



Wildwood Road Bridge MP 10.14 Scour Repair

Alternatives Analysis

Submitted to:

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Lewis County Public Works
57 W. Main, Chehalis, WA 98532

October 23, 2025

Prepared By:

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Project No. 21588.B00

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Executive Summary

The Wildwood Road MP 10.14 Bridge crossing the South Fork of the Chehalis River is a 124-foot long three-span concrete structure (built in 1955) supported by concrete piles. It is located approximately 2 miles south of Boistfort, WA. Wildwood Road is a through route and this structure can be closed during construction if necessary. The bridge is currently classified as scour critical due to abutment / interior pier pile tip elevations within ten feet of the stream's thalweg. Scour repairs for the bridge are necessary to maintain vehicular access and protect public safety along Wildwood Road.

Stream hydraulic analysis for the site indicates that the calculated potential scour could extend below the bottom of the existing piling on the intermediate piers, therefore some type of scour mitigation is necessary. The site is in a FEMA mapped floodplain and any type of proposed repair must not increase the 100-year flood elevation, thereby conforming to a no-rise condition.

Environmental studies were conducted at the site and no wetlands were identified within the project area. Stream classification was performed and riparian areas were defined. Environmental impacts due to the construction are expected to be able to be mitigated on-site. Environmental compliance through permits at the Federal, State and Local level will need to be obtained. Since the project is Federally Funded, NEPA compliance will be required. Both permanent and temporary ROW easements will be necessary for the project.

A Cultural Resource study was performed for the site and there were no archaeological finds or other cultural resources discovered within the project area. An inadvertent discovery plan is recommended to be in place prior to construction.

Four scour mitigation alternatives were studied:

- Alternative 1 – Bridge Replacement, approximate construction cost \$3.5 million
- Alternative 2 – Addition of drilled shafts, approximate construction cost \$1.7 million
- Alternative 3 – Rock Revetment, approximate construction cost \$980,000
- Alternative 4 – Revetment with rock and A-jacks, approximate construction cost \$2.1 million

Alternative 3 was recommended as the preferred alternative due to having the lowest cost, least impact to traffic, and the potential for plantings in various areas of the revetment.

Endorsement



10-23-2025

Douglas Sarkkinen

Otak Project Manager

Project Description

The Wildwood Road MP 10.14 Bridge crossing Lucas Creek is a 124-foot long three-span concrete structure (built in 1955) supported by concrete piles. Wildwood Road is a through route and this structure can be closed during construction if necessary. The bridge is currently classified as scour critical due to abutment/interior pier pile tip elevations within ten feet of the stream's thalweg. Scour repairs for the bridge are necessary to maintain vehicular access and protect public safety along Wildwood Road. Preliminary scour countermeasure design has been completed, and this report documents those efforts as well as summarizing the selection of a preferred alternative. The construction will require in-water-work as well as impact riparian areas, which will require mitigation. Following completion of construction, and new Bridge Scour Evaluation is to be performed and documented on WSDOT Form 140-091, indicating the completed project satisfies WSBIS Code (NBI Code 113) to be rated 7 – Design Countermeasures Installed.

Hydraulic Analysis

To support the development of conceptual scour countermeasure alternatives, hydrologic analysis and hydraulic modeling of the South Fork of the Chehalis River at the Wildwood Road crossing was conducted. The United States Geological Survey (USGS) Flood Q Ratio tool was used to analyze gage data from several stream gauges in the vicinity of the crossing. Regression equations and the USGS StreamStats application were also evaluated for the determination of design flows for the project. Ultimately, Flood Q Ratio results from stream gage #12021000 (SF Chehalis River at Boistfort, WA) were determined to be the most applicable for this project. The resulting flows for the 2-, 10-, 25-, 50-, 100- and 500-year flood events are 2590, 3860, 4490, 4960, 5440, and 6560 cubic feet per second (cfs) respectively. More detailed discussion of the hydrologic analysis is included in Appendix C.

Hydraulic modeling was conducted using the flow rates described above, survey information, and supplemental LiDAR for the overbank areas. Modeling was conducted using the U.S. Bureau of Reclamation's SRH-2D hydraulic model through Aqueveo's Surface Water Modeling System (SMS) application. Preliminary analysis suggests that the proposed countermeasure design will not have a major impact on the hydraulics of the bridge, so the existing conditions model was used to inform initial scour countermeasure conceptual designs and alternatives analysis. A proposed conditions model will be prepared as part of future design phases. Scour calculations were performed within SMS, which utilizes FHWA Scour calculation methods documented in HEC 18: Evaluating Scour at Bridges. Abutment scour was initially evaluated using the existing bed material, then subsequently evaluated at the rock revetment layer with an increased depth. More detailed discussion of the hydraulic modeling is provided in Appendix C. Key hydraulic results from the modeling that will influence scour countermeasure design are provided below:

- 100-Year WSE – 312.0 feet
- 500-Year WSE – 313.0 feet
- 500 Year Velocity – 6.5 feet per second
- Pier Scour – 6.7 feet
- Contraction Scour – 0.6 feet
- Abutment Scour (Existing Material) – 9.1 feet
- Abutment Scour (Class B Rock) – 0.0 feet

Conceptual scour countermeasures alternatives were designed based on the hydraulic parameters above.

Critical Areas

Otak biologists conducted field investigations on December 3, 2024. The study area for this report included areas along both sides of Wildwood Road and South Fork Chehalis River, upstream and downstream of Bridge No. 03. Areas immediately beyond the study area were also visually assessed to identify any wetlands and streams with buffers that could extend into the study area. No wetlands were observed in the project study area or in the adjacent areas.

One stream (South Fork Chehalis River) was identified in the study area. The South Fork Chehalis River is a Type S (Shoreline of the State) stream with an assigned buffer of 0 feet per the Lewis County Shoreline Master Program (Table 4-1, Section 4.04.02).

The project is located within the 100-year floodplain of the South Fork Chehalis River. The project area is within the Rural Conservancy Shoreline Environment Designation per the Lewis County Shoreline Master Program.

The full Critical Areas Report is included in Appendix D. Because construction will require in-water-work as well as impact riparian areas, mitigation will be required. The extent of the mitigation is not yet determined at this stage but will more than likely be able to be accomplished on-site through stream enhancement measures, removal of non-native plants and providing additional plantings within the project area.

Cultural Resources

Cultural Resource Consultants, LLSC completed a cultural resource assessment of the area near and adjacent to the proposed project. An APE (area of potential effect) was developed to estimate the extent of ground disturbance that will occur during construction of the proposed scour repair, including areas of bank and stream disturbance such as excavation along with adjacent areas that will be used for construction equipment and staging. The assessment was developed to document recorded and unrecorded archaeological sites, historic built environment resources, or other cultural resources at the project location.

In addition to background research, six shovel probes were excavated on site to depths ranging from 3.7 feet to 5.3 feet, which is within the range of expected ground disturbance. Review of historic records gave no evidence of previous sensitive activities at this site and the field investigation did not identify any archaeological sites or other cultural resources. No additional cultural resources investigation is recommended at this time, and a finding of “no historic properties affected” is recommended. However, because the site is classified as a high risk area, it is recommended that an inadvertent discovery protocol be followed by staff on site if archaeological materials or human skeletal remains are discovered.

A copy of the Cultural Resources Report is included in Appendix E.

Scour Mitigation Alternatives

Four alternatives were developed to mitigate the bridge scour risk at this site. Preliminary drawings and construction cost estimates of each alternative are included in Appendices A and B respectively. Descriptions of each alternative are as follows:

Alternative 1 – Bridge Replacement

This alternative completely removes the existing bridge and replaces it with a single span bridge that is supported back on the banks at each end, away from the risk of potential stream scour. There would be no intermediate piers with this option. The new bridge structure would be 125 feet long and 30 feet wide (two 12 foot lanes and 4 foot shoulders) with concrete barriers on each side. Precast concrete girders with a concrete deck is the assumed superstructure and the substructure would consist of driven steel piling or drilled shafts at each abutment with a concrete pile cap. Wildwood Road would require an approximate 7 month duration closure to replace the bridge, unless special incentives were provided to use accelerated bridge construction techniques. The removal of the existing bridge would require in-water-work, meaning temporary stream isolation and streambank restoration.

Construction costs for this alternative would be in the range of \$3.5 million.

Alternative 2 – Addition of 4'-0" Diameter Drilled Shafts

This alternative also involves closing the bridge for an extended period of time, possibly 4 to 5 months. At each intermediate pier, two new 4'-0" diameter drilled shaft would be installed on the outside of the bridge, extending deep below the expected scour depth. It would require temporary casing and stream isolation to prevent material from entering into the river. The drilled shafts would be extended up to just below the ground surface up to a new cross beam. The new cross beam would be approximately 5 feet square and would encapsulate the existing piling. After the new cross beams are cast and cured the streambanks would be restored and other stream enhancements such as large woody debris and stream gravels would be added for environmental mitigation.

Construction costs for this alternative would be in the range of \$1.7 million

Alternative 3 – Rock Revetment

This alternative requires complete stream isolation by a temporary dam upstream and downstream, fish removal and putting the stream in a pipe for the duration of the stream work. After this is complete and the stream area is dry, excavation would occur to remove existing material under and along side the bridge to install large rock, either riprap or rock for scour protection that would extend across the channel. At the channel location the rock would be covered with at least 4 feet of streambed material. The side slopes of the rock under the bridge would be approximately 2:1. Upstream and downstream of the bridge, habitat enhancements would be provided by the addition of large woody debris and additional streambed gravels. New plantings along the edges of the stream and higher on the banks would occur to mitigate for impacts to riparian areas.

Construction costs for this alternative would be in the \$980,000 range.

Alternative 4 – Concrete Slope Protection (A-jacks)

This alternative requires complete stream isolation by a temporary dam upstream and downstream, fish removal and putting the stream in a pipe for the duration of the stream work. After this is complete and the stream area is dry, excavation would occur to remove existing material under and alongside the bridge to install revetment. On the side slopes, precast concrete A-jacks would be installed. This is a hard armor solution that is used for streambank stability, scour protection and energy dissipation. The A-jacks would extend down the channel, and the large rock, either riprap or rock for scour protection would extend across the channel. At the channel location the rock would be covered with at least 4 feet of streambed material. The side slopes of the rock under the bridge would be approximately 1:1. Upstream and downstream of the bridge, habitat enhancements would be provided by the addition of large woody debris and more streambed gravels. New plantings along the edges of the stream and higher on the banks would occur to mitigate for impacts to riparian areas.

Construction costs for this alternative would be in the \$2.1 million range.

Summary

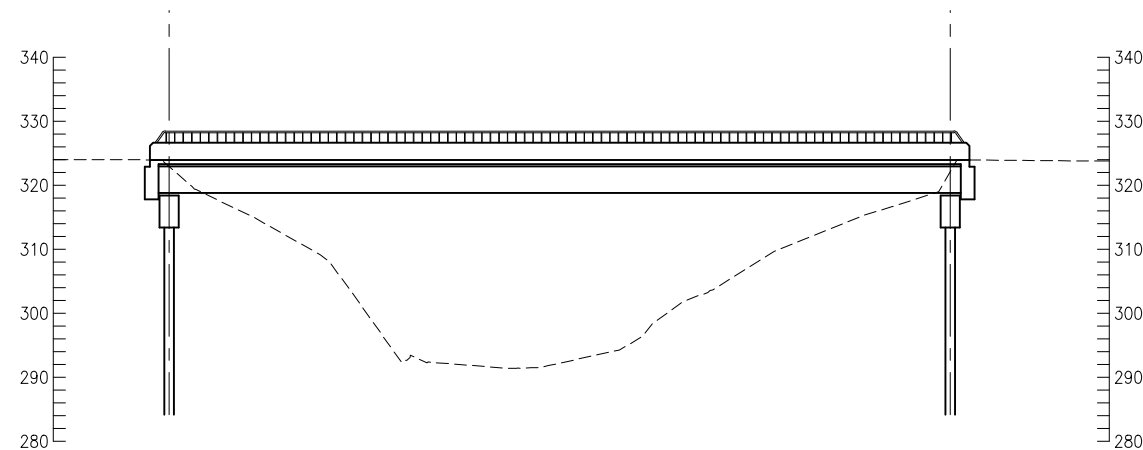
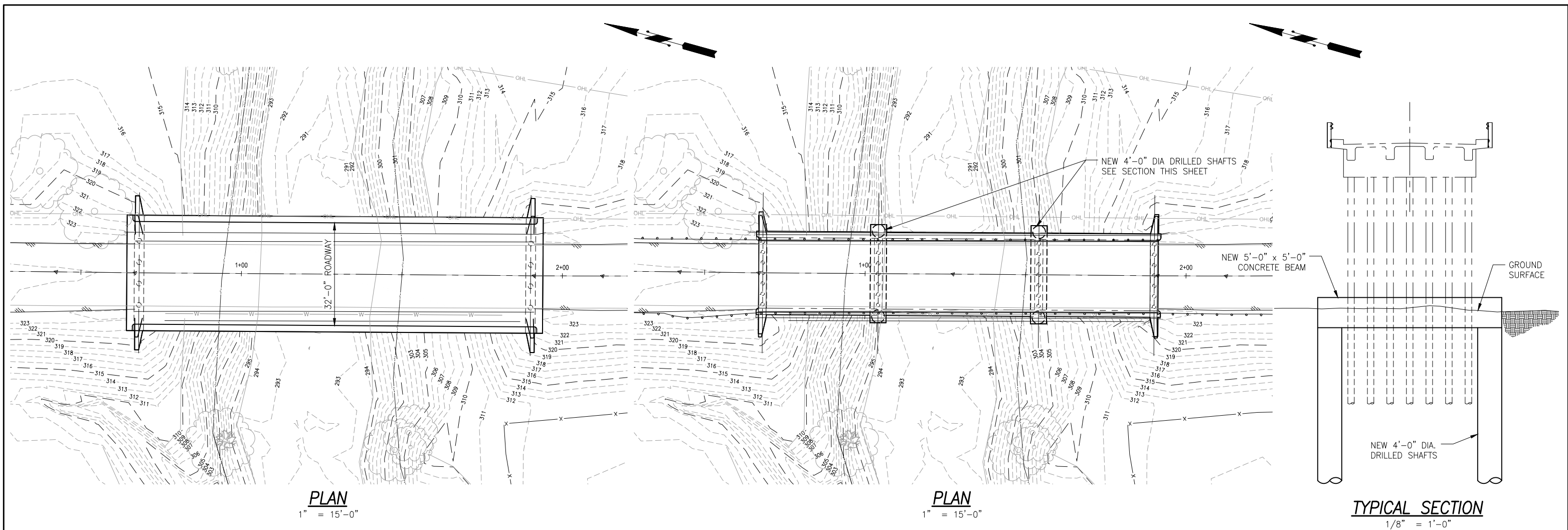
Of the four alternatives studied, Alternatives 3 and 4 appear to be the most beneficial for the project. Not only are they at the lower cost range, but they have the least impact to the traveling public. Minor road closures would be necessary when moving and staging equipment and materials, but otherwise the majority of the work can be accomplished while the bridge is open to traffic. Since Alternative 3 uses rock for revetment that will be exposed, it will more resemble the existing conditions and has the potential to have vegetation established within portions of it.

All four alternatives require in-water work, so initial environmental impacts and required mitigation would be expected to be similar. Alternative 1 would be the preferred environmental alternative as it removes the old bridge and intermediate piers as well as the riprap that has been installed previously. This alternative would allow the stream to be restored to its most natural condition, but it has the highest cost and is well beyond the funding limits for the project.

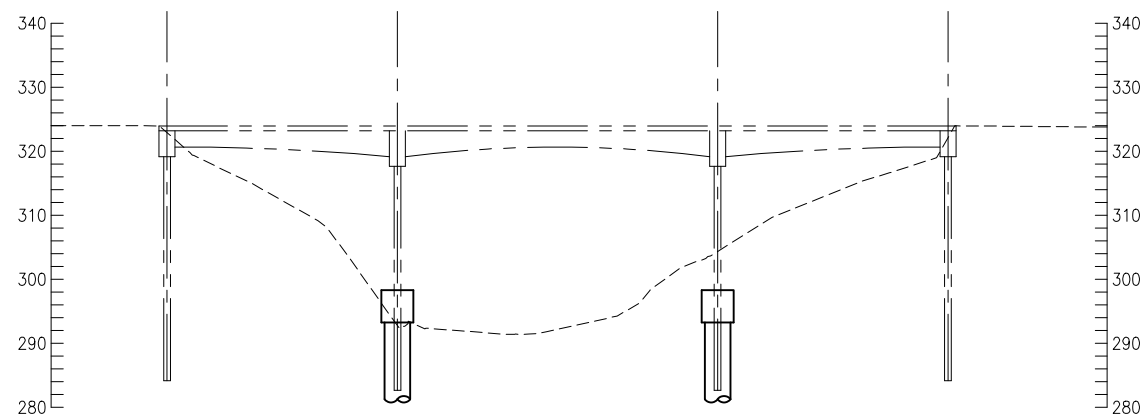
Based on the parameters reviewed and compared, it is recommended that Alternate 3 be selected as the preferred alternative and the project move forward based on this.

