\$ 150,000.00	1.0	\$ 150,000
9410	Asphalt Pavement - RR Trailhead Parking Lot	SF	\$ 4.00	8,857.0	\$ 35,428
9415	Shrubs @ Rain Garden - RR Trailhead	SF	\$ 6.00	2,946.0	\$ 17,676
9420	Planting - RR Trailhead	SF	\$ 6.00	805.0	\$ 4,830
9425	Planting areas (pop-up spray heads) - RR Trailhead	SF	\$ 2.25	3,751.0	\$ 8,440
9430	Asphalt Trail - Regional Trail (228th to PSE)	SF	\$ 4.00	39,437.0	\$ 157,748
9435	Asphalt Trail - PSE Junction	SF	\$ 4.00	6,036.0	\$ 24,144
9440	Concrete Plaza And Banding Along Trail - PSE trail Junction	SF	\$ 7.00	5,411.0	\$ 37,877
9445	Planting - PSE Trail Junction	SF	\$ 6.00	193.0	\$ 1,158
9450	Trail Bollards - PSE Trail Junction	EA	\$ 250.00	4.0	\$ 1,000
9455	Asphalt Pavement - 212th St Trail Viewpoint	SF	\$ 4.00	321.0	\$ 1,284
9460	Planting - 212th St Trail Viewpoint	SF	\$ 6.00	164.0	\$ 984
9465	Benches - 212th St Trail Viewpoint	EA	\$ 2,000.00	1.0	\$ 2,000
PART 9c - KENT PARK MASTER PLAN ELEMENTS BEYOND ALT. 4B (Berger Estimate) SUBTOTAL					\$ 455,846
+Construction Inflation Adjustment (% per year for 2017 const.)			2.50%		\$ 23,077
+Construction Contingency			20%		\$ 91,169
Part 9b Construction Cost Pretax Subtotal					\$ 570,092
+WA State Sales Tax			9.5%		\$ 54,159
TOTAL PART 9c - KENT PARK MASTER PLAN ELEMENTS BEYOND ALT. 4B (Berger Estimate) CONSTRUCTION COST					\$ 624,251
+Engineering, Legal, Administration			27%		\$ 168,548
TOTAL PART 9c - KENT PARK MASTER PLAN ELEMENTS BEYOND ALT. 4B (Berger Estimate) COST					\$ 792,799

TOTAL PROJECT COSTS		
TOTAL PART 1 - SITE REMOVALS AND GENERAL COST		\$ 1,204,446
TOTAL PART 2 - EROSION AND SEDIMENT CONTROL COST		\$ 819,922
TOTAL PART 3 - LEVEE COST		\$ 2,335,092
TOTAL PART 4 - STRUCTURAL FLOODWALL COST		\$ 6,033,104
TOTAL PART 5 - PUBLIC UTILITIES COST		\$ 1,018,565
TOTAL PART 6 - ROADWAY COST		\$ 831,776
TOTAL PART 7 - SCOUR COST		\$ 2,142,579
TOTAL PART 8a - HABITAT RESTORATION (Areas A & C) COST		\$ 11,847,804
TOTAL PART 8b - HABITAT RESTORATION (Area B) COST		\$ 2,349,755
TOTAL PART 9a - VAN DOREN'S PARK RELOCATION (HDR Design Portion) COST		\$ 1,237,870
TOTAL PART 9b - VAN DOREN'S PARK RELOCATION (Berger Design Portion) COST		\$ 3,703,036
TOTAL PART 10 - PSE UTILITY RELOCATION COST		\$ 1,073,016
SUBTOTAL PROJECT COSTS ALTERNATIVE 4B		\$ 34,596,966
REAL ESTATE ACQUISITION		\$ 7,000,000
CULTURAL RESOURCES		\$ 700,000
RCO CONVERSION		\$ 100,000
TOTAL PROJECT COSTS FOR ALTERNATIVE 4B		\$ 42,396,966
TOTAL PART 9c - KENT PARK MASTER PLAN ELEMENTS BEYOND ALT. 4B (Berger Estimate) COST		\$ 792,799
TOTAL PROJECT COSTS		\$ 43,189,765
TOTAL PROJECT COSTS (ROUNDED)		\$ 43,190,000