Appendix A

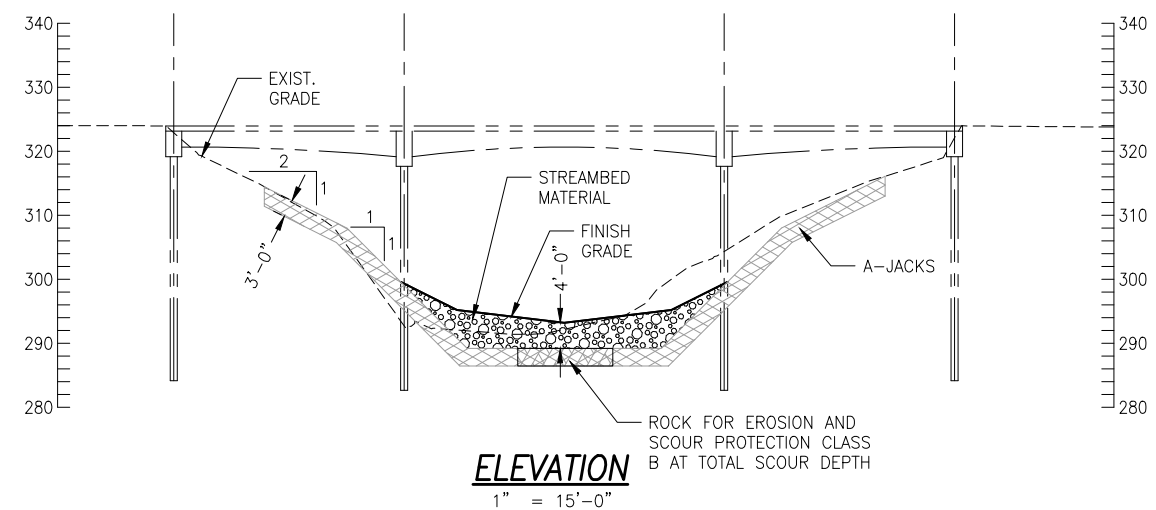
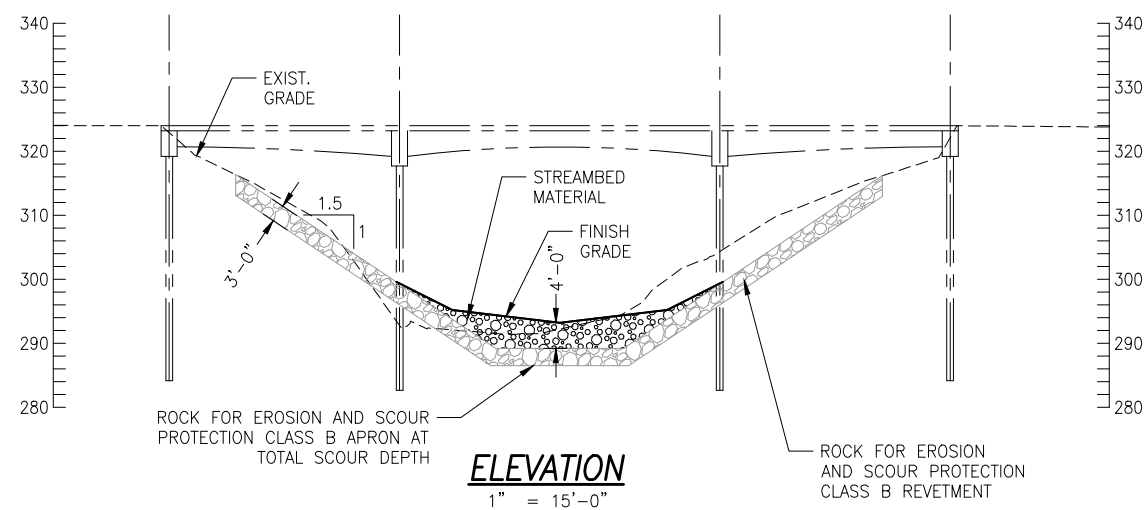
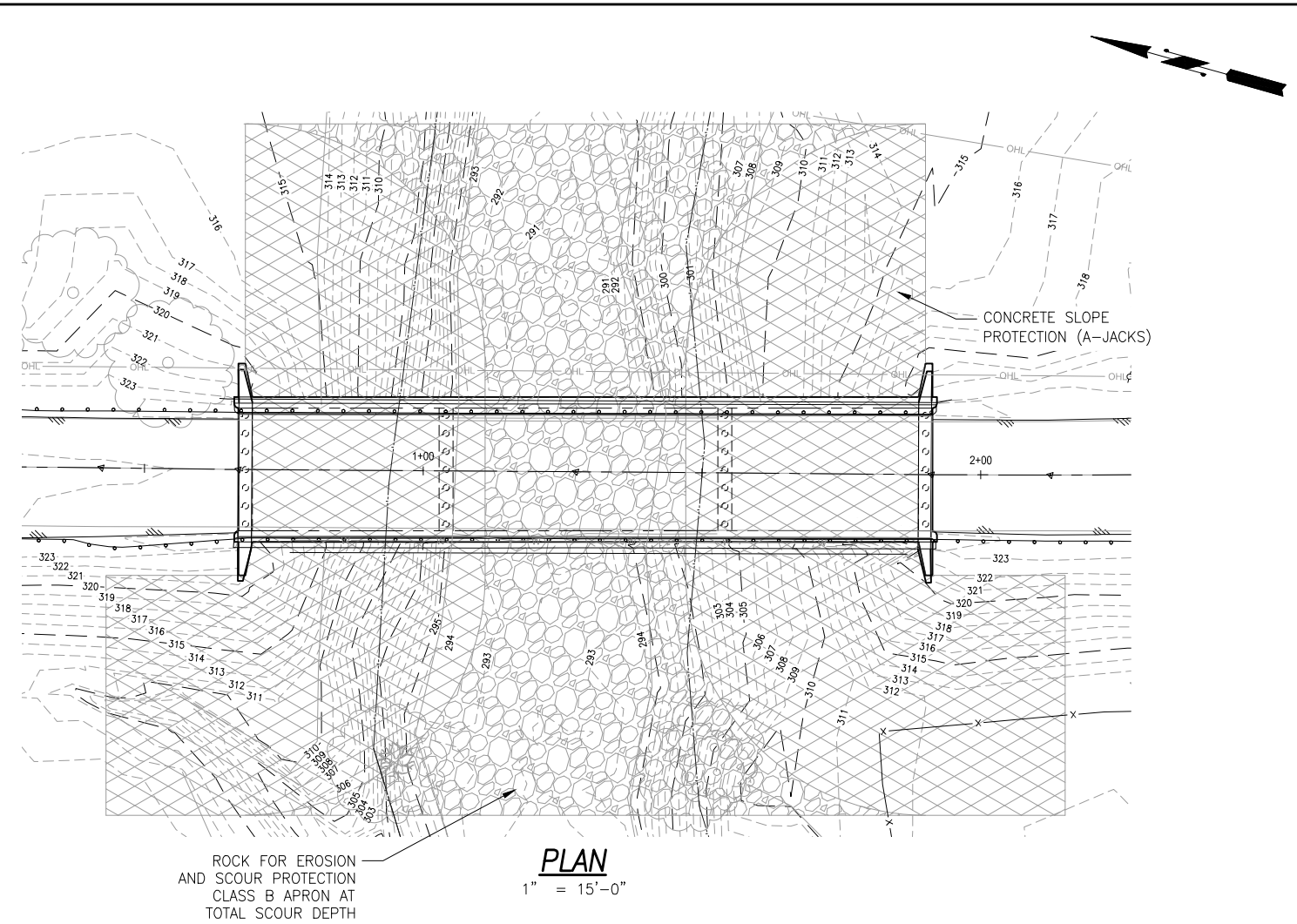
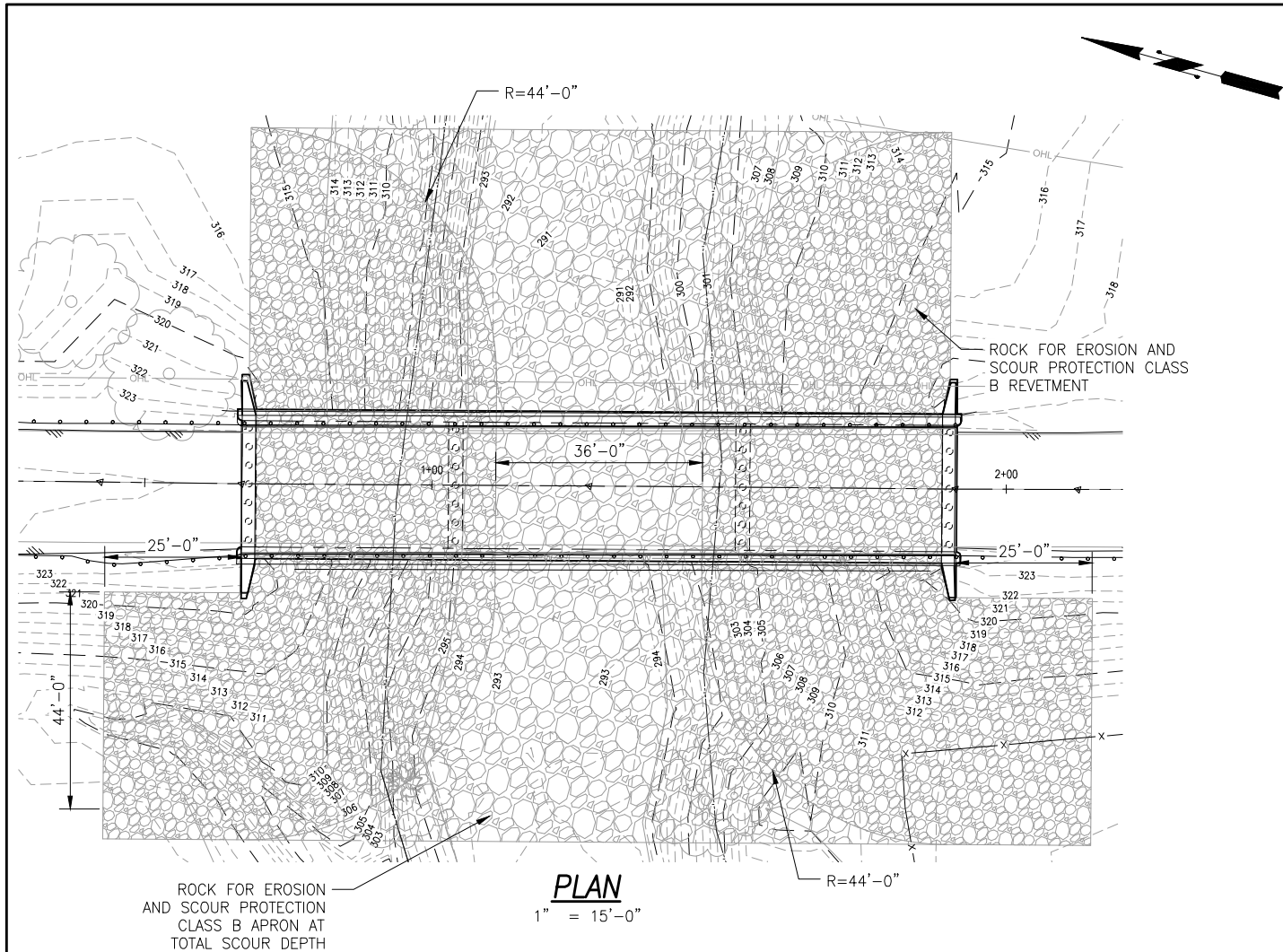
Drawings of Alternatives



ALTERNATIVE 1 – NEW BRIDGE

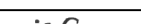
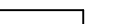


ALTERNATIVE 2 – DRILLED SHAFTS



ALTERNATIVE 3 – ROCK REVETMENT

ALTERNATIVE 4 – CONCRETE SLOPE PROTECTION (A-JACKS)

 57 W. MAIN ST. CHEHALIS WA 98532 PHONE # (360) 740-1123 FAX # (360) 740-2719	DESIGNED BY : DLS	NO.	DATE	REVISION	BY	APP.	WILDWOOD MP 10.14 BRIDGE SCOUR REPAIR	ALTERNATIVES ANALYSIS COUNTY ROAD PROJECT NO: 2159S	EXHIBIT B	SHEET 2 OF 2	 CALL 48 HOURS BEFORE YOU DIG 1-800- 424-5555 "It's the Law" Utilities Underground Location Center	
	DRAWN BY : JMM											
	CHECKED BY :											
	DATE :											

Appendix B

Preliminary Cost Estimates

LEWIS COUNTY
Wildwood Rd MP 10.14 Bridge Scour
Engineers Estimate of Probable Construction Cost
Alternate 1- Bridge Replacement



Estimate date: 10/23/2025
 Prepared by: Otak

Estimate Notes and assumptions

Unit costs for items derived from prior bid tabulations, WSDOT unit costs, and professional experience.

Note: Estimate does not include costs for property acquisition (if needed) or utility impacts

LEWIS COUNTY Wildwood Rd MP 10.14 Bridge Scour Repair

BID ITEM NUMBER	SPEC. SECTION	BID ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
1	1-09	MOBILIZATION	L.S.	1	\$ 322,140.00	\$ 322,140.00
2	1-04	MINOR CHANGE	FORCE ACCOUNT	1	\$ 22,000.00	\$ 22,000.00
3	1-05	CONSTRUCTION SURVEYING	L.S.	1	\$ 7,500.00	\$ 7,500.00
4	1-07	SPCC PLAN	L.S.	1	\$ 3,500.00	\$ 3,500.00
5	1-10	PROJECT TEMPORARY TRAFFIC CONTROL	L.S.	1	\$ 30,000.00	\$ 30,000.00
6	1-10	CONSTRUCTION SIGNS CLASS A	S.F.	171	\$ 30.00	\$ 5,130.00
7	2-01	CLEARING AND GRUBBING	ACRE	0.4	\$ 40,000.00	\$ 16,000.00
8	2-02	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.S.	1	\$ 16,000.00	\$ 16,000.00
9	2-03	CHANNEL EXCAVATION INCL. HAUL	C.Y.	810	\$ 62.00	\$ 50,220.00
10	2-12	CONSTRUCTION GEOTEXTILE FOR SEPARATION	S.Y.	60	\$ 25.00	\$ 1,500.00
11	6-02	REMOVE EXISTING BRIDGE	L.S.	1	\$ 250,000.00	\$ 250,000.00
5	3-02	ROADWAY RECONSTRUCTION	L.S.	1	\$ 270,000.00	\$ 270,000.00
5	6-02	STRUCTURE EXCAVATION INCL HAUL	L.S.	1	\$ 20,000.00	\$ 20,000.00
5	6-02	4 FOOT DIAMETER DRILLED SHAFT	L.F.	230	\$ 1,600.00	\$ 368,000.00
5	6-02	CONCRETE CLASS 4000	C.Y.	90	\$ 1,600.00	\$ 144,000.00
5	6-02	STEEL REINFORCING BAR	LB	25000	\$ 4.00	\$ 100,000.00
5	6-02	SUPERSTRUCTURE 'WILDWOOD RD BRIDGE'	L.S.	1	\$ 920,000.00	\$ 920,000.00
5	6-02	CONCRETE BARRIER	L.F.	220	\$ 600.00	\$ 132,000.00
5	6-02	BP RAIL	L.F.	220	\$ 150.00	\$ 33,000.00
5	6-02	TYPE 31 GUARDRAIL	L.F.	400	\$ 125.00	\$ 50,000.00
12	8-01	HIGH VISIBILITY SILT FENCE	L.F.	280	\$ 8.00	\$ 2,240.00
13	8-01	HIGH VISIBILITY FENCE	L.F.	400	\$ 8.00	\$ 3,200.00
14	8-01	STABILIZED CONSTRUCTION ENTRANCE	S.Y.	75	\$ 85.00	\$ 6,375.00
15	8-01	EROSION CONTROL AND WATER POLLUTION PREVENTION	L.S.	1	\$ 5,000.00	\$ 5,000.00
16	8-02	TOPSOIL TYPE B	C.Y.	290	\$ 75.00	\$ 21,750.00
17	8-15	ROCK FOR EROSION AND SCOUR PROTECTION CLASS B	TON	300	\$ 100.00	\$ 30,000.00
18	8-15	FILTER BLANKET	TON	190	\$ 75.00	\$ 14,250.00
19	8-31	TEMPORARY STREAM DIVERSION (WILDWOOD RD BRIDGE SCOUR)	L.S.	1	\$ 70,000.00	\$ 70,000.00
20	SP	LANDSCAPE RESTORATION	L.S.	1	\$ 39,125.00	\$ 39,125.00
21	SP	WOODY MATERIAL-LOG WITH ROOTWAD (EA)	EA.	10	\$ 2,800.00	\$ 28,000.00
23	SP	COIR SLOPE PROTECTION	S.Y.	160	\$ 80.00	\$ 12,800.00
24	SP	STREAMBED COBBLES 10 IN.	TON	120	\$ 118.00	\$ 14,160.00
25	SP	STREAMBED SEDIMENT	TON	150	\$ 85.00	\$ 12,750.00
26	SP	STREAMBED SAND	TON	100	\$ 80.00	\$ 8,000.00
						\$ -
SUB -TOTAL						\$3,028,640.00
15% CONTINGENCY						\$454,296.00
TOTAL						\$3,482,936.00

LEWIS COUNTY
Wildwood Rd MP 10.14 Bridge Scour
Engineers Estimate of Probable Construction Cost
Alternate 2 - Adding drilled shafts



Estimate date: 10/23/2025
 Prepared by: Otak

Estimate Notes and assumptions

Unit costs for items derived from prior bid tabulations, WSDOT unit costs, and professional experience.

Note: Estimate does not include costs for property acquisition (if needed) or utility impacts

LEWIS COUNTY Wildwood Rd MP 1.14 Bridge Scour Repair

BID ITEM NUMBER	SPEC. SECTION	BID ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
1	1-09	MOBILIZATION	L.S.	1	\$ 155,232.00	\$ 155,232.00
2	1-04	MINOR CHANGE	FORCE ACCOUNT	1	\$ 22,000.00	\$ 22,000.00
3	1-05	CONSTRUCTION SURVEYING	L.S.	1	\$ 7,500.00	\$ 7,500.00
4	1-07	SPCC PLAN	L.S.	1	\$ 3,500.00	\$ 3,500.00
5	1-10	PROJECT TEMPORARY TRAFFIC CONTROL	L.S.	1	\$ 10,000.00	\$ 10,000.00
6	1-10	CONSTRUCTION SIGNS CLASS A	S.F.	171	\$ 30.00	\$ 5,130.00
7	2-01	CLEARING AND GRUBBING	ACRE	0.2	\$ 40,000.00	\$ 8,000.00
8	2-02	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.S.	1	\$ 11,000.00	\$ 11,000.00
9	2-03	CHANNEL EXCAVATION INCL. HAUL	C.Y.	810	\$ 62.00	\$ 50,220.00
10	2-12	CONSTRUCTION GEOTEXTILE FOR SEPARATION	S.Y.	60	\$ 25.00	\$ 1,500.00
11	6-02	REMOVE EXIST PILING	L.S.	1	\$ 15,000.00	\$ 15,000.00
5	6-02	STRUCTURE EXCAVATION INCL HAUL	L.S.	1	\$ 20,000.00	\$ 20,000.00
5	6-02	ACCESS PLATFORM FOR SHAFT EQUIPMENT	L.S.	1	\$ 150,000.00	\$ 150,000.00
5	6-02	4 FOOT DIAMETER DRILLED SHAFT	L.F.	160	\$ 3,500.00	\$ 560,000.00
5	6-02	CONCRETE CLASS 4000	C.Y.	60	\$ 2,500.00	\$ 150,000.00
5	6-02	STEEL REINFORCING BAR	LB	14000	\$ 4.00	\$ 56,000.00
12	8-01	HIGH VISIBILITY SILT FENCE	L.F.	280	\$ 8.00	\$ 2,240.00
13	8-01	HIGH VISIBILITY FENCE	L.F.	400	\$ 8.00	\$ 3,200.00
14	8-01	STABILIZED CONSTRUCTION ENTRANCE	S.Y.	75	\$ 85.00	\$ 6,375.00
15	8-01	EROSION CONTROL AND WATER POLLUTION PREVENTION	L.S.	1	\$ 5,000.00	\$ 5,000.00
16	8-02	TOPSOIL TYPE B	C.Y.	190	\$ 75.00	\$ 14,250.00
17	8-15	ROCK FOR EROSION AND SCOUR PROTECTION CLASS B	TON	300	\$ 100.00	\$ 30,000.00
18	8-15	FILTER BLANKET	TON	190	\$ 75.00	\$ 14,250.00
19	8-31	TEMPORARY STREAM DIVERSION (WILDWOOD RD BRIDGE SCOUR)	L.S.	1	\$ 60,000.00	\$ 60,000.00
20	SP	LANDSCAPE RESTORATION	L.S.	1	\$ 29,125.00	\$ 29,125.00
21	SP	WOODY MATERIAL-LOG WITH ROOTWAD (EA)	EA.	12	\$ 2,800.00	\$ 33,600.00
23	SP	COIR SLOPE PROTECTION	S.Y.	160	\$ 80.00	\$ 12,800.00
24	SP	STREAMBED COBBLES 10 IN.	TON	120	\$ 118.00	\$ 14,160.00
25	SP	STREAMBED SEDIMENT	TON	150	\$ 85.00	\$ 12,750.00
26	SP	STREAMBED SAND	TON	100	\$ 80.00	\$ 8,000.00
						\$ -

SUB -TOTAL **\$1,470,832.00**
15% CONTINGENCY **\$220,624.80**
TOTAL **\$1,691,456.80**

LEWIS COUNTY
Wildwood Rd MP 10.14 Bridge Scour
Engineers Estimate of Probable Construction Cost
Alternate 3 - Rock Revetment



Estimate date: 10/23/2025
 Prepared by: Otak

Estimate Notes and assumptions

Unit costs for items derived from prior bid tabulations, WSDOT unit costs, and professional experience.

Note: Estimate does not include costs for property acquisition (if needed) or utility impacts

LEWIS COUNTY Wildwood Rd MP 10.14 Bridge Scour Repair

BID ITEM NUMBER	SPEC. SECTION	BID ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
1	1-09	MOBILIZATION	L.S.	1	\$ 88,650.00	\$ 88,650.00
2	1-04	MINOR CHANGE	FORCE ACCOUNT	1	\$ 22,000.00	\$ 22,000.00
3	1-05	CONSTRUCTION SURVEYING	L.S.	1	\$ 7,500.00	\$ 7,500.00
4	1-07	SPCC PLAN	L.S.	1	\$ 3,500.00	\$ 3,500.00
5	1-10	PROJECT TEMPORARY TRAFFIC CONTROL	L.S.	1	\$ 20,000.00	\$ 20,000.00
6	1-10	CONSTRUCTION SIGNS CLASS A	S.F.	171	\$ 30.00	\$ 5,130.00
7	2-01	CLEARING AND GRUBBING	ACRE	0.4	\$ 40,000.00	\$ 16,000.00
8	2-02	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.S.	1	\$ 16,000.00	\$ 16,000.00
9	2-03	CHANNEL EXCAVATION INCL. HAUL	C.Y.	810	\$ 62.00	\$ 50,220.00
10	2-12	CONSTRUCTION GEOTEXTILE FOR SEPARATION	S.Y.	60	\$ 25.00	\$ 1,500.00
12	8-01	HIGH VISIBILITY SILT FENCE	L.F.	280	\$ 8.00	\$ 2,240.00
13	8-01	HIGH VISIBILITY FENCE	L.F.	400	\$ 8.00	\$ 3,200.00
14	8-01	STABILIZED CONSTRUCTION ENTRANCE	S.Y.	75	\$ 85.00	\$ 6,375.00
15	8-01	EROSION CONTROL AND WATER POLLUTION PREVENTION	L.S.	1	\$ 5,000.00	\$ 5,000.00
16	8-02	TOPSOIL TYPE B	C.Y.	490	\$ 80.00	\$ 39,200.00
17	8-15	ROCK FOR EROSION AND SCOUR PROTECTION CLASS B	TON	2200	\$ 95.00	\$ 209,000.00
18	8-15	FILTER BLANKET	TON	190	\$ 80.00	\$ 15,200.00
19	8-31	TEMPORARY STREAM DIVERSION (WILDWOOD RD BRIDGE SCOUR)	L.S.	1	\$ 45,000.00	\$ 45,000.00
20	SP	LANDSCAPE RESTORATION	L.S.	1	\$ 49,125.00	\$ 49,125.00
22	SP	WOODY MATERIAL	EA.	18	\$ 1,800.00	\$ 32,400.00
23	SP	COIR SLOPE PROTECTION	S.Y.	260	\$ 80.00	\$ 20,800.00
24	SP	STREAMBED COBBLES 10 IN.	TON	1270	\$ 118.00	\$ 149,860.00
25	SP	STREAMBED SEDIMENT	TON	300	\$ 85.00	\$ 25,500.00
26	SP	STREAMBED SAND	TON	200	\$ 80.00	\$ 16,000.00
						\$ -
SUB - TOTAL						\$849,400.00
CONTINGENCY 15%						\$127,410.00
TOTAL						\$976,810.00

LEWIS COUNTY
Wildwood Rd MP 10.14 Bridge Scour
Engineers Estimate of Probable Construction Cost
Alternate 4 - Concrete Slope Protection (A-Jacks)



Estimate date: 10/23/2025
 Prepared by: Otak

Estimate Notes and assumptions

Unit costs for items derived from prior bid tabulations, WSDOT unit costs, and professional experience.

Note: Estimate does not include costs for property acquisition (if needed) or utility impacts

LEWIS COUNTY Wildwood Rd MP 10.14 Bridge Scour Repair

BID ITEM NUMBER	SPEC. SECTION	BID ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
1	1-09	MOBILIZATION	L.S.	1	\$ 198,342.00	\$ 198,342.00
2	1-04	MINOR CHANGE	FORCE ACCOUNT	1	\$ 22,000.00	\$ 22,000.00
3	1-05	CONSTRUCTION SURVEYING	L.S.	1	\$ 7,500.00	\$ 7,500.00
4	1-07	SPCC PLAN	L.S.	1	\$ 3,500.00	\$ 3,500.00
5	1-10	PROJECT TEMPORARY TRAFFIC CONTROL	L.S.	1	\$ 20,000.00	\$ 20,000.00
6	1-10	CONSTRUCTION SIGNS CLASS A	S.F.	171	\$ 30.00	\$ 5,130.00
7	2-01	CLEARING AND GRUBBING	ACRE	0.4	\$ 40,000.00	\$ 16,000.00
8	2-02	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.S.	1	\$ 11,000.00	\$ 11,000.00
9	2-03	CHANNEL EXCAVATION INCL. HAUL	C.Y.	810	\$ 62.00	\$ 50,220.00
10	2-12	CONSTRUCTION GEOTEXTILE FOR SEPARATION	S.Y.	60	\$ 25.00	\$ 1,500.00
12	8-01	HIGH VISIBILITY SILT FENCE	L.F.	280	\$ 8.00	\$ 2,240.00
13	8-01	HIGH VISIBILITY FENCE	L.F.	400	\$ 8.00	\$ 3,200.00
14	8-01	STABILIZED CONSTRUCTION ENTRANCE	S.Y.	75	\$ 85.00	\$ 6,375.00
15	8-01	EROSION CONTROL AND WATER POLLUTION PREVENTION	L.S.	1	\$ 5,000.00	\$ 5,000.00
16	8-02	TOPSOIL TYPE B	C.Y.	290	\$ 75.00	\$ 21,750.00
17	8-15	ROCK FOR EROSION AND SCOUR PROTECTION CLASS B	TON	550	\$ 90.00	\$ 49,500.00
17	8-15	CONCRETE SLOPE PROTECTION (A-JACKS)	S.Y.	1600	\$ 700.00	\$ 1,120,000.00
18	8-15	FILTER BLANKET	TON	190	\$ 75.00	\$ 14,250.00
19	8-31	TEMPORARY STREAM DIVERSION (SENN RD BRIDGE SCOUR)	L.S.	1	\$ 40,000.00	\$ 40,000.00
20	SP	LANDSCAPE RESTORATION	L.S.	1	\$ 39,125.00	\$ 39,125.00
22	SP	WOODY MATERIAL-	EA.	18	\$ 1,800.00	\$ 32,400.00
23	SP	COIR SLOPE PROTECTION	S.Y.	160	\$ 80.00	\$ 12,800.00
24	SP	STREAMBED COBBLES 10 IN.	TON	1270	\$ 118.00	\$ 149,860.00
25	SP	STREAMBED SEDIMENT	TON	300	\$ 85.00	\$ 25,500.00
26	SP	STREAMBED SAND	TON	200	\$ 80.00	\$ 16,000.00
						\$ -

SUB-TOTAL **\$1,873,192.00**
CONTINGENCY 15% **\$280,978.80**
TOTAL **\$2,154,170.80**

Appendix C

Hydraulics Report



Osborn Consulting
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TECHNICAL MEMORANDUM

Date: May 12, 2026

Project: Lewis County Wildwood MP 10.14 Scour Mitigation
To: Doug Sarkkinen, PE | Otak

From: Mike Zarecor, PE | Osborn Consulting
Monika Kaneshige, EIT | Osborn Consulting

cc:
Subject: Wildwood Hydraulic and Hydrology Report

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INTRODUCTION

Lewis County (County) is implementing a scour mitigation project at the Wildwood Road Bridge (MP 10.14) crossing of the South Fork of the Chehalis River. The goal of the project is to raise the existing structure's National Bridge Inspection (NBI) Code 113 Rating 3 – Scour Critical, up to 7 – Design Countermeasures Installed. Osborn Consulting, Inc. (Osborn) performed hydrologic, hydraulic, and scour analyses for the Wildwood Road Bridge crossing as part of this project. Project location and vicinity are shown below in Figure 1.

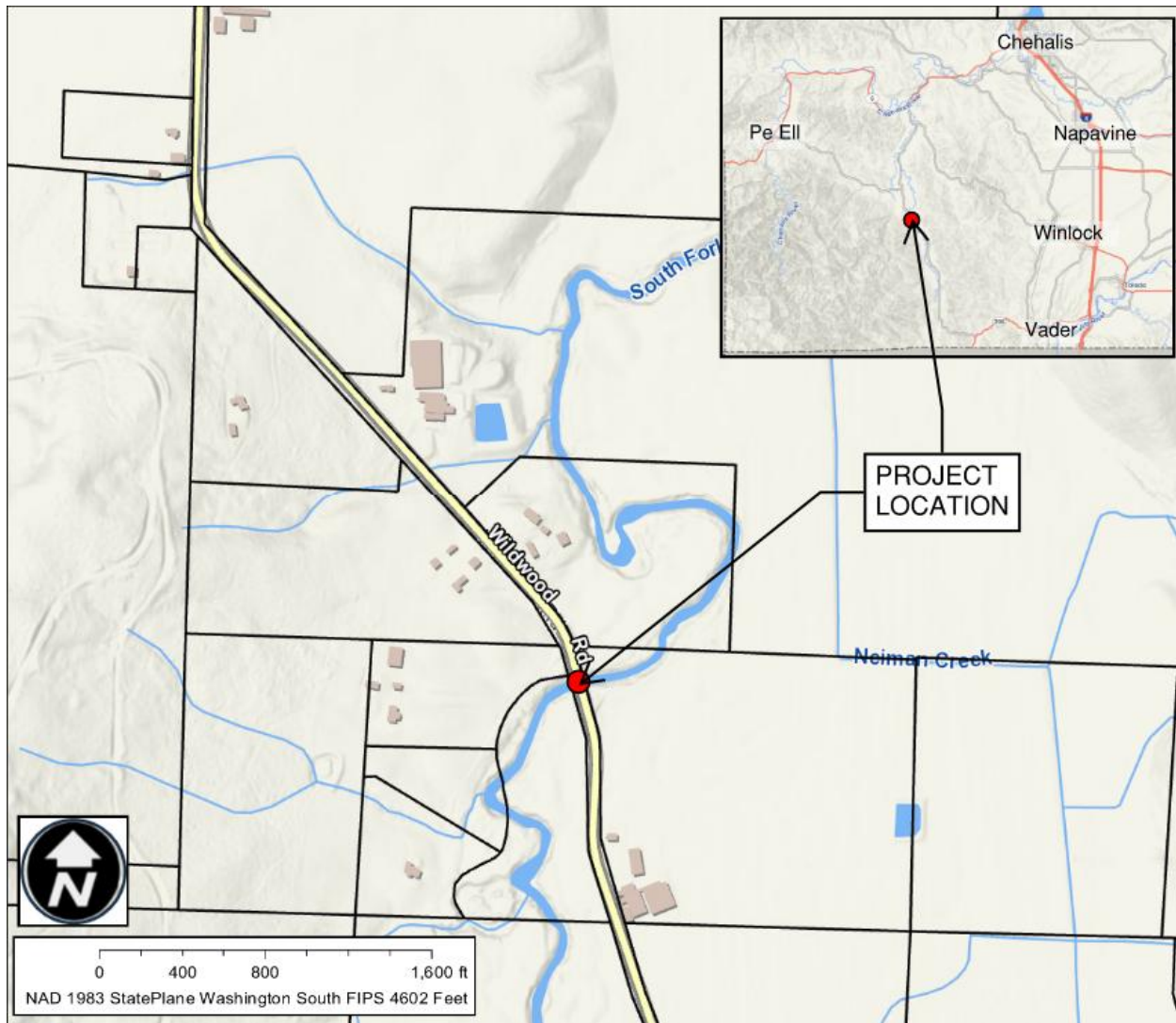


Figure 1: Project Vicinity Map (Lewis County GIS Web Map)

SECTION 1 HYDROLOGIC ANALYSIS

A hydrologic analysis of the South Fork of the Chehalis River at the project location was conducted to inform subsequent hydraulic modeling efforts. The methods for the analysis include regression equations from the United States Geological Survey (USGS) StreamStats application (USGS 2019), and use of the USGS Flood Q Ratio Tool. The report generated by StreamStats, including the regression equation flows, is provided in Appendix A. The Flood Q Ratio Tool uses gage data, statistical analysis, and regional regression equations to provide weighted estimates of flood discharges at the project location. The Flood Q Ratio Tool was used on three stream-flow gages in the vicinity of the project. Gages #12020800, #12020900, and #12021000, were analyzed and scaled using the tool. Inputs to the tool include the drainage areas of the gaged location (27.0, 45.2, and 48.1 square miles, respectively) and the drainage area of the project location (43.0 square miles) as well as the mean annual precipitation of the project basin (68.1 inches). The project drainage area and mean annual precipitation values are from the StreamStats report. The basin size for Gage #12020800 is out of the applicable range for which the drainage area adjustment is valid and therefore was not considered further. The drainage areas for Gages #12020900 and #12021000 were within the applicable range for which the drainage area adjustment is valid. Gage #12021000 was used instead of #12020900 as there is a longer period of record and the flows generated by the Flood Q Ratio Tool were more consistent with the flows from the StreamStats report. Gage #12021000 (South Fork Chehalis River at Boistfort, WA) flow estimates were used for hydraulic modeling. See Appendix B for the Flood Q Ratio Tool results. Estimated flood discharges for the South Fork Chehalis River at the Wildwood Bridge crossing are listed in Table 1.