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 King County		Project Name		King County - Lower Russell Road Setback Levee	
		Date		January 15, 2016	
		Customer		King County DNRP	
		Design Phase Description		30% Design Development Estimate	
ESTIMATE DESCRIPTION - 2018 CONSTRUCTION START				30% Design Development Opinion of Probable Cost	
Bid Item No.	Item Description	Units	Unit Price	Alternative 4B - Proposed Project Quantity	Alternative 4B - Proposed Project Total Amount
PART 1 - SITE REMOVALS AND GENERAL					
1000	Mob/Demob (% of Site Removal Bid Item Costs)	LS	3%	1.0	\$ 20,171
1005	Minor Work Allowance	AL	\$ 20,000.00	1.0	\$ 20,000
1010	Excavator with Operator	HR	\$ 250.00	20.0	\$ 5,000
1015	General Laborer	HR	\$ 60.00	40.0	\$ 2,400
1020	Foreman with Truck	HR	\$ 115.00	20.0	\$ 2,300
1025	Plastic Construction Fence (High Visibility Fence)	LF	\$ 3.25	9,000.0	\$ 29,250
1030	Demolition of Noble Pacific Property	LS	\$ 100,000.00	1.0	\$ 100,000
1035	Demolition of Holiday Kennels	LS	\$ 100,000.00	1.0	\$ 100,000
1040	Demolition of House & Garage on Gagliardi Property	LS	\$ 30,000.00	1.0	\$ 30,000
1045	Clearing and Grubbing	AC	\$ 2,500.00	76.0	\$ 190,000
1050	Remove Tree	LS	\$ 34,400.00	1.0	\$ 34,400
1055	Salvage Tree	EA	\$ 500.00	30.0	\$ 15,000
1060	Remove Guardrail	LF	\$ 3.00	605.0	\$ 1,815
1065	Salvage and Replace Split Rail Fence	LF	\$ 10.00	590.0	\$ 5,900
1070	Remove Fence	LF	\$ 3.00	8,150.0	\$ 24,450
1075	Salvage and Reinstall GRNRA Gates	EA	\$ 800.00	2.0	\$ 1,600
1080	5 ft Chain Link Fence	LF	\$ 20.00	4,480.0	\$ 89,600
1085	Remove Bollard	EA	\$ 50.00	13.0	\$ 650
1120	Field Office	LS	\$ 20,000.00	1.0	\$ 20,000
PART 1 - SITE REMOVALS AND GENERAL SUBTOTAL					\$ 692,536
			<i>+Construction Inflation Adjustment (% per year for 2018 const.)</i>		\$ 53,250
			<i>+Construction Contingency</i>		\$ 138,507.19
Part 1 Construction Cost Pretax Subtotal					\$ 884,293
			<i>+WA State Sales Tax</i>		\$ 84,008
TOTAL PART 1 - SITE REMOVALS AND GENERAL CONSTRUCTION COST					\$ 968,300
			<i>+Engineering, Legal, Administration</i>		\$ 261,441
TOTAL PART 1 - SITE REMOVALS AND GENERAL COST					\$ 1,229,742
PART 2 - EROSION AND SEDIMENT CONTROL					
2000	Mob/Demob (% of Site Removal Bid Item Costs)	LS	3%	-	\$ 13,731
2005	Construction Entrance, Rock	TN	\$ 30.00	140.0	\$ 4,200
2010	Construction Entrance, Grate	EA	\$ 4,000.00	2.0	\$ 8,000
2015	Water For Dust Control (1,000 Gallon)	1000 GAL	\$ 50.00	1,500.0	\$ 75,000
2020	Silt Fence	LF	\$ 5.00	11,530.0	\$ 57,650
2025	Wood Slash Mulch Berm	LF	\$ 5.00	9,760.0	\$ 48,800
2030	Upland Native Seeding	AC	\$ 2,000.00	47.2	\$ 94,400
2035	Wet Native Seeding	AC	\$ 2,000.00	8.6	\$ 17,200
2040	Cat 2 Erosion Control Blanket with Natural Fiber Netting	SY	\$ 4.00	13,460.0	\$ 53,840
2045	Straw Mulch	TN	\$ 700.00	111.6	\$ 78,120
2050	Plastic Covering	SY	\$ 3.50	3,000.0	\$ 10,500

Lower Russell Road Levee Setback Project - Detail Breakdown of Engineer's Opinion of Costs - 2018 Construction Start

Bid Item No.	Item Description	Units	Unit Price	Alternative 4B - Proposed Project Quantity	Alternative 4B - Proposed Project Total Amount
2055	Hydraulic Mulch	TN	\$ 1,000.00	10.0	\$ 10,000
PART 2 - EROSION AND SEDIMENT CONTROL SUBTOTAL					\$ 471,441
			<i>+Construction Inflation Adjustment (% per year for 2018 const.)</i>		\$ 36,249
			<i>+Construction Contingency</i>		\$ 94,288
Part 2 Construction Cost Pretax Subtotal					\$ 601,979
			<i>+WA State Sales Tax</i>		\$ 57,188
TOTAL PART 2 - EROSION AND SEDIMENT CONTROL CONSTRUCTION COST					\$ 659,167
			<i>+Engineering, Legal, Administration</i>		\$ 177,975
TOTAL PART 2 - EROSION AND SEDIMENT CONTROL COST					\$ 837,142
PART 3 - LEVEE					
3000	Mob/Demob (% of Levee Bid Item Costs)	LS	3%	-	\$ 37,996
3005	Over Excavation, 10" Deep	CY	\$ 20.00	12,084.0	\$ 241,680
3010	Over Excavation, 2' Deep (5% of 10" Deep Over Excavation)	CY	\$ 20.00	846.0	\$ 16,920
3015	Inspection Trench Excavation	CY	\$ 12.00	3,850.0	\$ 46,200
3020	Levee Fill - Common Fill	CY	\$ 3.25	72,955.0	\$ 237,104
3025	Levee Fill - Core Fill	CY	\$ 22.00	21,176.0	\$ 465,872
3035	Salvage Topsoil	CY	\$ 8.50	11,529.0	\$ 97,997
3040	HMA CL. 1/2 IN. PG 64-22 (Levee Trail Only)	TN	\$ 85.00	810.0	\$ 68,850
3045	Crushed Surface Base Course (Levee Trail Only)	TN	\$ 22.00	5,910.0	\$ 130,020
PART 3 - LEVEE SUBTOTAL					\$ 1,342,638
			<i>+Construction Inflation Adjustment (% per year for 2018 const.)</i>		\$ 103,236
			<i>+Construction Contingency</i>		\$ 268,528
Part 3 Construction Cost Pretax Subtotal					\$ 1,714,402
			<i>+WA State Sales Tax</i>		\$ 162,868
TOTAL PART 3 - LEVEE CONSTRUCTION COST					\$ 1,877,270
			<i>+Engineering, Legal, Administration</i>		\$ 506,863
TOTAL PART 3 - LEVEE COST					\$ 2,384,133
PART 4 - STRUCTURAL FLOODWALL					
4000	Mob/Demob (% of Structural Bid Item Costs)	LS	3%	-	\$ 101,037
4005	Foundation Excavation	CY	\$ 12.00	9,968.0	\$ 119,616
4010	Toe Drain Crushed Rock	CY	\$ 62.00	134.5	\$ 8,339
4015	6" Diameter HDPE Toe Drain	LF	\$ 16.00	2,906.0	\$ 46,496
4020	Concrete Wall	CY	\$ 564.00	4,818.0	\$ 2,717,352
4025	Structural Backfill	CY	\$ 22.00	6,562.0	\$ 144,364
4030	Reinforcement	TN	\$ 1,821.00	169.0	\$ 307,749
4035	CSBC for O&M of Patrol Road	CY	\$ 22.00	1,090.0	\$ 23,980
PART 4 - STRUCTURAL FLOODWALL SUBTOTAL					\$ 3,468,933
			<i>+Construction Inflation Adjustment (% per year for 2018 const.)</i>		\$ 266,728
			<i>+Construction Contingency</i>		\$ 693,787
Part 4 Construction Cost Pretax Subtotal					\$ 4,429,448
			<i>+WA State Sales Tax</i>		\$ 420,798
TOTAL PART 4 - STRUCTURAL FLOODWALL CONSTRUCTION COST					\$ 4,850,245
			<i>+Engineering, Legal, Administration</i>		\$ 1,309,566
TOTAL PART 4 - STRUCTURAL FLOODWALL COST					\$ 6,159,812

Lower Russell Road Levee Setback Project - Detail Breakdown of Engineer's Opinion of Costs - 2018 Construction Start

Bid Item No.	Item Description	Units	Unit Price	Alternative 4B - Proposed Project Quantity	Alternative 4B - Proposed Project Total Amount
PART 5 - PUBLIC UTILITIES					
5000	Mob/Demob (% of Utility Bid Item Costs)	LS	3%	-	\$ 14,669.64
5005	Trench Safety System	LS	\$ 20,000.00	1.0	\$ 20,000
5010	Remove Buried Private Utilities at Facilities to be Demo'ed	LS	\$ 3,200.00	1.0	\$ 3,200
5015	Remove 12" DIP Water Main	LF	\$ 15.00	2,900.0	\$ 43,500
5020	Remove Hydrant	EA	\$ 725.00	9.0	\$ 6,525
5025	8" DIP Water Main	LF	\$ 55.00	3,400.0	\$ 187,000
5030	Connect to Existing Water Main	EA	\$ 1,500.00	5.0	\$ 7,500
5035	Hydrant	EA	\$ 5,000.00	5.0	\$ 25,000
5040	8" Bends	EA	\$ 350.00	6.0	\$ 2,100
5045	8" x 6" Tee	EA	\$ 1,000.00	4.0	\$ 4,000
5050	8" Gate Valve and Box	EA	\$ 1,500.00	6.0	\$ 9,000
5055	6" Gate Valve and Box	EA	\$ 1,100.00	4.0	\$ 4,400
5060	Remove 8" PVC Sewer Pipe	LF	\$ 15.00	700.0	\$ 10,500
5065	Remove 15" PVC Sewer Pipe	LF	\$ 15.00	250.0	\$ 3,750
5070	Abandon Sanitary Sewer Pipe	LF	\$ 7.00	700.0	\$ 4,900
5075	Remove Sanitary Sewer Manhole	EA	\$ 600.00	6.0	\$ 3,600
5080	8" PVC, SDR 35, Sewer Pipe	LF	\$ 35.00	700.0	\$ 24,500
5085	15" PVC, SDR 35, Sewer Pipe	LF	\$ 55.00	220.0	\$ 12,100
5090	4' Dia. Sanitary Sewer Manhole	EA	\$ 3,200.00	4.0	\$ 12,800
5095	Connect to Existing Sanitary Sewer Pipe	EA	\$ 1,200.00	2.0	\$ 2,400
5100	Remove 8" DIP Sanitary Sewer FM, CL 52	LF	\$ 15.00	500.0	\$ 7,500
5105	8" DIP Sanitary Sewer FM, CL 52	LF	\$ 100.00	500.0	\$ 50,000
5115	Remove Storm Pipe	LF	\$ 20.00	550.0	\$ 11,000
5120	Remove Storm Structures	EA	\$ 400.00	2.0	\$ 800
5125	SDMH 48 IN. DIAM	EACH	\$ 2,900.00	1.0	\$ 2,900
5130	12" RCP Storm Pipe, Class 5	LF	\$ 55.00	362.4	\$ 19,932
5135	18" RCP Storm Pipe, Class 5	LF	\$ 75.00	41.1	\$ 3,081
5140	Biofiltration Swale (4' wide base, 3:1 side slopes, 2' deep, 130' long)	EACH	\$ 14,700.00	3.0	\$ 44,100
5145	Vegetated Filter Strip	SF	\$ 5.35	7,000.0	\$ 37,450
5150	Quarry Spalls Dissipation Pad (3'x3'x1')	EACH	\$ 150.00	3.0	\$ 450
PART 5 - PUBLIC UTILITIES SUBTOTAL					\$ 585,658
<i>+Construction Inflation Adjustment (% per year for 2018 const.)</i>			2.50%		\$ 45,032
<i>+Construction Contingency</i>			20%		\$ 117,132
Part 5 Construction Cost Pretax Subtotal					\$ 747,821
<i>+WA State Sales Tax</i>			9.5%		\$ 71,043
TOTAL PART 5 - PUBLIC UTILITIES CONSTRUCTION COST					\$ 818,864
<i>+Engineering, Legal, Administration</i>			27%		\$ 221,093
TOTAL PART 5 - PUBLIC UTILITIES COST					\$ 1,039,957
PART 6 - ROADWAY					
6000	Mob/Demob (% of Roadway Bid Items)	LS	5%	-	\$ 22,348
6005	Traffic Control (% of Roadway Bid Items)	LS	2%	-	\$ 8,939
6010	HMA CL. 1/2 IN. PG 64-22	TN	\$ 85.00	1,670.0	\$ 141,950
6015	Crushed Surface Base Course	TN	\$ 22.00	3,100.0	\$ 68,200
6020	Common Borrow Incl. Haul	CY	\$ 3.25	6,216.0	\$ 20,202
6025	4" Paint Line	LF	\$ 3.00	4,380.0	\$ 13,140
6030	Permanent Signing	LS	\$ 5,000.00	1.0	\$ 5,000
6035	Bollard Type 1	EA	\$ 500.00	8.0	\$ 4,000