Table 1. Peak Flows for the South Fork Chehalis River at the Wildwood Road Bridge Crossing

Gage # Analysis Tool	Flow Frequency Return Period					
	2-Year (cfs)	10-Year (cfs)	25-Year (cfs)	50-Year (cfs)	100-Year (cfs)	500-Year (cfs)
#12021000 Flood Q Ratio Tool	2,590	3,860	4,490	4,960	5,440	6,560

Notes:

cfs = cubic feet per second

SECTION 2 HYDRAULIC ANALYSIS

Hydraulic modeling was conducted using the United States Bureau of Reclamation's SRH-2D Version 3.3.1 computer program, a two-dimensional hydraulic and sediment transport numerical model (USBR, 2020). Pre- and post- processing for this model was included using the Surface-water Modeling System (SMS) version 13.4.2 (Aquaveo, 2025). Results from the hydraulic modeling were used in coordination with the FHWA Hydraulic Toolbox software version 5.4, specifically the Bridge Scour Analysis calculator (FHWA 2024a). Scour calculations are discussed in Section 3.

The existing condition and proposed condition scenarios were analyzed using SRH-2D simulations for each flow frequency. Model configuration including mesh qualities, roughness coefficients, and boundary conditions are discussed in the subsequent section.

2.1 Model Setup

Channel geometry data in the existing model was developed from topographic survey provided by Otak, which extended 300 feet upstream and 300 feet downstream of the Wildwood Road bridge. Supplemental topographic information sourced from the SWWA Foothills 2017 dataset on the Washington LiDAR Portal (USGS 2017) was merged with the survey to provide adequate model extents for larger flood simulations. The existing conditions mesh extends from approximately 300 feet upstream to approximately 300 feet

downstream of the crossing. The channel bed, banks, and thalweg were modeled using patch-type (quadrilateral) elements to capture the more singular-directional flow. Areas outside of the channel were modeled using paving-type (triangular) elements. The existing bridge abutments and piers were modeled as holes in the mesh. There are two groups of seven cylindrical piers: one group on either side of the channel. The spacing between piers in a grouping is 3.2 feet, and the piers have a width of 1.1 feet. The spacing between piers is less than five times the width of an individual pier, therefore the two groups of seven piers were each modeled as two round-nosed piers (FHWA 2012). The existing model mesh is shown in Figure 2.

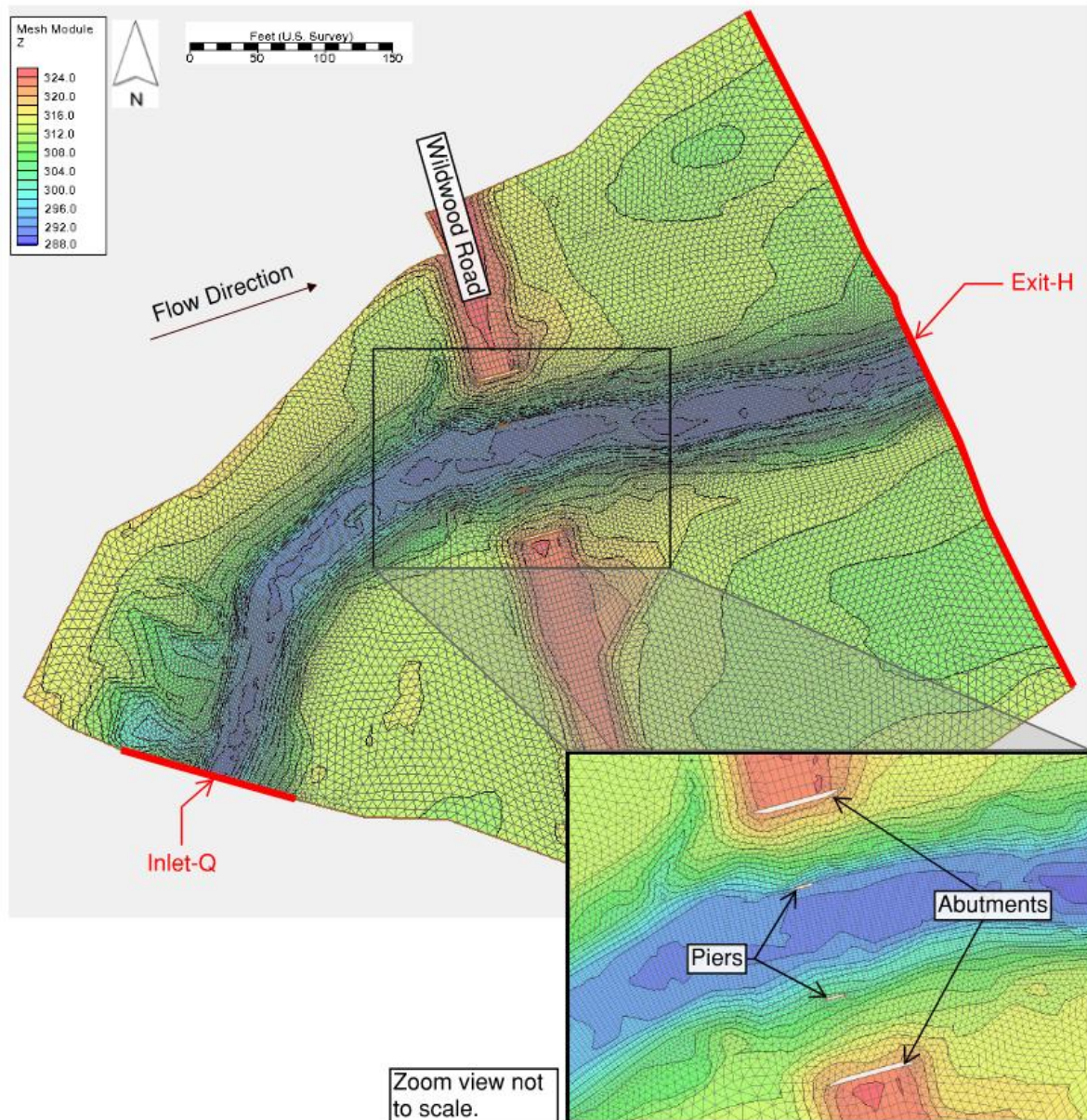


Figure 2: Existing conditions mesh and boundary conditions

Most properties of the proposed condition model were kept the same as existing condition, including mesh domain, element types, and existing abutments and piers represented as voids in the mesh. Differences are reflected in the proposed channel geometry, which was graded in Civil 3D. Proposed

grading extends from about 75 feet upstream to 115 feet downstream from the center of the bridge. Mesh areas affected by the proposed grading were adjusted so that patch-type elements were in line with the proposed channel. The proposed model mesh is shown in Figure 3.

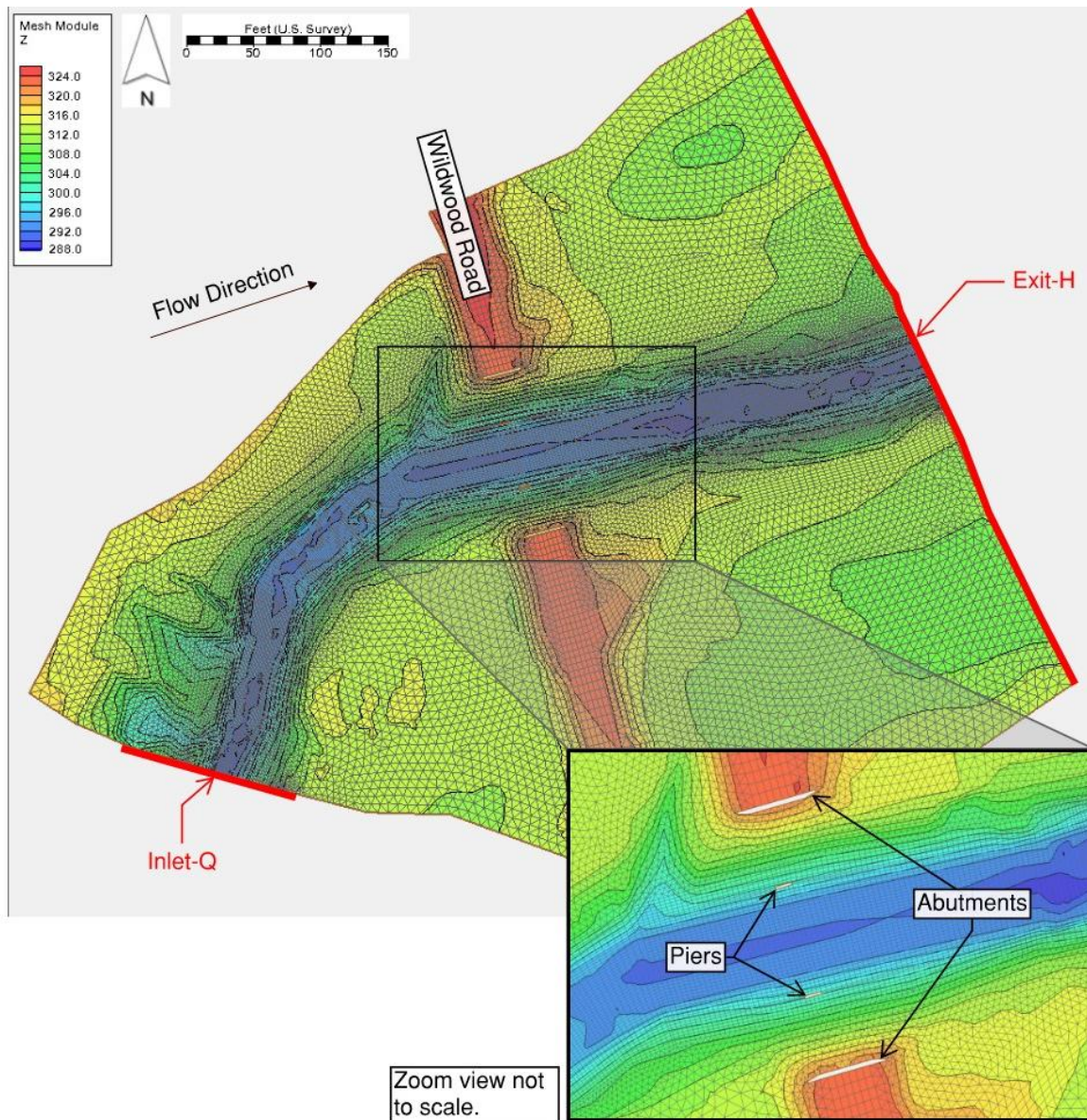


Figure 3: Proposed conditions mesh and boundary conditions

Boundary conditions were placed within survey limits. Inflow boundary conditions used the Inlet-Q (subcritical flow) type with a constant discharge and conveyance distribution at the inlet. Discharge values varied by design flow event. The 2-year, 10-year, 25-year, 50-year, 100-year, and 500-year flow events were simulated (see Table 1 for flood discharge values). Outflow boundary conditions used the Exit-H (subcritical outflow) type with an exit water surface elevation generated from a normal depth rating curve. The rating curve was populated using the following inputs: Manning's $n = 0.045$, slope = 0.00178 feet/foot, and flows ranging from 0 to 6,600 cfs. Boundary arc locations are shown in Figure 2 and Figure 3.

Hydraulic roughness within each model simulation is defined by Manning' n values. Material coverages, which define the spatial distribution of roughness values, were delineated for the existing-conditions model. The channel roughness coefficient was evaluated using the quasi-quantitative method (Arcement and Schneider 1989) in the Stream Channel Flow Resistance Coefficient Computation Tool (NSAEC 2018). Other material coverages including vegetated overbank, roadway, and agricultural land, were assigned Manning's n roughness coefficients estimated from Chow's *Open-Channel Hydraulics* (Chow 1959). For proposed conditions, the existing channel roughness is maintained, except in areas on the overbanks where riprap will be exposed. Manning's n values are listed in Table 2.

Table 2. Roughness Coefficients

Material	Manning's n
Existing Channel	0.45
Vegetated Overbank	0.08
Roadway	0.016
Agricultural Land	0.035
Riprap	0.033

2.2 Model Results

Hydraulic results for maximum channel depth, average channel velocity, and average channel shear stress were analyzed at representative cross section locations. Results were analyzed at seven cross section locations: three downstream (DS), one spanning the bridge, and three upstream (US). Maximum depth at DS 2+36 increased by approximately 1.4 feet due to changes to the streambed elevation in the proposed condition. This increase in depth does not indicate a water surface rise, see Section 2.3 for no-rise analysis. Cross section locations overlayed on the 100-year velocity dataset are shown below for existing and proposed conditions on Figure 4 and Figure 5, respectively. Main channel existing and proposed condition results are summarized in Table 3 and Table 4.

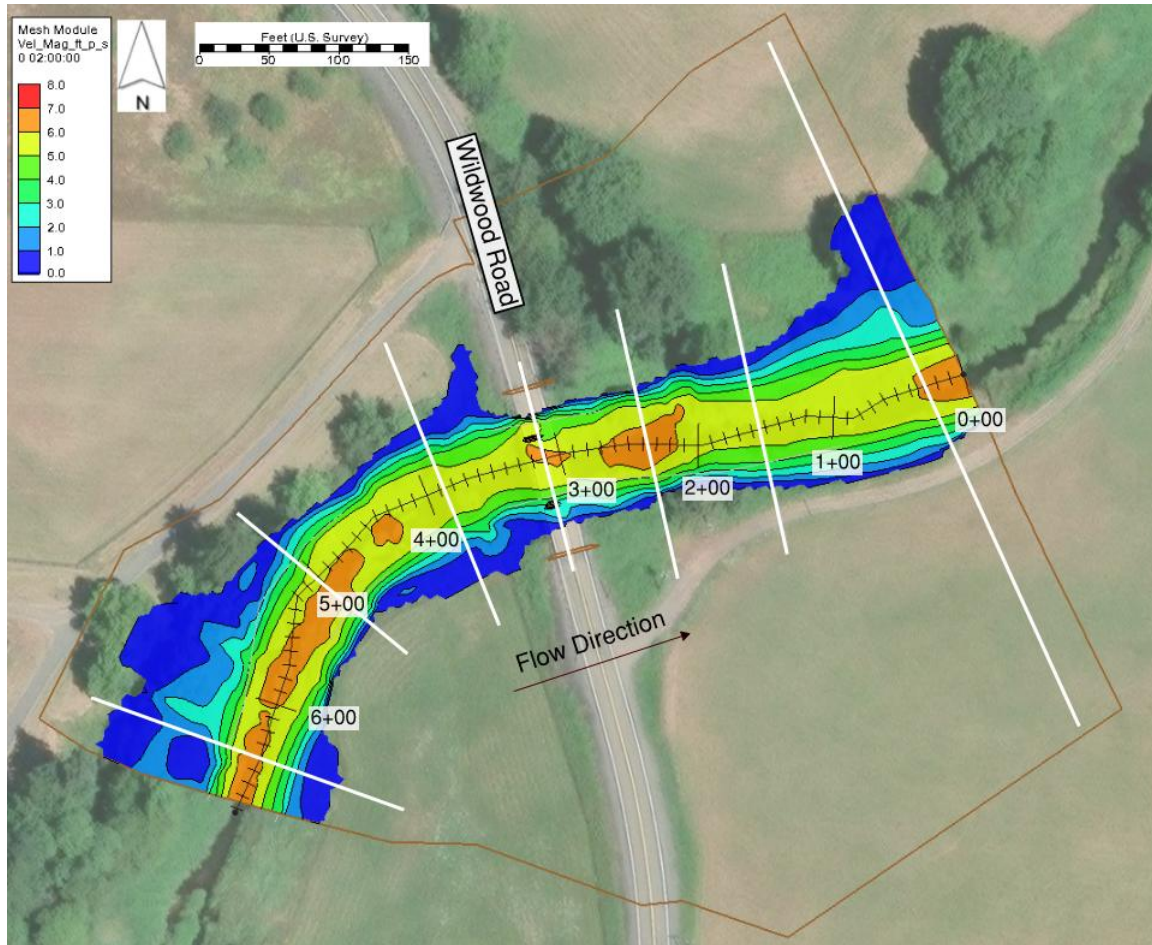


Figure 4: Existing conditions 100-year velocity dataset with locations of cross sections

Table 3. Existing Conditions Hydraulic Model Results

Hydraulic Parameter	Cross Section STA	2-Year	100-Year	500-Year
Max Depth (ft)	DS 0+29	14.9	21.0	21.9
	DS 1+53	15.6	21.6	22.5
	DS 2+36	14.1	20.0	21.0
	Structure 3+15	15.1	21.1	22.1
	US 3+86	15.0	21.1	22.1
	US 5+01	14.3	20.4	21.5
	US 6+40	15.6	21.9	23.0
Average Velocity (ft/s)	DS 0+29	5.2	5.9	6.4
	DS 1+53	3.6	4.9	5.6
	DS 2+36	4.7	5.9	6.7
	Structure 3+15	4.0	5.3	6.0
	US 3+86	4.1	5.1	5.7
	US 5+01	4.4	5.6	6.2
	US 6+40	4.3	5.1	5.6

Hydraulic Parameter	Cross Section STA	2-Year	100-Year	500-Year
Average Shear (lb/SF)	DS 0+29	0.7	0.8	0.9
	DS 1+53	0.4	0.5	0.7
	DS 2+36	0.6	0.8	1.0
	Structure 3+15	0.5	0.7	0.9
	US 3+86	0.4	0.6	0.7
	US 5+01	0.5	0.7	0.9
	US 6+40	0.6	0.6	0.7