Lower Russell Road Levee Setback Project - Detail Breakdown of Engineer's Opinion of Costs - 2018 Construction Start

Bid Item No.	Item Description	Units	Unit Price	Alternative 4B - Proposed Project Quantity	Alternative 4B - Proposed Project Total Amount
6040	Bollards, Fixed	EA	\$ 300.00	10.0	\$ 3,000
6045	Remove Asphalt Pavement	SY	\$ 10.00	13,908.0	\$ 139,080
6050	Sawcut Asphalt Pavement	SY	\$ 2.20	1,850.0	\$ 4,070
6055	Remove Concrete Curb and Gutter	LF	\$ 5.00	1,080.0	\$ 5,400
6060	Remove Concrete Walk	SY	\$ 4.00	260.0	\$ 1,040
6065	Roadway Excavation Incl Haul	CY	\$ 22.00	1,210.0	\$ 26,620
6070	Cement Concrete Curb Ramp Type 1	SY	\$ 70.00	25.0	\$ 1,750
6075	Cement Conc. Sidewalk	SY	\$ 64.00	15.0	\$ 960
6080	Cement Conc. Traffic Curb and Gutter	LF	\$ 45.00	110.0	\$ 4,950
6085	Beam Guardrail Type 31	LF	\$ 34.00	180.0	\$ 6,120
6090	Plastic Stop Line	LF	\$ 12.00	60.0	\$ 720
6095	Raised Pavement Marker Type 1	HUND	\$ 305.00	0.5	\$ 153
6100	Raised Pavement Marker Type 2	HUND	\$ 615.00	1.0	\$ 615
PART 6 - ROADWAY SUBTOTAL					\$ 478,257
+Construction Inflation Adjustment (% per year for 2018 const.)			2.50%		\$ 36,774
+Construction Contingency			20%		\$ 95,651
Part 6 Construction Cost Pretax Subtotal					\$ 610,682
+WA State Sales Tax			9.5%		\$ 58,015
TOTAL PART 6 - ROADWAY CONSTRUCTION COST					\$ 668,697
+Engineering, Legal, Administration			27%		\$ 180,548
TOTAL PART 6 - ROADWAY COST					\$ 849,245
PART 7 - SCOUR					
7000	Mob/Demob (% of Scour Bid Items)	LS	3%	-	\$ 28,738.80
7005	Dry Excavation (Above Elev 21-ft) North	CY	\$ 12.00	13,534.0	\$ 162,408
7010	Saturated Excavation (Elev 14 to Elev 21-ft) North	CY	\$ 20.00	3,367.0	\$ 67,340
7015	Wet Excavation (Elev 6 to Elev 14-ft) North	CY	\$ 20.00	775.0	\$ 15,500
7020	Rock Revetment	LF	\$ 700.00	170.0	\$ 119,000
7025	Wood Structure (wood atop launchable toe)	EA	\$ 12,000.00	2.0	\$ 24,000
7030	Wet Excavation (Elev 6 to Elev 14-ft) Middle	CY	\$ 20.00	10,748.0	\$ 214,960
7035	Scour Protection Deflectors	EA	\$ 75,000.00	8.0	\$ 600,000
PART 7 - SCOUR SUBTOTAL					\$ 1,231,947
+Construction Inflation Adjustment (% per year for 2018 const.)			2.50%		\$ 94,725
+Construction Contingency			20%		\$ 246,389
Part 7 Construction Cost Pretax Subtotal					\$ 1,573,061
+WA State Sales Tax			9.5%		\$ 149,441
TOTAL PART 7 - SCOUR CONSTRUCTION COST					\$ 1,722,502
+Engineering, Legal, Administration			27%		\$ 465,076
TOTAL PART 7 - SCOUR COST					\$ 2,187,578
PART 8a - HABITAT RESTORATION (Habitat Areas A & C)					
8000	Mob/Demo		3%	-	\$ 215,660.33
8005	Remove Riprap (LV)	CY	\$ 45.00	1,718.0	\$ 77,310
8010	Turbidity Curtain, Type 2	LF	\$ 50.00	800.0	\$ 40,000
8015	Turbidity Curtain, Type 2 with Filter Screen Skirt	LF	\$ 50.00	800.0	\$ 40,000
8020	Turbidity Curtain Relocation	EA	\$ 1,000.00	16.0	\$ 16,000
8025	Riparian Revegetation	AC	\$ 15,000.00	13.6	\$ 204,012
8030	Wood Structure (Individual)	EA	\$ 2,300.00	44.0	\$ 101,200
8035	Wood Structure (Floodplain)	EA	\$ 10,300.00	19.0	\$ 195,700
8040	Wood Structure (Small Channel)	EA	\$ 12,600.00	23.0	\$ 289,800

Lower Russell Road Levee Setback Project - Detail Breakdown of Engineer's Opinion of Costs - 2018 Construction Start