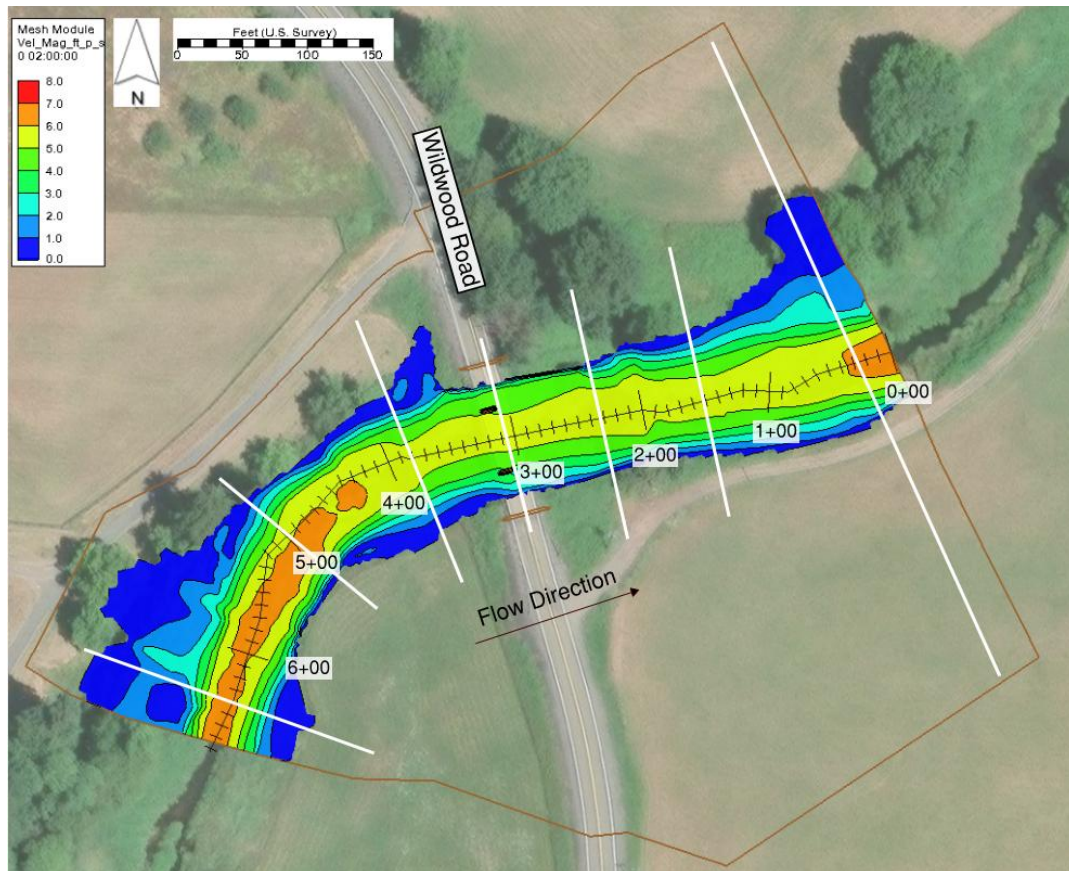


Figure 5: Proposed conditions 100-year velocity dataset with locations of cross sections

Table 4. Proposed Conditions Hydraulic Model Results

Hydraulic Parameter	Cross Section STA	2-Year	100-Year	500-Year
Max Depth (ft)	DS 0+29	14.9	21.0	21.9
	DS 1+53	15.5	21.5	22.4
	DS 2+36	15.4	21.4	22.4

Hydraulic Parameter	Cross Section STA	2-Year	100-Year	500-Year
	Structure 3+13	14.5	20.5	21.5
	US 3+85	14.8	20.9	21.9
	US 5+01	14.3	20.3	21.4
	US 6+40	15.6	21.8	22.9
Average Velocity (ft/s)	DS 0+29	5.2	5.9	6.4
	DS 1+53	3.7	4.9	5.6
	DS 2+36	3.8	5.0	5.6
	Structure 3+13	3.4	4.4	5.0
	US 3+85	3.8	4.9	5.5
	US 5+01	4.4	5.6	6.2
	US 6+40	4.3	5.2	5.7
Average Shear (lb/SF)	DS 0+29	0.7	0.8	0.9
	DS 1+53	0.4	0.5	0.7
	DS 2+36	0.4	0.6	0.8
	Structure 3+13	0.4	0.5	0.7
	US 3+85	0.4	0.6	0.7
	US 5+01	0.5	0.7	0.9
	US 6+40	0.6	0.6	0.8

2.3 100-Year Water Surface Elevation Comparison

This project is within FEMA Zone A Special Flood Hazard Area. Otak performed a 1D no-rise analysis of the project reach (see Appendix C). Results show that there is not an increase in the 100-year water surface elevation anywhere within the modeled project reach. Results are provided in Table 5.

Table 5. 1D No-Rise: 100-Year Average WSE Comparison

Cross Section STA	Existing WSE	Proposed WSE	WSE Difference ¹
US 6+15	312.2	312.0	-0.2
US 5+62	312.1	311.9	-0.2
US 5+00	312.0	311.9	-0.1
US 4+36	311.9	311.7	-0.2
US 3+65	311.8	311.7	-0.1
US 3+33	311.9	311.6	-0.3
DS 2+64	311.4	311.4	0.0
DS 2+39	311.4	311.4	0.0
DS 1+73	311.4	311.4	0.0
DS 1+03	311.2	311.2	0.0
DS 0+18	310.8	310.8	0.0

1. Difference is Proposed WSE minus Existing WSE.

SECTION 3 SCOUR ANALYSIS

3.1 Scour Results

Hydraulic model results were exported from the bridge scour coverage in SMS to the Hydraulic Toolbox Bridge Scour Calculator (FWHA 2024a). Placement of the bridge scour coverage arcs are shown in Figure 6. Contraction, pier, and abutment scour were evaluated for proposed conditions. All modeled flood events were evaluated to identify which flow produced the greatest amount of scour. Long-term degradation potential was evaluated separately.

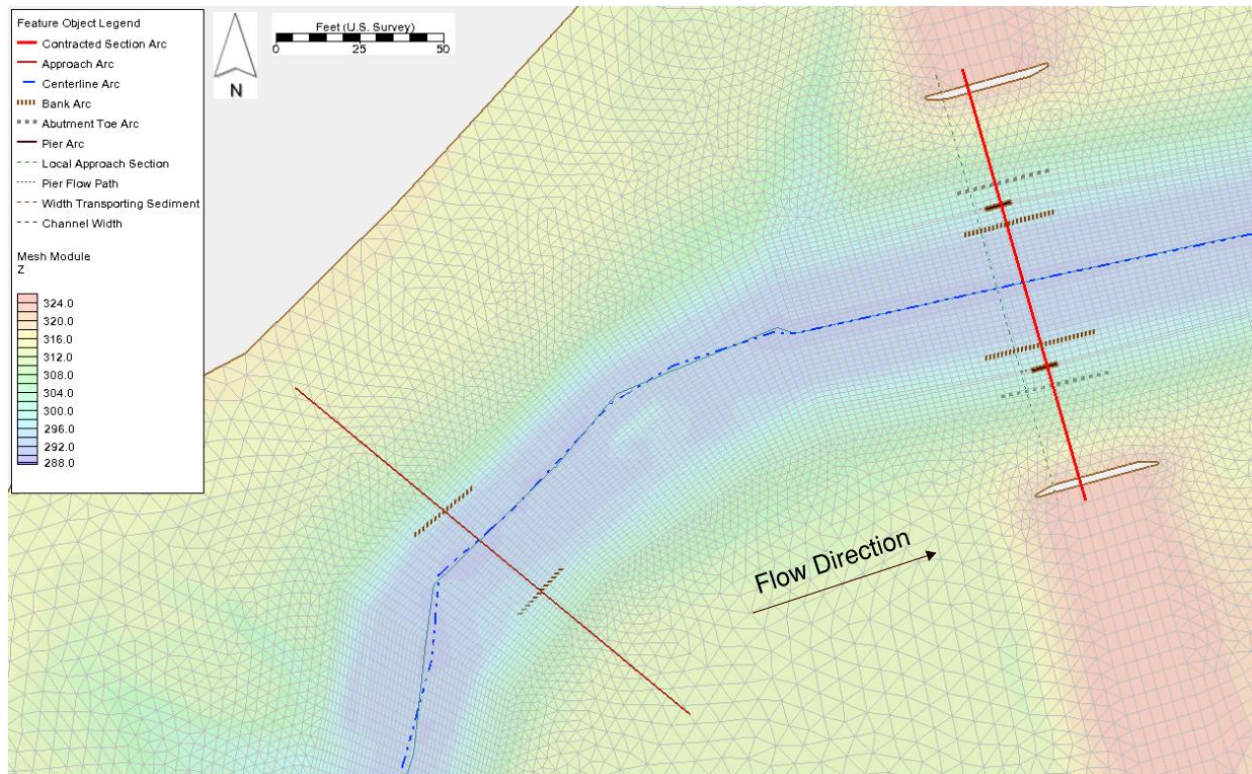


Figure 6: Bridge scour coverage arcs

There is no expected contraction scour for all flood events. Maximum abutment scour depths are expected to occur at the 500-year flow event with a value of 0.7 feet. Maximum pier scour is expected at the 500-year flow event with a scour depth of 5.2 feet.

Table 6. Scour Summary

Flood Frequency	Scour Type			
	Contraction (feet)	Pier #1 (feet)	Pier #2 (feet)	Abutment ⁽¹⁾ (feet)
500-Year	0.0	5.2 ⁽²⁾	4.8	0.7
100-Year	0.0	4.9	4.7	0.0
50-Year	0.0	4.8	4.6	0.0
25-Year	0.0	4.7	4.6	0.0

Flood Frequency	Scour Type			
	Contraction (feet)	Pier #1 (feet)	Pier #2 (feet)	Abutment ⁽¹⁾ (feet)
10-Year	0.0	5.0	4.5	0.0
2-Year	0.0	4.6	3.6	0.0

1. Abutment scour depths are the same for left and right abutment.
2. Bold values indicate maximum scour depth for each type of scour.

Long-term degradation potential is low because the South Fork Chehalis River has a flat slope with a large sediment supply. The cross section drawn on the original bridge plans from 1954 shows the thalweg to be approximately 34 feet below the bridge deck (see Appendix D). A cross section from the existing conditions mesh shows the thalweg approximately 33 feet below the bridge deck (see Figure 7). This 1-foot difference in thalweg elevation is likely due to short-term bed adjustments and shows no indication of long-term degradation occurring at this site since the existing bridge was built. Additionally, cross section data from the years 1993, 1996, 2017, and 2020 shows minor adjustments and no significant change in channel shape and elevation (see Figure 8).

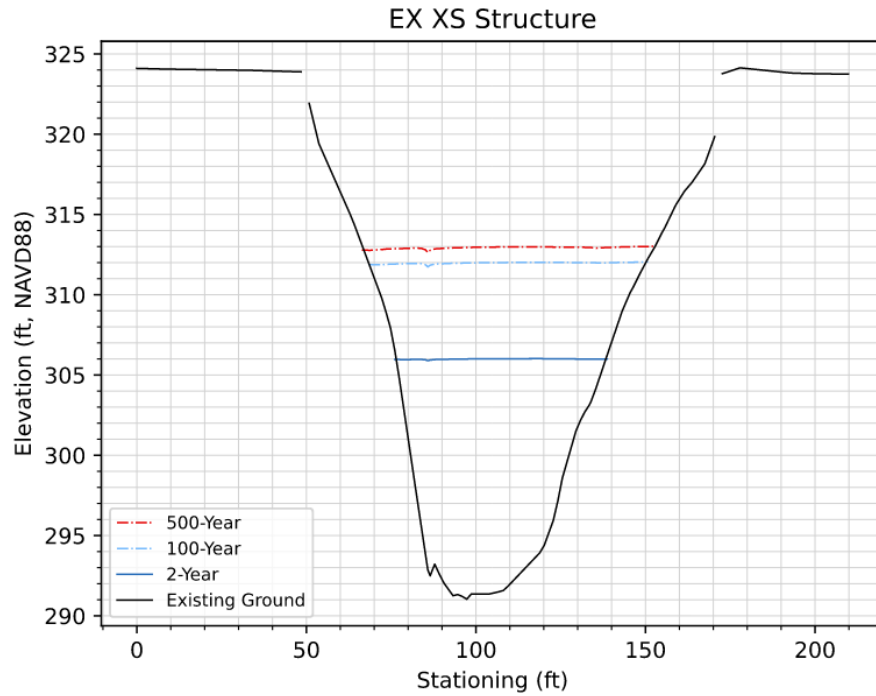


Figure 7: Existing (EX) cross section (XS) spanning the existing bridge with 2-year, 100-year, and 500-year water surface elevations

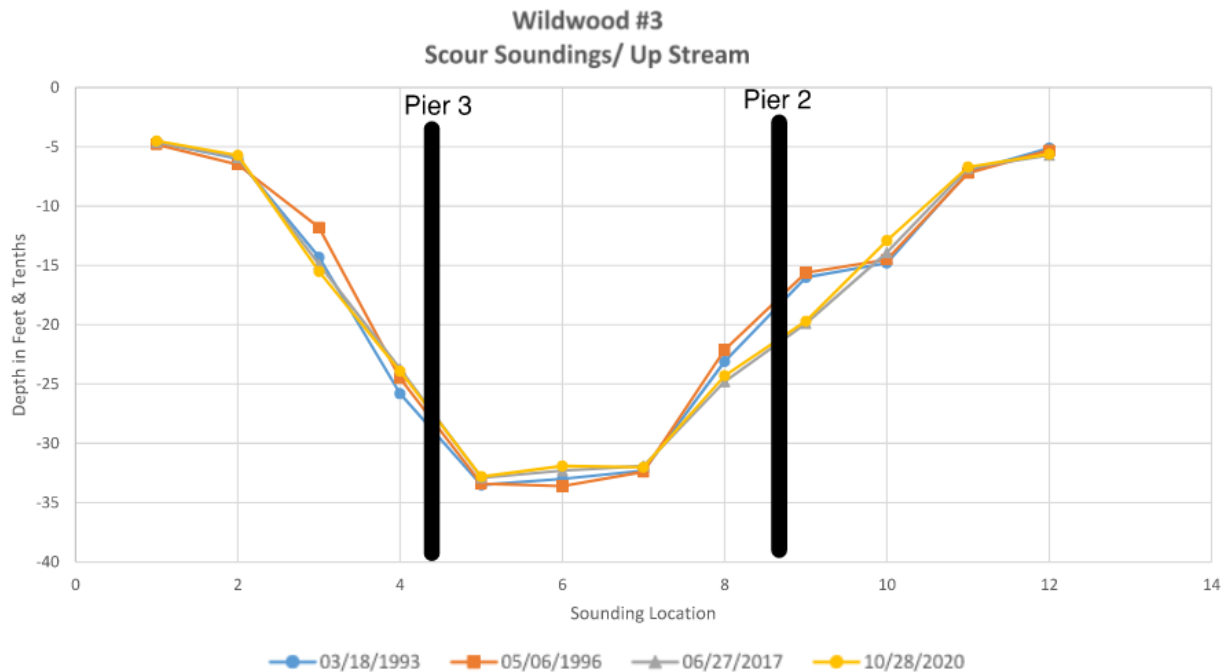


Figure 8: Historical Cross Section Data

3.2 Scour Countermeasure Design

Scour countermeasures were designed using the hydraulic and scour results described above in Section 2 and Section 3. Proposed designs are detailed in this section and plans are included in Appendix E.

3.2.1 Material Sizing

The scour countermeasure rock class was calculated using the Federal Highway Administration's (FHWA) HEC-23: Bridge Scour and Stream Instability Countermeasures Experience, Selection, and Design Guidance Volume 2 (HEC 23 V2), Equation 4.1 (FHWA 2009). The inputs and results of this calculation are provided in Appendix F. A conservative factor of safety of 2.0 was used in the calculations. Based on these calculations the D_{30} and D_{50} of the proposed rock material must be greater than 1.0 and 1.2 feet, respectively, and therefore will be sized per the Washington State Department of Transportation (WSDOT) Standard Specification 9-13.4(2) Rock for Erosion and Scour Protection Class B (WSDOT 2025).

Pier scour material sizing was evaluated separately using equations 11.1 and 11.3 from HEC 23 V2, and the results are presented in Appendix G. The results indicate Rock for Erosion and Scour Protection Class A could be used for pier protection, however, since the piers are located within the revetment Rock for Erosion and Scour Protection Class B will be utilized everywhere within the countermeasure footprint.

3.2.2 Layout

Layout of the revetment and aprons was performed using the FHWA Hydraulic Considerations of Abutments on Deep Foundations and Bridge Embankment Protection Tech Brief (TechBrief) (FHWA 2023) as well as recommendations from HEC 23 V2 Design Guidelines 4 & 11 (FHWA 2009). Figure 9, Figure 10, Figure 11, and Figure 12 illustrate the suggested countermeasure extents from the three guidelines. Proposed plan and section views are shown in Appendix E.