Bid Item No.	Item Description	Units	Unit Price	Alternative 4B - Proposed Project Quantity	Alternative 4B - Proposed Project Total Amount
8045	Wood Structure (Large Channel)	EA	\$ 19,600.00	7.0	\$ 137,200
8055	Apex ELJ	EA	\$ 60,000.00	1.0	\$ 60,000
8050	Chain	LS	VARIABLES	1.0	\$ 81,500
8060	Salvage Topsoil	CY	\$ 8.50	14,431.0	\$ 122,664
8065	Dry Excavation (Above Elev 21-ft) Middle	CY	\$ 12.00	367,431.0	\$ 4,409,172
8070	Saturated Excavation (Elev 14 to Elev 21-ft) Middle	CY	\$ 20.00	70,706.0	\$ 1,414,120
PART 8a - HABITAT RESTORATION (Areas A & C) SUBTOTAL					\$ 7,404,338
+Construction Inflation Adjustment (% per year for 2018 const.)			2.50%		\$ 569,324
+Construction Contingency			10%		\$ 740,434
PART 8a Construction Cost Pretax Subtotal					\$ 8,714,096
+WA State Sales Tax			9.5%		\$ 827,839
TOTAL PART 8a - HABITAT RESTORATION CONSTRUCTION COST					\$ 9,541,935
+Engineering, Legal, Administration			27%		\$ 2,576,322
TOTAL PART 8a - HABITAT RESTORATION (Areas A & C) COST					\$ 12,118,257
PART 8b - HABITAT RESTORATION (Habitat Area B)					
8500	Mob/Demo		3%	-	\$ 42,771.56
8505	Remove Riprap (LV)	CY	\$ 45.00	712.0	\$ 32,040
8510	Turbidity Curtain, Type 2	LF	\$ 50.00	600.0	\$ 30,000
8515	Turbidity Curtain, Type 2 with Filter Screen Skirt	LF	\$ 50.00	600.0	\$ 30,000
8520	Turbidity Curtain Relocation	EA	\$ 1,000.00	9.0	\$ 9,000
8525	Riparian Revegetation	AC	\$ 15,000.00	12.0	\$ 180,000
8530	Saturated Excavation (South)	CY	\$ 20.00	2,015.0	\$ 40,300
8535	Salvage Topsoil	CY	\$ 8.50	12,101.0	\$ 102,859
8540	Dry Excavation (South)	CY	\$ 12.00	83,460.0	\$ 1,001,520
PART 8b - HABITAT RESTORATION (Habitat Area B) SUBTOTAL					\$ 1,468,490
+Construction Inflation Adjustment (% per year for 2018 const.)			2.50%		\$ 112,913
+Construction Contingency			10%		\$ 146,849
Part 8b Construction Cost Pretax Subtotal					\$ 1,728,252
+WA State Sales Tax			9.5%		\$ 164,184
TOTAL PART 8b - HABITAT RESTORATION (Area B) CONSTRUCTION COST					\$ 1,892,436
+Engineering, Legal, Administration			27%		\$ 510,958
TOTAL PART 8b - HABITAT RESTORATION (Area B) COST					\$ 2,403,394
PART 9a - VAN DOREN'S PARK RELOCATION (HDR Design Portion)					
9000	Mob/Demob (% of Site Removal Bid Item Costs)	LS	3%	-	\$ 20,730.71
9005	Remove Concrete Surface	SY	\$ 4.00	1,390.0	\$ 5,560
9010	Remove Asphalt Pavement	SY	\$ 3.00	8,880.0	\$ 26,640
9015	Remove Asphalt Trail	SY	\$ 3.00	3,230.0	\$ 9,690
9020	Remove Concrete Curb and Gutter	LF	\$ 5.00	2,370.0	\$ 11,850
9025	Remove Park Shelter/Pavilion (30ft x 36ft)	EA	\$ 10,000.00	2.0	\$ 20,000
9030	Demolition of Bathroom Facility (11ft x 27ft)	LS	\$ 15,000.00	1.0	\$ 15,000
9035	Remove Playground Area (41ft x 61ft)	LS	\$ 8,000.00	1.0	\$ 8,000
9040	Remove Drinking Fountain	EA	\$ 200.00	1.0	\$ 200
9045	Remove Irrigation System	LS	\$ 4,100.00	1.0	\$ 4,100
9050	Remove Wood Park Entrance Sign	EA	\$ 500.00	1.0	\$ 500
9055	Remove Park Rules Sign	EA	\$ 200.00	1.0	\$ 200
9060	Remove Picnic Table	EA	\$ 50.00	34.0	\$ 1,700
9065	Remove Park Bench	EA	\$ 50.00	4.0	\$ 200
9070	Remove Trash Receptacle	EA	\$ 50.00	8.0	\$ 400

Lower Russell Road Levee Setback Project - Detail Breakdown of Engineer's Opinion of Costs - 2018 Construction Start