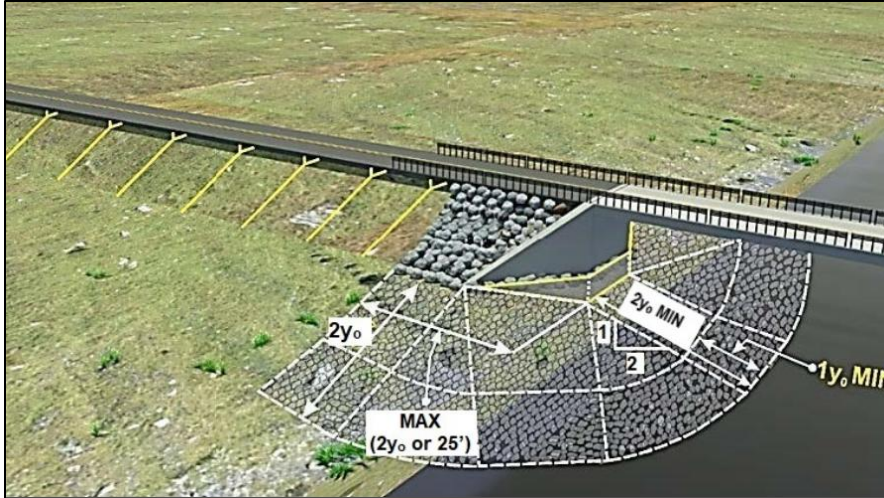


Figure 9: Countermeasure extents (y_o = main channel flow depth through the bridge) (TechBrief)

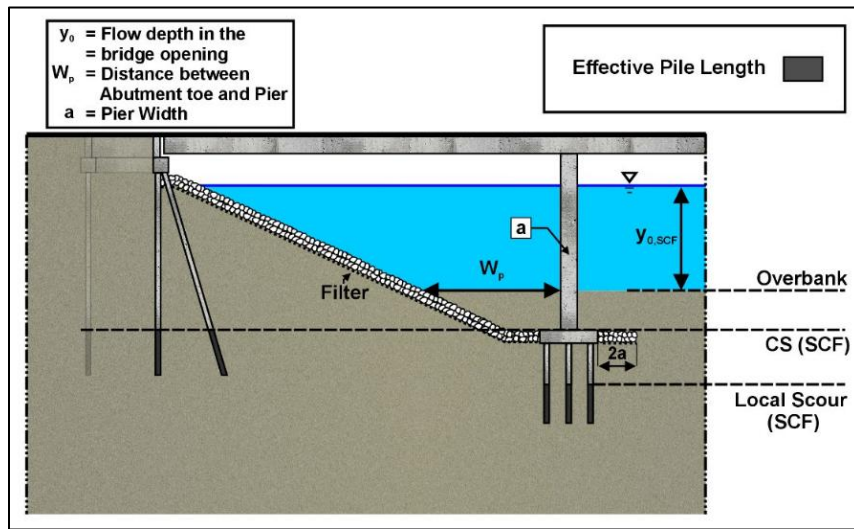


Figure 10: Countermeasure for scour condition B and a closely located pier (TechBrief)

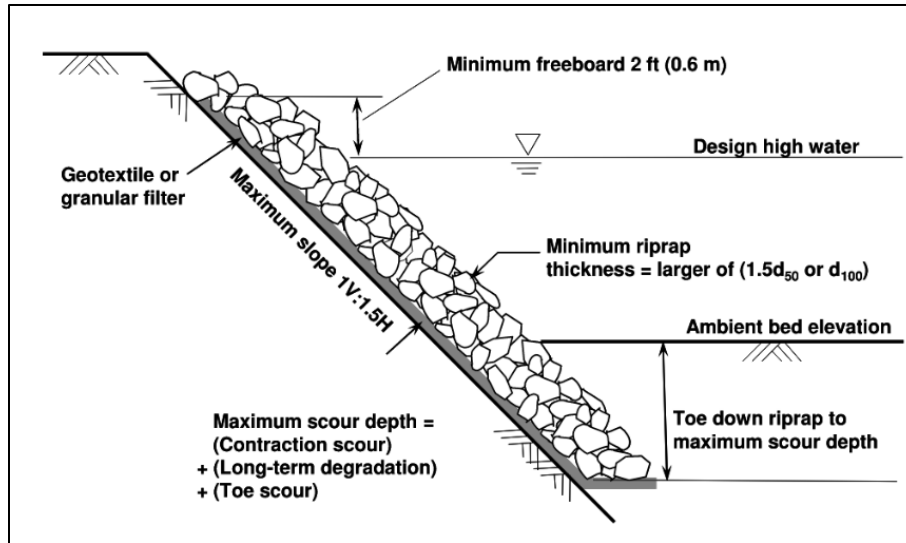


Figure 11: Riprap revetment with buried toe (HEC 23 V2 Design Guideline 4)

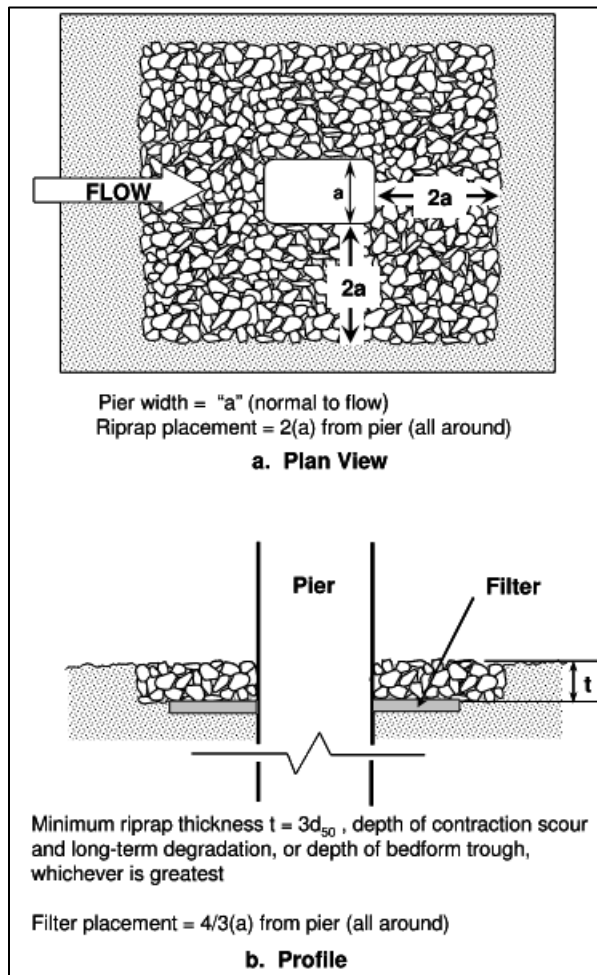


Figure 12: Riprap layout diagram for pier scour protection (HEC 23 V2 Design Guideline 11)

The design incorporates elements from several of the recommended scour countermeasure treatments shown above, while accommodating project requirements, site constraints, constructability, and cost considerations.

1. 1.5H:1V slopes were used for the revetment design, as the proposed rock for erosion and scour protection material can sustain that slope.
2. The top of the countermeasure provides 2 feet of freeboard over the 500-year water surface elevation.
3. The proposed revetment and apron do not extend out from the abutment parallel to the roadway at the countermeasure design depth. The cross sections shown in Figure 6 indicate that over the last 30 years there has not been channel migration at the crossing. Furthermore, review of Google Earth Aerial Imagery indicates there has been limited to no change in channel alignment since 1990 within 500 feet of the bridge structure. Lateral migration of streams generally occurs at bends and progresses from upstream to downstream. The scour countermeasure and bridge structure will prevent lateral migration downstream of the structure.

Upstream of the structure, the banks are vegetated and appear stable. The nearest river bend that could progress towards the roadway embankment on the right side of the channel is approximately 600 feet upstream which is sufficiently far upstream to ensure the structure should not be impacted within its design life. On the left side of the structure, the bank is on the outside of a slight bend with a radius of curvature of approximately 180 feet. This is approximately 3 times the bankfull width, indicating the curve is a slight curve, with minimal additional erosive potential. Additionally, LWM will be installed at the toe of the bank to improve bank stability. To be conservative, the rock thickness on the upstream left bank was increased from 3 feet to 6 feet

4. The toe of the revetment and the apron was extended further below the channel grade than required to provide for placement of streambed material above the countermeasure. Placing streambed material above the countermeasure is beneficial from a habitat and project permitting perspective and will not negatively impact the effectiveness of the countermeasure.
5. Design Guideline 11 recommends that rock pier protection be installed at the surface to facilitate inspection. In this case since the piers are located near the abutments, the proposed pier protection would be installed as shown in the TechBrief.
6. HEC-23 guidance for pier protection requires Class A rock with a thickness of 3 feet. The guidance for revetments requires Class B rock with a thickness of 3 feet. The proposed protection measures were sized per the revetment guidance, which equals the thickness required for pier protection, but with a larger rock size.

SECTION 4 STREAM BYPASS SIZING

The conceptual stream diversion plan in Appendix E includes a gravity bypass pipe. Maximum mean daily flows for the USGS Gage #12021000 during the date range from July 15th to September 30th were used to estimate expected flow during construction. The average flow was approximately 31 cfs, and a factor of safety of 2 was applied due to the age of the stream gage data and uncertainty around determining the base flow. The maximum flow in the summer gage data was 118 cfs, but to be conservative, 5 percent of

the 2-year flood event was used as the maximum summer flow instead. The summer base flow of 62 cfs, and maximum summer flow of 130 cfs were used to size the diversion pipe(s).

HY-8 (FWHA 2024b) was used to determine a suitable diversion pipe size for the average flow of 62cfs. A single 3.5-foot diameter high-density polyethylene (HDPE) pipe would be sufficient to convey this flow with an upstream cofferdam height of approximately 5.0 feet. To convey the maximum daily peak flow of 130 cfs, two 3.5-foot diameter HDPE pipes in parallel would be needed with an upstream cofferdam height of approximately 6.0 feet. See key HY-8 inputs, resulting headwater depths, and resulting cofferdam heights summarized in Table 7.

Table 7. Stream Bypass Sizing

Bypass Pipe(s) (quantity, size)	Discharge (cfs)	Headwater Depth (ft)	Cofferdam Height Upstream (ft) ¹	Tailwater Depth (ft)	Cofferdam Height Downstream (ft) ¹
One, 3.5-ft diameter	62.0	4.0	5.0	1.9	3.0
Two, 3.5-ft diameter (in parallel)	130.0	4.2	6.0	2.8	4.0

¹ Cofferdam height is the difference between headwater or tailwater elevation and thalweg elevation, rounded up, plus 1-foot.

SECTION 5 CONCLUSION

The hydrologic and hydraulic analyses of the project site were used to develop a scour countermeasure design which is expected to provide protection to the piers and abutments of the existing Wildwood Road Bridge. Installing this countermeasure would reach the project goal of raising the NCI Code rating for this bridge to a 7 - Design Countermeasures Installed.

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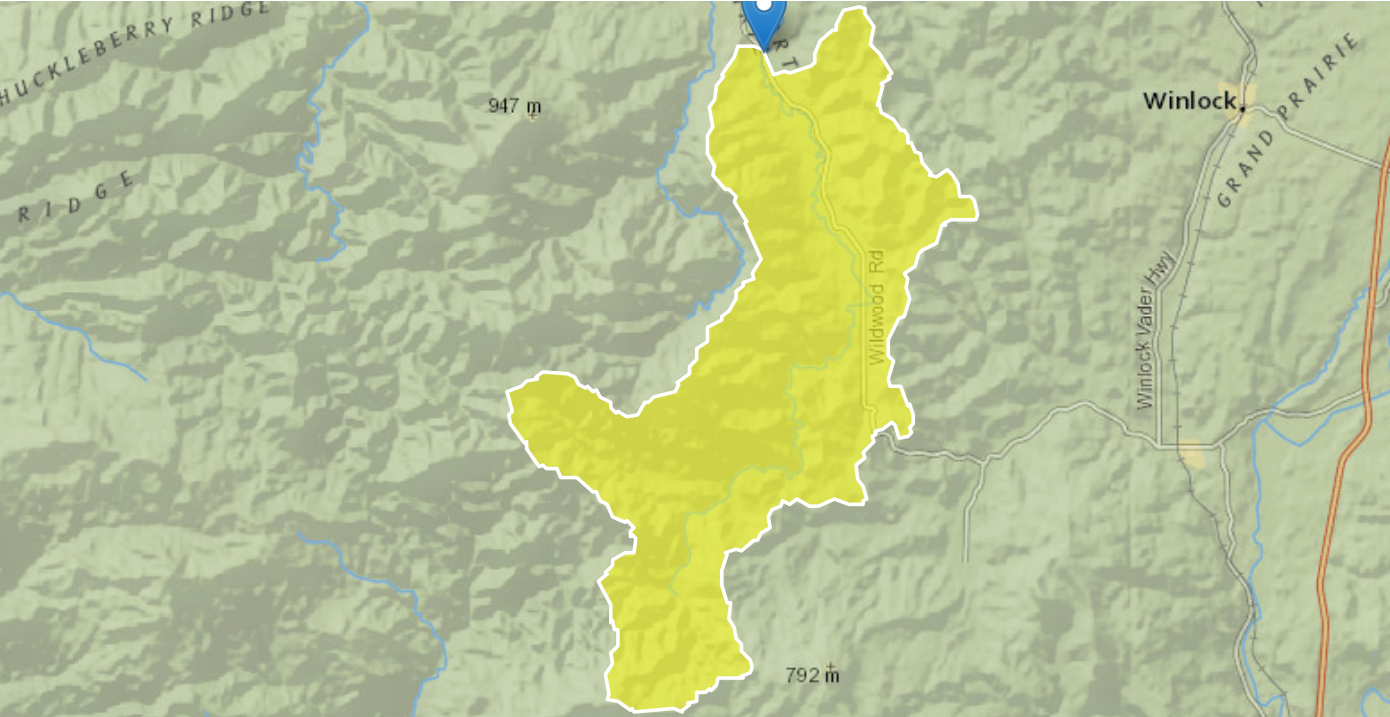
Attachments: **Appendix A: StreamStats Report**
Appendix B: Flood Q Ratio Tool
Appendix C: No-Rise Analysis
Appendix D: Original Bridge Plans (1954)
Appendix E: Proposed Plans
Appendix F: Revetment Rock Sizing Calculations
Appendix G: Pier Rock Sizing Calculations

Appendix A: StreamStats Report

Appendix A: StreamStats Report

StreamStats Report

Region ID: WA
Workspace ID: WA20240610164449556000
Clicked Point (Latitude, Longitude): 46.50588, -123.12153
Time: 2024-06-10 09:45:24 -0700



+ Collapse All

➤ Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	42.95	square miles
PRECPRIS10	Basin average mean annual precipitation for 1981 to 2010 from PRISM	68.1	inches

➤ Peak-Flow Statistics

Peak-Flow Statistics Parameters [Peak Region 4 2016 5118]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	42.95	square miles	0.18	2230
PRECPRIS10	Mean Annual Precip PRISM 1981 2010	68.1	inches	11.9	187

Peak-Flow Statistics Flow Report [Peak Region 4 2016 5118]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct (other -- see report)

Statistic	Value	Unit	PIL	PIU	ASEp
50-percent AEP flood	1480	ft ³ /s	328	6670	52.5
20-percent AEP flood	2360	ft ³ /s	537	10400	50.6
10-percent AEP flood	3060	ft ³ /s	684	13700	50.5
4-percent AEP flood	3960	ft ³ /s	834	18800	51.7
2-percent AEP flood	4690	ft ³ /s	937	23500	52.9
1-percent AEP flood	5460	ft ³ /s	1040	28700	54.2
0.5-percent AEP flood	6160	ft ³ /s	1110	34100	55.5
0.2-percent AEP flood	7330	ft ³ /s	1220	44000	58

Peak-Flow Statistics Citations

Mastin, M.C., Konrad, C.P., Veilleux, A.G., and Tecca, A.E., 2016, Magnitude, frequency, and trends of floods at gaged and ungaged sites in Washington, based on data through water year 2014 (ver 1.1, October 2016): U.S. Geological Survey Scientific Investigations Report 2016–5118, 70 p. (<http://dx.doi.org/10.3133/sir20165118>)

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

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Application Version: 4.20.1

StreamStats Services Version: 1.2.22

NSS Services Version: 2.2.1

Appendix B: Flood Q Ratio Tool

Appendix B: Flood Q Ratio Tool

Gage #12021000

Flood Q Ratio Tool. Estimates of flood discharge for an ungaged sites in Washington State using the Drainage-Area Ratio Method

Station Index=

24

A_u , contributing drainage area of ungaged site; A_g , contributing drainage area of the streamflow gaging site; $Q_{(u)g}$, gage-based estimate of flood discharge in cubic feet per second at ungaged site; $Q_{(u)wd}$, weighted estimate of flood discharge in cubic feet per second for the ungaged site and indicated streamflow characteristic; $Q_{(u)reg}$, regression estimate of flood discharge in cubic feet per second for ungaged site; $Q(g)wd$, weighted estimate of flood discharge for streamgaging station]

Instructions for estimating streamflow characteristics at an ungaged site using the Drainage-Area Ratio Method

- 1 Select a streamflow-gaging station from the list box below which is on the same stream as the ungaged site.
Determine contributing drainage area for ungaged site (A_u , in square miles) and enter value in the green cell (F12), where $0.5A_g \leq A_u \leq 1.5A_g$. If the drainage area is outside the appropriate range, the cell will turn red. An initial estimate of the flood discharges will be computed in column G, rows 23 to 30.
- 2 The estimates will be improved by computing weighted estimates using the regional regression estimates. To do this, enter the Mean Annual Precipitation in the green box (column I, row x). If the site is in regression region 1 or 2, enter the percent canopy coverage for the ungaged basin in the green box (column I, row x). If either of these values are outside the acceptable range, the cell will turn red.
- 3 The final answer, the weighted estimates of flood discharge ($Q_{(u)wd}$), will be listed in column G, rows 37-44.

12009500 BEAR BRANCH NEAR NASELLE, WA
12010000 NASELLE RIVER NEAR NASELLE, WA
12010500 SALMON CREEK NEAR NASELLE, WA
12010600 LANE CREEK NEAR NASELLE, WA
12010700 SOUTH FORK NASELLE RIVER NEAR NASELLE, WA
12010800 SOUTH NEMAH RIVER NEAR NASELLE, WA
12011000 NORTH NEMAH RIVER NEAR SOUTH BEND, WA
12011100 NORTH NEMAH RIVER TRIBUTARY NEAR SOUTH BEND, WA
12011200 WILLIAMS CREEK NEAR SOUTH BEND, WA
12011500 WILLAPA RIVER AT LEBAM, WA
12012000 FORK CREEK NEAR LEBAM, WA
12012200 GREEN CREEK NEAR LEBAM, WA
12013500 WILLAPA RIVER NEAR WILLAPA, WA
12014500 SOUTH FORK WILLAPA RIVER NEAR RAYMOND, WA
12015100 CLEARWATER CREEK NEAR RAYMOND, WA
12015500 NORTH RIVER NEAR BROOKLYN, WA
12016700 JOE CREEK NEAR COSMOPOLIS, WA
12017000 NORTH RIVER NEAR RAYMOND, WA
12019600 WATER MILL CREEK NEAR PE ELL, WA
12020000 CHEHALIS RIVER NEAR DOTY, WA
12020500 ELK CREEK NEAR DOTY, WA
12020800 SOUTH FORK CHEHALIS RIVER NEAR WILDWOOD, WA
12020900 SOUTH FORK CHEHALIS RIVER NEAR BOISTFORT, WA
12021000 SOUTH FORK CHEHALIS RIVER AT BOISTFORT, WA

Estimates of streamflow characteristics based on Drainage-Area Ratio method

Contributing drainage areas of the streamflow-gaging station (A_g) and ungaged site (A_u), located on the same stream

Range of drainage areas for which drainage area adjustment is valid

Drainage area of selected index site, A_g = 48.1 square miles --
Drainage area of ungaged location, A_u = 42.95 square miles 24.1 - 72.2

Station Number Number of Years of Record
Selected Streamflow-gaging Station: 12021000 21

Regression Region: 4

Initial estimate of Flood Discharges at ungaged site, Q_u (eq. 10)

AEP		$Q_{(g)wd}$	$Q_{(u)g}$ ft ³ /s
0.5	=	3,210.0	2,893.7
0.2	=	4,020.0	3,623.1
0.1	=	4,520.0	4,072.8
0.04	=	5,140.0	4,629.8
0.02	=	5,590.0	5,034.0
0.01	=	6,030.0	5,429.6
0.005	=	6,470.0	5,824.5
0.002	=	7,050.0	6,344.5

$2(|A_g - A_u|)/A_g = 0.215250364$

Regression Region: 4

Weighted estimate of Flood Discharge at ungaged site, using regression estimate, $Q_{(u)wd}$ (eq. 11)

Basin Characteristics for Regional Regression Estimate, $Q_{(u)reg}$

AEP		$Q_{(u)reg}$
0.5	=	1,481.7
0.2	=	2,363.2
0.1	=	3,061.3
0.04	=	3,963.9
0.02	=	4,689.8
0.01	=	5,462.1
0.005	=	6,157.2
0.002	=	7,325.8

* $Q_{(u)wd}$
2590
3350
3860
4490
4960
5440
5900
6560

*rounded to 3 significant figures

Applicable Range
Enter Mean Annual Precipitation of ungaged basin= 68.1 11.94 - 186.6
If ungaged location is in regression region 1 or 2, enter percent canopy coverage= 0.8 not applicable

Used in hydraulic analysis

Gage #12020900

Not Used

Flood Q Ratio Tool. Estimates of flood discharge for an ungaged sites in Washington State using the Drainage-Area Ratio Method

Station Index=

23

A_u , contributing drainage area of ungaged site; A_g , contributing drainage area of the streamflow gaging site; $Q_{(u)g}$, gage-based estimate of flood discharge in cubic feet per second at ungaged site; $Q_{(u)wtd}$, weighted estimate of flood discharge in cubic feet per second for the ungaged site and indicated streamflow characteristic; $Q_{(u)reg}$, regression estimate of flood discharge in cubic feet per second for ungaged site; $Q(g)wtd$, weighted estimate of flood discharge for streamgaging station]

Instructions for estimating streamflow characteristics at an ungaged site using the Drainage-Area Ratio Method

- 1 Select a streamflow-gaging station from the list box below which is on the same stream as the ungaged site.
Determine contributing drainage area for ungaged site (A_u , in square miles) and enter value in the green cell (F12), where $0.5A_g \leq A_u \leq 1.5A_g$. If the drainage area is outside the appropriate range, the cell will turn red. An initial estimate of the flood discharges will be computed in column G, rows 23 to 30.
- 2
- 3 The estimates will be improved by computing weighted estimates using the regional regression estimates. To do this, enter the Mean Annual Precipitation in the green box (column I, row x). If the site is in regression region 1 or 2, enter the percent canopy coverage for the ungaged basin in the green box (column I, row x). If either of these values are outside the acceptable range, the cell will turn red.
- 4 The final answer, the weighted estimates of flood discharge ($Q_{(u)wtd}$), will be listed in column G, rows 37-44.

12009500 BEAR BRANCH NEAR NASELLE, WA
12010000 NASELLE RIVER NEAR NASELLE, WA
12010500 SALMON CREEK NEAR NASELLE, WA
12010600 LANE CREEK NEAR NASELLE, WA
12010700 SOUTH FORK NASELLE RIVER NEAR NASELLE, WA
12010800 SOUTH NEMAH RIVER NEAR NASELLE, WA
12011000 NORTH NEMAH RIVER NEAR SOUTH BEND, WA
12011100 NORTH NEMAH RIVER TRIBUTARY NEAR SOUTH BEND, WA
12011200 WILLIAMS CREEK NEAR SOUTH BEND, WA
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12012200 GREEN CREEK NEAR LEBAM, WA
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12015500 NORTH RIVER NEAR BROOKLYN, WA
12016700 JOE CREEK NEAR COSMOPOLIS, WA
12017000 NORTH RIVER NEAR RAYMOND, WA
12019600 WATER MILL CREEK NEAR PE ELL, WA
12020000 CHEHALIS RIVER NEAR DOTY, WA
12020500 ELK CREEK NEAR DOTY, WA
12020800 SOUTH FORK CHEHALIS RIVER NEAR WILDWOOD, WA
12020900 SOUTH FORK CHEHALIS RIVER NEAR BOISTFORT, WA
12021000 SOUTH FORK CHEHALIS RIVER AT BOISTFORT, WA

Estimates of streamflow characteristics based on Drainage-Area Ratio method

Contributing drainage areas of the streamflow-gaging station (A_g) and ungaged site (A_u), located on the same stream

Range of drainage areas for which drainage area adjustment is valid

Drainage area of selected index site, A_g = 45.2 square miles --
Drainage area of ungaged location, A_u = 42.95 square miles 22.6 - 67.9

Station Number Number of Years of Record
Selected Streamflow-gaging Station: 12020900 15

Regression Region: 4

Initial estimate of Flood Discharges at ungaged site, Q_u (eq. 10)

AEP		$Q_{(g)wtd}$	$Q_{(u)g}$ ft ³ /s
0.5	=	2,800.0	2,670.6
0.2	=	4,070.0	3,881.5
0.1	=	4,950.0	4,720.2
0.04	=	6,110.0	5,825.5
0.02	=	7,000.0	6,673.3
0.01	=	7,920.0	7,550.0
0.005	=	8,860.0	8,445.2
0.002	=	10,200.0	9,721.0

$2(|A_g - A_u|)/A_g = 0.101237843$

Regression Region: 4

Weighted estimate of Flood Discharge at ungaged site, using regression estimate, $Q_{(u)wtd}$ (eq. 11)

Basin Characteristics for Regional Regression Estimate, $Q_{(u)reg}$

AEP		$Q_{(u)reg}$	* $Q_{(u)wtd}$	Applicable Range
0.5	=	1,481.7	2550	Enter Mean Annual Precipitation of ungaged basin= 68.1 11.94 - 186.6
0.2	=	2,363.2	3730	
0.1	=	3,061.3	4550	
0.04	=	3,963.9	5640	
0.02	=	4,689.8	6470	If ungaged location is in regression region 1 or 2, enter percent canopy coverage= 0.8 not applicable
0.01	=	5,462.1	7340	
0.005	=	6,157.2	8210	
0.002	=	7,325.8	9480	

*rounded to 3 significant figures

Gage #12020800

Not Used

Flood Q Ratio Tool. Estimates of flood discharge for an ungaged sites in Washington State using the Drainage-Area Ratio Method

Station Index=

22

A_u , contributing drainage area of ungaged site; A_g , contributing drainage area of the streamflow gaging site; $Q_{(u)g}$, gage-based estimate of flood discharge in cubic feet per second at ungaged site; $Q_{(u)wd}$, weighted estimate of flood discharge in cubic feet per second for the ungaged site and indicated streamflow characteristic; $Q_{(u)reg}$, regression estimate of flood discharge in cubic feet per second for ungaged site; $Q(g)wd$, weighted estimate of flood discharge for streamgaging station]

Instructions for estimating streamflow characteristics at an ungaged site using the Drainage-Area Ratio Method

- 1 Select a streamflow-gaging station from the list box below which is on the same stream as the ungaged site.
Determine contributing drainage area for ungaged site (A_u , in square miles) and enter value in the green cell (F12), where $0.5A_g \leq A_u \leq 1.5A_g$. If the drainage area is outside the appropriate range, the cell will turn red. An initial estimate of the flood discharges will be computed in column G, rows 23 to 30.
- 2 The estimates will be improved by computing weighted estimates using the regional regression estimates. To do this, enter the Mean Annual Precipitation in the green box (column I, row x). If the site is in regression region 1 or 2, enter the percent canopy coverage for the ungaged basin in the green box (column I, row x). If either of these values are outside the acceptable range, the cell will turn red.
- 3 The final answer, the weighted estimates of flood discharge ($Q_{(u)wd}$), will be listed in column G, rows 37-44.
- 4

12009500 BEAR BRANCH NEAR NASELLE, WA
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12020900 SOUTH FORK CHEHALIS RIVER NEAR BOISTFORT, WA
12021000 SOUTH FORK CHEHALIS RIVER AT BOISTFORT, WA

Estimates of streamflow characteristics based on Drainage-Area Ratio method

Contributing drainage areas of the streamflow-gaging station (A_g) and ungaged site (A_u), located on the same stream

Range of drainage areas for which drainage area adjustment is valid

Drainage area of selected index site, A_g = 27.0 square miles --
Drainage area of ungaged location, A_u = 42.95 square miles 13.5 - 40.4

Station Number Number of Years of Record
Selected Streamflow-gaging Station: 12020800 16

Regression Region: 4

Initial estimate of Flood Discharges at ungaged site, Q_u (eq. 10)

AEP		$Q_{(g)wd}$	$Q_{(u)g}$, ft ³ /s
0.5	=	3,180.0	4,862.0
0.2	=	5,110.0	7,820.2
0.1	=	6,560.0	10,048.6
0.04	=	8,570.0	13,145.8
0.02	=	10,200.0	15,660.7
0.01	=	11,900.0	18,279.4
0.005	=	13,600.0	20,910.2
0.002	=	16,100.0	24,788.6

$2(|A_g - A_u|)/A_g = 1.187384045$

Regression Region: 4

Weighted estimate of Flood Discharge at ungaged site, using regression estimate, $Q_{(u)wd}$ (eq. 11)

Basin Characteristics for Regional Regression Estimate, $Q_{(u)reg}$

AEP		$Q_{(u)reg}$	* $Q_{(u)wd}$	Applicable Range
0.5	=	1,481.7	848	Enter Mean Annual Precipitation of ungaged basin= 68.1 11.94 - 186.6
0.2	=	2,363.2	1340	
0.1	=	3,061.3	1750	
0.04	=	3,963.9	2240	If ungaged location is in regression region 1 or 2, enter percent canopy coverage= 0.8 not applicable
0.02	=	4,689.8	2630	
0.01	=	5,462.1	3060	
0.005	=	6,157.2	3390	
0.002	=	7,325.8	4050	

*rounded to 3 significant figures

Appendix C: No-Rise Analysis

From: Nick Cook <Nick.Cook@otak.com>
Sent: Thursday, March 5, 2026 1:24 PM
To: Mike Zarecor <mikez@osbornconsulting.com>; Doug Sarkkinen <doug.sarkkinen@otak.com>
Cc: Isaac Fournier <isaacf@osbornconsulting.com>
Subject: RE: Senn and Wildwood Scour Repair

see data
below:

HEC-RAS River: Wildwood Reach: Reach 1 Profile: 100-yr													
Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude
Reach 1	615	100-yr	EC	5440.00	291.67	312.17		312.60	0.001031	5.59	1244.95	149.75	
Reach 1	615	100-yr	PC	5440.00	291.67	312.03		312.47	0.001071	5.66	1223.75	148.39	
Reach 1	562	100-yr	EC	5440.00	292.16	312.05		312.53	0.001222	5.85	1158.60	122.81	
Reach 1	562	100-yr	PC	5440.00	292.16	311.91		312.40	0.001271	5.93	1140.70	122.56	
Reach 1	500	100-yr	EC	5440.00	291.55	312.00		312.45	0.001072	5.48	1064.99	96.09	
Reach 1	500	100-yr	PC	5440.00	291.55	311.85		312.32	0.001109	5.54	1051.05	95.15	
Reach 1	436	100-yr	EC	5440.00	291.80	311.85		312.37	0.001236	5.86	990.71	88.13	
Reach 1	436	100-yr	PC	5440.00	291.80	311.70		312.24	0.001278	5.92	977.66	86.53	
Reach 1	365	100-yr	EC	5440.00	290.96	311.84		312.27	0.000943	5.48	1182.71	112.96	
Reach 1	365	100-yr	PC	5440.00	291.04	311.67		312.14	0.000987	5.71	1149.98	110.18	
Reach 1	333	100-yr	EC	5440.00	291.94	311.89	300.55	312.21	0.000694	4.60	1239.80	103.47	
Reach 1	333	100-yr	PC	5440.00	291.50	311.58	301.43	312.10	0.000981	6.05	1114.64	95.69	
Reach 1	300			Bridge									
Reach 1	264	100-yr	EC	5440.00	291.25	311.40		312.01	0.001264	6.37	969.26	82.98	
Reach 1	264	100-yr	PC	5440.00	291.90	311.39		311.96	0.001385	6.12	948.91	83.21	
Reach 1	239	100-yr	EC	5440.00	291.11	311.35		311.97	0.001977	6.37	911.93	83.60	
Reach 1	239	100-yr	PC	5440.00	291.10	311.35		311.93	0.001216	6.23	992.29	85.58	
Reach 1	173	100-yr	EC	5440.00	289.23	311.36		311.79	0.000906	5.28	1091.88	85.75	
Reach 1	173	100-yr	PC	5440.00	289.23	311.36		311.79	0.000907	5.28	1091.68	85.79	
Reach 1	103	100-yr	EC	5440.00	290.50	311.22		311.71	0.001126	5.77	1079.98	105.92	
Reach 1	103	100-yr	PC	5440.00	290.50	311.22		311.71	0.001126	5.77	1079.98	105.92	
Reach 1	18	100-yr	EC	5440.00	291.02	310.83	302.91	311.57	0.001782	7.08	943.87	137.12	
Reach 1	18	100-yr	PC	5440.00	291.02	310.83	302.91	311.57	0.001782	7.08	943.87	137.12	

Nicholas Cook, PhD, PE | Water Resources

808 SW Third Ave., Suite 800 | Portland, OR 97204
 Direct: 503.415.2362 | Cell: 828.291.8004 Main: 503.287.6825
www.otak.com

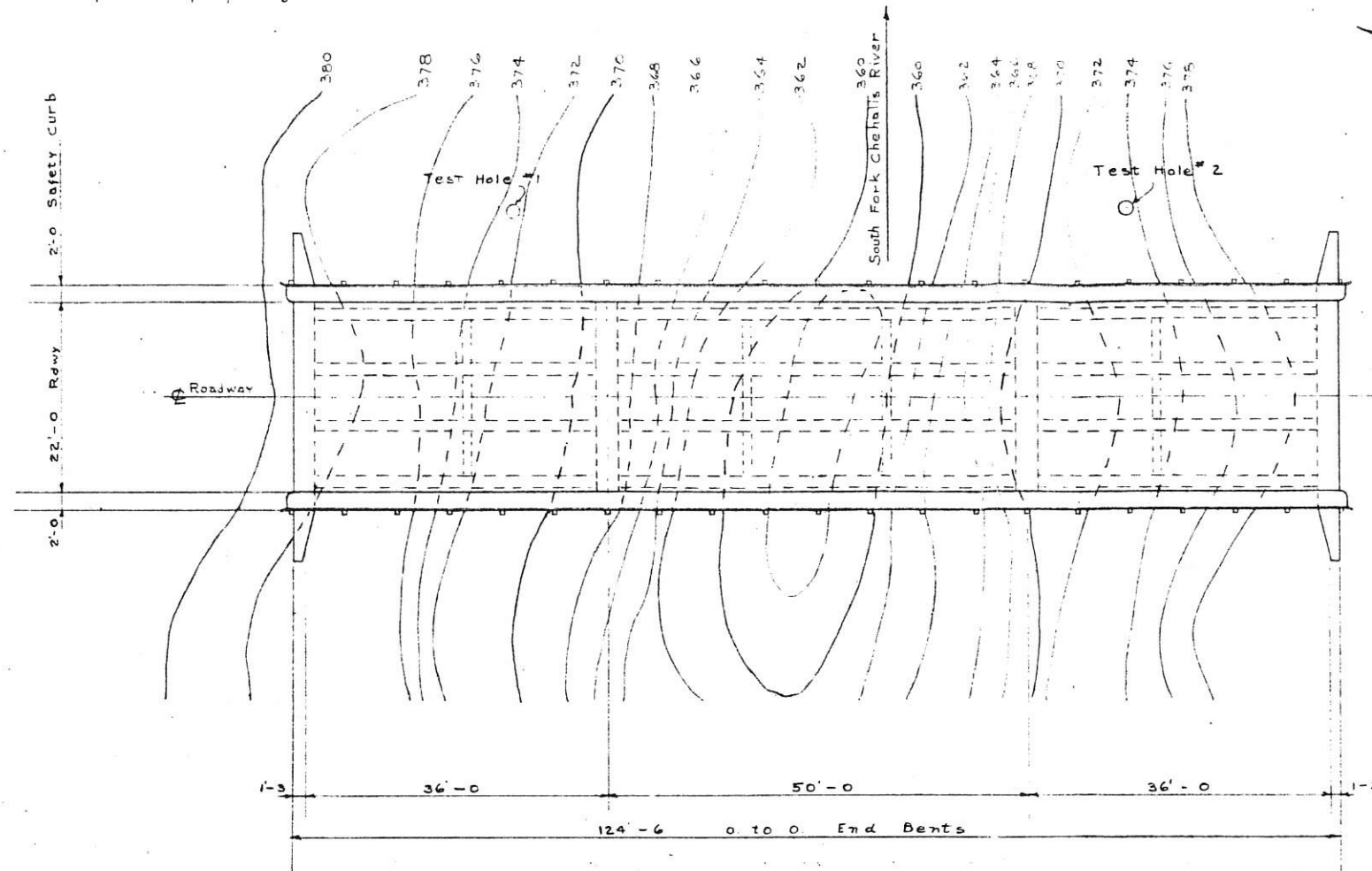
Appendix D: Original Bridge Plans (1954)

Appendix C: Original Bridge Plans (1954)

FED. ROAD DIV. No.	STATE	FED. AID PROJ. No.	FISCAL YEAR	SHEET
8	WASH.	5-0538(3)		1

NOTE:

Elevations shown are finish grade and are equal to profile grade.