Bid Item No.	Item Description	Units	Unit Price	Alternative 4B - Proposed Project Quantity	Alternative 4B - Proposed Project Total Amount
9075	Gravel Trail	TN	\$ 22.00	150.0	\$ 3,300
9080	Common Excavation	CY	\$ 20.00	16,140.0	\$ 322,800
9085	Park Fill - Common Fill	CY	\$ 3.25	50,475.0	\$ 164,044
9090	Topsoil Borrow	CY	\$ 12.00	8,070.0	\$ 96,840
PART 9a - VAN DOREN'S PARK RELOCATION (HDR Design Portion) SUBTOTAL					\$ 711,754
+Construction Inflation Adjustment (% per year for 2018 const.)			2.50%		\$ 54,727
+Construction Contingency			20%		\$ 142,351
Part 9 Construction Cost Pretax Subtotal					\$ 908,833
+WA State Sales Tax			9.5%		\$ 86,339
TOTAL PART 9a - VAN DOREN'S PARK RELOCATION (HDR Design Portion)					\$ 995,172
+Engineering, Legal, Administration			27%		\$ 268,696
TOTAL PART 9a - VAN DOREN'S PARK RELOCATION (HDR Design Portion) COST					\$ 1,263,868
PART 9b - VAN DOREN'S PARK RELOCATION (Berger Design Portion)					
9500	Mob/Demob (% of Site Removal Bid Item Costs)	LS	3%	-	\$ 62,015.03
9505	Art Relocation	Allow	\$ 8,000.00	1.0	\$ 8,000
9510	Concrete Pad - Picnic Shelter (3)	SF	\$ 5.00	1,728.0	\$ 8,640
9515	Concrete Pad - Picnic Table (15)	SF	\$ 5.00	675.0	\$ 3,375
9520	Concrete - Walkways	SF	\$ 6.00	27,310.0	\$ 163,860
9525	Concrete - Parking Curb	LF	\$ 15.00	1,761.0	\$ 26,415
9530	Concrete - Play Curb	LF	\$ 20.00	625.0	\$ 12,500
9535	Concrete - Accessible Ramps (Curb and Play Area)	EA	\$ 500.00	6.0	\$ 3,000
9540	Play Area Equipment (5 - 12 yo, 6308 SF)	Allow	\$ 150,000.00	1.0	\$ 150,000
9545	Play Area Equipment (2 - 5 yo, 2528 SF)	Allow	\$ 75,000.00	1.0	\$ 75,000
9550	Play Area Splash Pad (1749 SF)	Allow	\$ 100,000.00	1.0	\$ 100,000
9555	Site Furnishing - Restroom (3 w's, 3 m's, 25'x40')	EA	\$ 250,000.00	1.0	\$ 250,000
9560	Site Furnishing - Shelter (24x24)	EA	\$ 40,000.00	3.0	\$ 120,000
9565	Site Furnishing - Drinking Fountain	EA	\$ 2,000.00	1.0	\$ 2,000
9570	Site Furnishing - Bicycle Racks	EA	\$ 1,000.00	2.0	\$ 2,000
9575	Site Furnishing - Picnic Tables	EA	\$ 1,800.00	15.0	\$ 27,000
9580	Site Furnishing - Benches	EA	\$ 1,200.00	8.0	\$ 9,600
9585	Site Furnishing - Horseshoe Pit	EA	\$ 1,500.00	3.0	\$ 4,500
9590	Site Furnishing - Trail Bollard	EA	\$ 250.00	13.0	\$ 3,250
9595	Site Furnishing - Park Sign	EA	\$ 2,500.00	1.0	\$ 2,500
9600	Site Furnishing - Misc. Park Signs	EA	\$ 500.00	8.0	\$ 4,000
9605	Site Furnishing - Trash Receptacles	EA	\$ 850.00	8.0	\$ 6,800
9610	Electrical - Power Service	Allow	\$ 25,000.00	1.0	\$ 25,000
9615	Electrical - Site Receptacles	EA	\$ 550.00	4.0	\$ 2,200
9620	Electrical - Security lighting	EA	\$ 1,500.00	4.0	\$ 6,000
9625	Earthwork - Fine Grading	SF	\$ 0.30	140,000.0	\$ 42,000
9630	Asphalt paving- Parking	SF	\$ 4.00	31,158.0	\$ 124,632
9635	Asphalt paving- Pathway to visitor center	SF	\$ 4.00	352.0	\$ 1,408
9640	Parking stall striping	Allow	\$ 1,200.00	1.0	\$ 1,200
9645	Park Gate	EA	\$ 15,000.00	1.0	\$ 15,000
9650	Irrigation - Planting areas (pop-up spray heads)	SF	\$ 2.00	15,660.0	\$ 31,320
9655	Irrigation - Lawn (rotors)	SF	\$ 1.25	349,127.0	\$ 436,409
9660	Irrigation - POC (DCVA, Master valve, vaults, etc.; assumes 2" connection)	Allow	\$ 7,000.00	1.0	\$ 7,000
9665	Irrigation - Controller	Allow	\$ 3,500.00	1.0	\$ 3,500
9670	Plant - Planting topsoil	CY	\$ 45.00	550.0	\$ 24,750

Lower Russell Road Levee Setback Project - Detail Breakdown of Engineer's Opinion of Costs - 2018 Construction Start

Bid Item No.	Item Description	Units	Unit Price	Alternative 4B - Proposed Project Quantity	Alternative 4B - Proposed Project Total Amount
9675	Trees - evergreen	EA	\$ 300.00	30.0	\$ 9,000
9680	Trees - deciduous	EA	\$ 350.00	50.0	\$ 17,500
9685	Planting	SF	\$ 5.00	688.0	\$ 3,440
9690	Shrubs @ rain garden	SF	\$ 5.00	14,972.0	\$ 74,860
9695	Turf Grass Seeding	SF	\$ 0.15	349,127.0	\$ 52,369
9700	Mulch	CY	\$ 40.00	160.0	\$ 6,400
9705	Safety Surfacing - Poured in place surfacing	SF	\$ 20.00	5,293.0	\$ 105,860
9710	Safety Surfacing - Wood fiber surfacing	CY	\$ 40.00	122.0	\$ 4,880
9715	Stormwater drainage	Allow	\$ 50,000.00	1.0	\$ 50,000
9720	Sanitary sewer service	Allow	\$ 25,000.00	1.0	\$ 25,000
9725	Water service	Allow	\$ 15,000.00	1.0	\$ 15,000
PART 9b - VAN DOREN'S PARK RELOCATION (Berger Design Portion) SUBTOTAL					\$ 2,129,183
<i>+Construction Inflation Adjustment (% per year for 2018 const.)</i>			2.50%		\$ 163,714
<i>+Construction Contingency</i>			20%		\$ 425,837
Part 10 Construction Cost Pretax Subtotal					\$ 2,718,734
<i>+WA State Sales Tax</i>			9.5%		\$ 258,280
TOTAL PART 9b - VAN DOREN'S PARK RELOCATION (Berger Design Portion) CONSTRUCTION COST					\$ 2,977,013
<i>+Engineering, Legal, Administration</i>			27%		\$ 803,794
TOTAL PART 9b - VAN DOREN'S PARK RELOCATION (Berger Design Portion) COST					\$ 3,780,807
PART 10 - PSE UTILITY RELOCATION					
10000	Mob/Demob (% of Site Removal Bid Item Costs)	LS	3%	-	\$ 19,845
10005	Utility Trench and Conduit	LF	\$ 135.00	4,900.0	\$ 661,500
PART 10 - PSE UTILITY RELOCATION SUBTOTAL					\$ 681,345
<i>+Construction Inflation Adjustment (% per year for 2018 const.)</i>			2.50%		\$ 52,389.04
<i>+Construction Contingency</i>			20%		\$ 136,269
Part 10 Construction Cost Pretax Subtotal					\$ 870,003
<i>+WA State Sales Tax</i>			9.5%		\$ 82,650
TOTAL PART 10 - PSE UTILITY RELOCATION CONSTRUCTION COST					\$ 952,653
<i>+Engineering, Legal, Administration</i>			15%		\$ 142,898
TOTAL PART 10 - PSE UTILITY RELOCATION COST					\$ 1,095,551

Lower Russell Road Levee Setback Project - Detail Breakdown of Engineer's Opinion of Costs - 2018 Construction Start

Bid Item No.	Item Description	Units	Unit Price	Alternative 4B - Proposed Project Quantity	Alternative 4B - Proposed Project Total Amount
SUMMARY OF TOTAL PROJECT COSTS FOR ALTERNATIVE 4B (PARTS 1-10)					
PART 1 - SITE REMOVALS AND GENERAL SUBTOTAL					\$ 692,536
PART 2 - EROSION AND SEDIMENT CONTROL SUBTOTAL					\$ 471,441
PART 3 - LEVEE SUBTOTAL					\$ 1,342,638
PART 4 - STRUCTURAL FLOODWALL SUBTOTAL					\$ 3,468,933
PART 5 - PUBLIC UTILITIES SUBTOTAL					\$ 585,658
PART 6 - ROADWAY SUBTOTAL					\$ 478,257
PART 7 - SCOUR SUBTOTAL					\$ 1,231,947
PART 8a - HABITAT RESTORATION (Areas A & C) SUBTOTAL					\$ 7,404,338
PART 8b - HABITAT RESTORATION (Habitat Area B) SUBTOTAL					\$ 1,468,490
PART 9a - VAN DOREN'S PARK RELOCATION (HDR Design Portion) SUBTOTAL					\$ 711,754
PART 9b - VAN DOREN'S PARK RELOCATION (Berger Design Portion) SUBTOTAL					\$ 2,129,183
PART 10 - PSE UTILITY RELOCATION SUBTOTAL					\$ 681,345
Parts 1 - 10 Subtotal					\$ 20,666,520
+Construction Inflation Adjustment (% per year for 2018 const.)			2.50%		\$ 1,589,062
+Construction Contingency *			10% - 20%		\$ 3,246,021
Construction Cost Subtotal					\$ 25,501,603
+WA State Sales Tax			9.5%		\$ 2,422,652
PARTS 1 - 10 Construction Cost Total (rounded up)					\$ 27,924,300
Real Estate Acquisition					\$ 7,000,000
Cultural Resources					\$ 700,000
RCO Conversion					\$ 100,000
Admin, Legal and Planning (% of Construction Cost)			6%		\$ 1,675,458
Engineering and Design (% of Construction Cost Total) **			12%		\$ 3,236,598
Construction Survey (% of Construction Cost Total)			1%		\$ 279,243
Construction Management (% of Construction Cost Total)			8%		\$ 2,233,944
TOTAL PROJECT COST (rounded up)					\$ 43,150,000

Constriction Inflation Adjustment Computations:

2018 Assumed Cost Year

2015 Cost Est Yr Basis

Inflation rate of 2.5% per year from 2015 to mid-Point of Construction

* Construction Contingency for Part 8 is 10% due to amount of excavation. All other Parts have 20% Construction Contingency.

** No Engineering and Design Costs are included for Part 10 as it is assumed that PSE will do the engineering and design work.

Lower Russell Road Levee Setback Project - Detail Breakdown of Engineer's Opinion of Costs - 2018 Construction Start

Bid Item No.	Item Description	Units	Unit Price	Alternative 4B - Proposed Project Quantity	Alternative 4B - Proposed Project Total Amount
PART 9c - KENT PARK MASTER PLAN ELEMENTS BEYOND ALT. 4B (Berger Estimate)					
9400	Mob/Demob (% of Site Removal Bid Item Costs)	LS	3%	-	\$ 13,277
9405	Observation Tower	Allow	\$ 150,000.00	1.0	\$ 150,000
9410	Asphalt Pavement - RR Trailhead Parking Lot	SF	\$ 4.00	8,857.0	\$ 35,428
9415	Shrubs @ Rain Garden - RR Trailhead	SF	\$ 6.00	2,946.0	\$ 17,676
9420	Planting - RR Trailhead	SF	\$ 6.00	805.0	\$ 4,830
9425	Planting areas (pop-up spray heads) - RR Trailhead	SF	\$ 2.25	3,751.0	\$ 8,440
9430	Asphalt Trail - Regional Trail (228th to PSE)	SF	\$ 4.00	39,437.0	\$ 157,748
9435	Asphalt Trail - PSE Junction	SF	\$ 4.00	6,036.0	\$ 24,144
9440	Concrete Plaza And Banding Along Trail - PSE trail Junction	SF	\$ 7.00	5,411.0	\$ 37,877
9445	Planting - PSE Trail Junction	SF	\$ 6.00	193.0	\$ 1,158
9450	Trail Bollards - PSE Trail Junction	EA	\$ 250.00	4.0	\$ 1,000
9455	Asphalt Pavement - 212th St Trail Viewpoint	SF	\$ 4.00	321.0	\$ 1,284
9460	Planting - 212th St Trail Viewpoint	SF	\$ 6.00	164.0	\$ 984
9465	Benches - 212th St Trail Viewpoint	EA	\$ 2,000.00	1.0	\$ 2,000
PART 9c - KENT PARK MASTER PLAN ELEMENTS BEYOND ALT. 4B (Berger Estimate) SUBTOTAL					\$ 455,846
+Construction Inflation Adjustment (% per year for 2018 const.)			2.50%		\$ 35,050
+Construction Contingency			20%		\$ 91,169
Part 9b Construction Cost Pretax Subtotal					\$ 582,065
+WA State Sales Tax			9.5%		\$ 55,296
TOTAL PART 9c - KENT PARK MASTER PLAN ELEMENTS BEYOND ALT. 4B (Berger Estimate) CONSTRUCTION COST					\$ 637,361
+Engineering, Legal, Administration			27%		\$ 172,088
TOTAL PART 9c - KENT PARK MASTER PLAN ELEMENTS BEYOND ALT. 4B (Berger Estimate) COST					\$ 809,449

TOTAL PROJECT COSTS		
TOTAL PART 1 - SITE REMOVALS AND GENERAL COST		\$ 1,229,742
TOTAL PART 2 - EROSION AND SEDIMENT CONTROL COST		\$ 837,142
TOTAL PART 3 - LEVEE COST		\$ 2,384,133
TOTAL PART 4 - STRUCTURAL FLOODWALL COST		\$ 6,159,812
TOTAL PART 5 - PUBLIC UTILITIES COST		\$ 1,039,957
TOTAL PART 6 - ROADWAY COST		\$ 849,245
TOTAL PART 7 - SCOUR COST		\$ 2,187,578
TOTAL PART 8a - HABITAT RESTORATION (Areas A & C) COST		\$ 12,118,257
TOTAL PART 8b - HABITAT RESTORATION (Area B) COST		\$ 2,403,394
TOTAL PART 9a - VAN DOREN'S PARK RELOCATION (HDR Design Portion) COST		\$ 1,263,868
TOTAL PART 9b - VAN DOREN'S PARK RELOCATION (Berger Design Portion) COST		\$ 3,780,807
TOTAL PART 10 - PSE UTILITY RELOCATION COST		\$ 1,095,551
SUBTOTAL PROJECT COSTS ALTERNATIVE 4B		\$ 35,349,486
REAL ESTATE ACQUISITION		\$ 7,000,000
CULTURAL RESOURCES		\$ 700,000
RCO CONVERSION		\$ 100,000
TOTAL PROJECT COSTS FOR ALTERNATIVE 4B		\$ 43,149,486
TOTAL PART 9c - KENT PARK MASTER PLAN ELEMENTS BEYOND ALT. 4B (Berger Estimate) COST		\$ 809,449
TOTAL PROJECT COSTS		\$ 43,958,935
TOTAL PROJECT COSTS (ROUNDED)		\$ 43,960,000

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Appendix D

Lower Russell Road Levee Setback Project

Listing of Studies / Technical Memorandums / Reports Prepared for this Project

The following investigations and studies were conducted to support the 30% design effort:

Aspect Consulting. Final Geotechnical Data for Lower Russell Road Levee Setback Project. November 2014.

Aspect Consulting. Geotechnical Report in Support of 30% Design of Lower Russell Road Levee Setback Project. January 6, 2016.

Confluence Environmental Company. Draft Wetland Delineation and Riparian Corridor Study for the King County Lower Russell Road Levee Setback Project, King County, WA. October 5, 2014.

Confluence Environmental Company. Draft Development and Evaluation of Conceptual Habitat Restoration Alternatives for the King County Lower Russell Road Levee Setback Project, King County, WA. February 2, 2015.

Confluence Environmental Company. Geomorphic Response Analysis for Lower Russell Road Levee Setback Project. March 20, 2015.

Confluence Environmental Company. Existing Conditions Scour Analysis Results for Lower Russell Road Levee Setback Project. March 26, 2015.

HDR. Preliminary Roadway Cross Sections Technical Memorandum for Lower Russell Road Levee Setback Project, December 15, 2014.

HDR. Lower Russell Road Levee Setback Project, Draft Alternatives Analysis Summary Report, King County, WA, March 10, 2015.

HDR. Lower Russell Road Levee Setback Project, 30% Basis of Design – Phase 1, Version 1.0, King County, WA, October 20, 2015.

HDR. Lower Russell Road Levee Setback Project, 30% Floodwall Technical Memorandum, Version 1.0, King County, WA, December 14, 2015.

Watershed Science & Engineering (WSE). Russell Road Hydraulic Baseline Model Development Summary Memorandum for Lower Russell Road Levee Setback Project, November 26, 2014.

Watershed Science & Engineering (WSE). Hydraulic Analysis Summary Memorandum for Lower Russell Road Levee Setback Project, March 25, 2015.

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