GENERAL NOTES

All material and workmanship shall be in accordance with the requirements of the Standard Specifications for Road and Bridge Construction of the State of Washington Dated April 1948.

All concrete shall be class "A" mix.

Precast concrete piles shall be driven to a depth sufficient to develop a minimum load bearing capacity of thirty (30) tons per pile.

All bolts, nuts, shims and washers shall be galvanized in accordance with A.S.T.M. Designation A-153, class B.

Reinforcing steel shall be of intermediate grade with deformations in accordance with A-305-50T designations.

Falsework shall not be released in any span until all concrete has been in place the required length of time and has developed sufficient strength in accordance with the standard specifications.

Falsework shall be carefully released to prevent impact or undue stresses in the structure.

SEQUENCE OF POURING

1. Caps, girders, end walls and cross beams to fill of roadway slab in one continuous pour - Class "A".
2. Roadway slab in one continuous pour - Class "A".
3. Safety Curbs - Class "A" mix.

APPROXIMATE QUANTITIES

Mechanical Tamper	4	Days
Concrete Class "A"	187.0	Cu. Yds.
Steel Reinforcing Bars	38,700.0	Lbs.
Steel Bridge Rail	255.5	Lin. Ft.
Furnishing Precast Concrete Piling	700	Lin. Ft.
Driving Precast Concrete Piles	20	Only
Furnishing & Driving Precast Conc. Test Piles	2	Only

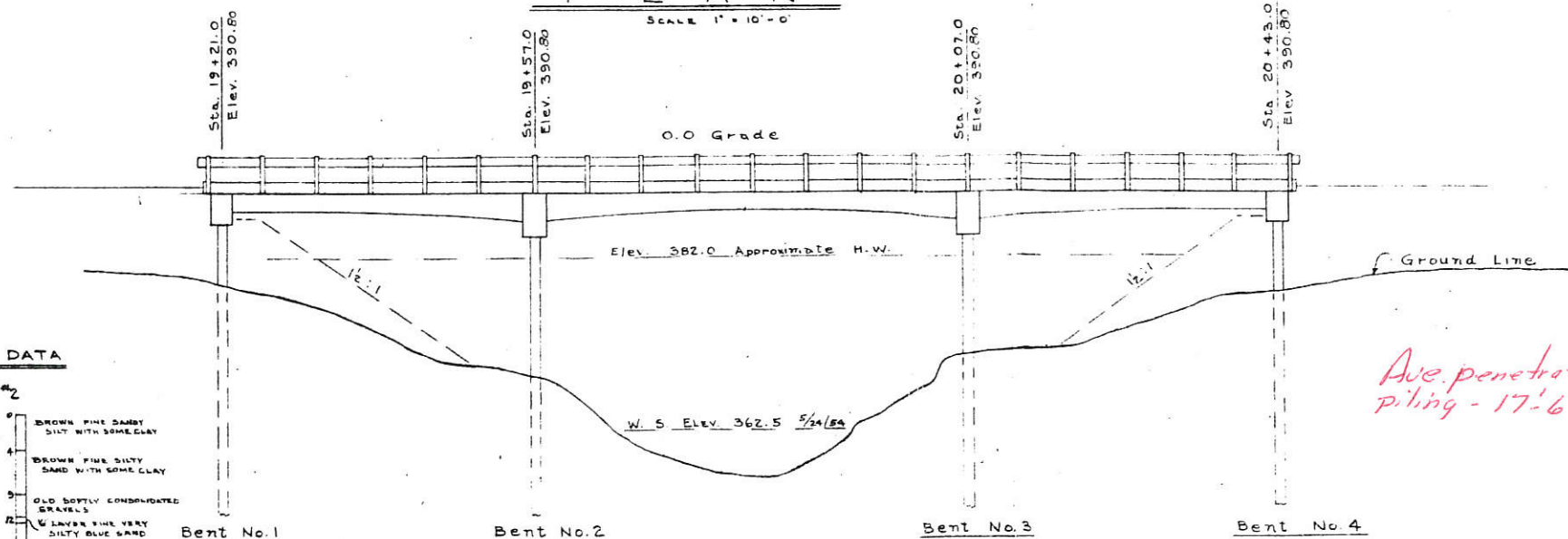
H15-S12-44 LOADING

TEST HOLE DATA

TEST HOLE #1	TEST HOLE #2
1. LIGHT BROWN SAND, FINE, WITH ORGANIC MATERIAL.	1. BROWN FINE SANDY SILT WITH SOME CLAY.
2. BROWN SILT WITH SOME CLAY.	2. BROWN FINE SILTY SAND WITH SOME CLAY.
3. FINE VERY SILTY BLUE SAND.	3. OLD SOFTLY CONSOLIDATED GRAVELS.
4. BROWN COLORED OLD SOFTLY CONSOLIDATED GRAVELS, WITH SOME WOOD PIECES.	4. 6 LAYERS FINE VERY SILTY BLUE SAND.
5. BLUE GRAY MEDIUM TO COARSE, VERY SILTY SAND WITH PIECES OF WOOD.	5. OLD SOFTLY CONSOLIDATED GRAVELS.
6. DARK GRAY SHALE.	6. MEDIUM TO COARSE BLUE GRAY VERY SILTY SAND WITH A FEW SMALL GRAVELS AND SOME WOOD PIECES.
7. DARK GRAY SHALE, ROCK OR VERY HARD SHALE.	7. DARK GRAY SHALE (30 BLOWS/IN).
8. DARK GRAY SHALE (20 BLOWS/IN).	

PLAN

SCALE 1" = 10'-0"



ELEVATION

SCALE 1" = 10'-0"

Ave. penetration of piling - 17'-6"

THIS PRINT HAS BEEN REDUCED
DO NOT SCALE



APPROVED
Charles E. Menille
LEWIS COUNTY ROAD ENGINEER

JAVORSKY BRIDGE SOUTH FORK CHEHALIS PLAN & ELEVATION	
FOR: LEWIS COUNTY CHEHALIS WAS HORACE J. WHITACRE & ASSOCIATES Professional Engineers CIVIL & STRUCTURAL 2807 "A" STREET TACOMA 4 WASH.	
Drawn: SLF	Chkd: HFS
Scale: AS NOTED	Date: 7/12/54
212-1	SHEET

T.12N. R.4W. W.M.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.
8	WASH.	5-0338(3)		3

STATION 14+00 BEGINNING OF PROJECT
BEGINNING OF F.A.S. NO. 5-0338 (3)

JOHN C. MILLER
PL. 17-111
SEC. 24

PASTURE

S 43° 30' E

CULTIVATED

CULTIVATED

ORCHARD

CULTIVATED

PL. 17-111

Station 19+15 Construct on Rt.
Reflector Unit

Station 20+42.25

Station 20+42.25

Station 20+42.25

Station 20+42.25

Station 20+42.25

Station 20+42.25

Station 20+42.25

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Station 20+42.25

Station 20+42.25

Station 20+42.25

STATION 26+50 END OF PROJECT
END OF F.A.S. NO. 5-0338 (3)

Govt. Lot 2 Sec. 24

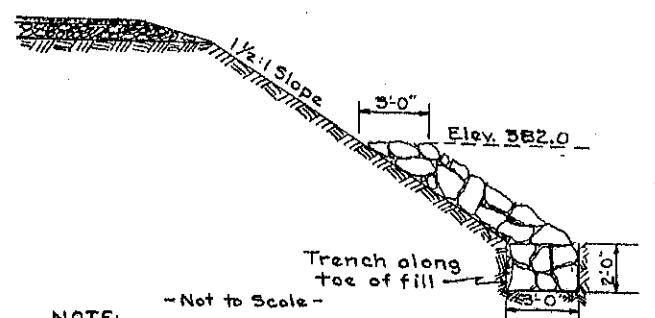
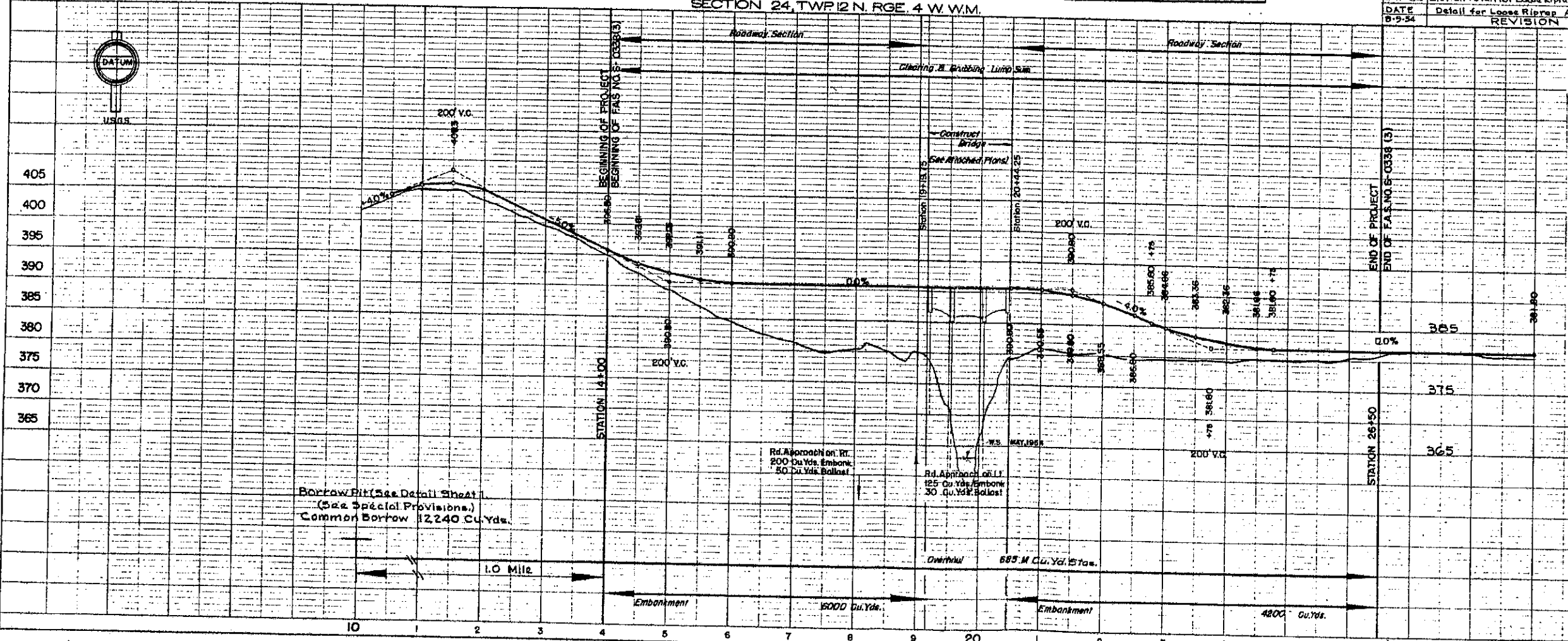
THIS PRINT HAS BEEN REDUCED
DO NOT SCALE

SECTION 24, TWP. 12 N. RGE. 4 W. W.M.

DATE	REVISION	BY
8-11-54	Elev. on Detail for Loose Riprap Revised	C.M.
8-9-54	Detail for Loose Riprap Added	D.A.P.



KLABER-WILDWOOD
COUNTY ROAD PROJECT
JAVORSKY BRIDGE & AP
LEWIS COUNTY
Vol. 622
Charles E. Neville
County Road Engineer
Sheet 2 of 5 Sh.
SCALE: HOR. 1"=100'
VERT. 1"=10'



Borrow Pit (See Detail Sheet 1)
(See Special Provisions.)
Common Borrow 12,240 Cu. Yds.

Rd. Approach on Rt.
200 Cu. Yds. Embank.
50 Cu. Yds. Ballast

Rd. Approach on Lt.
125 Cu. Yds. Embank.
30 Cu. Yds. Ballast

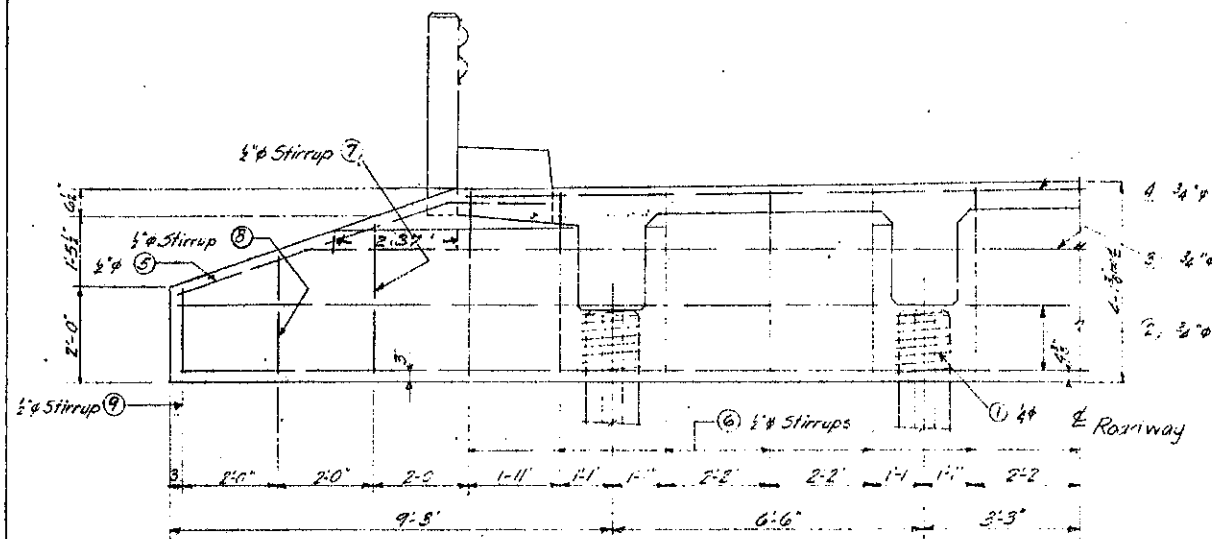
Overhaul 685 M. Cu. Yds. 5 to 5

Embankment

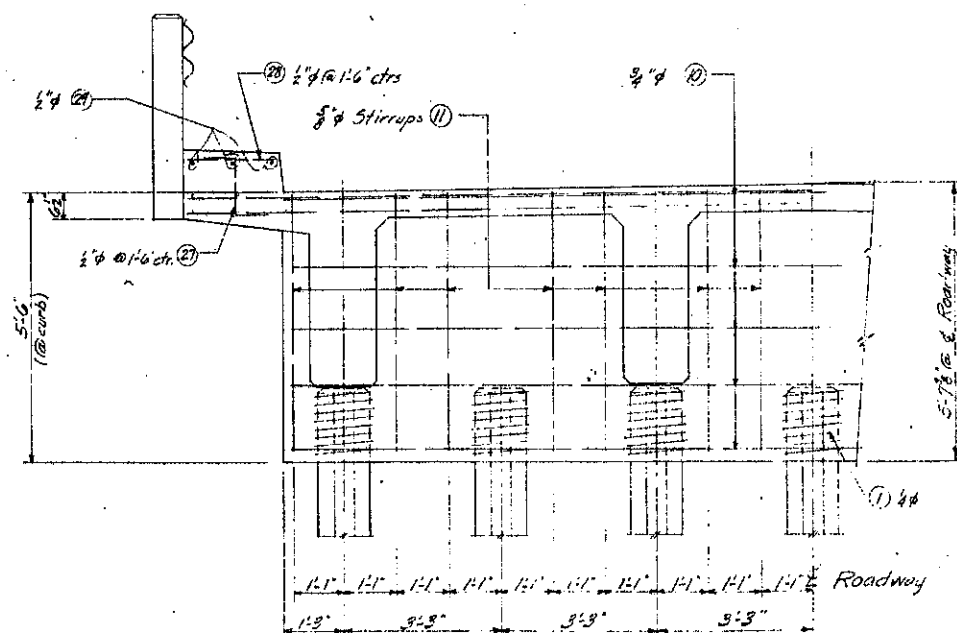
Embankment

Embankment

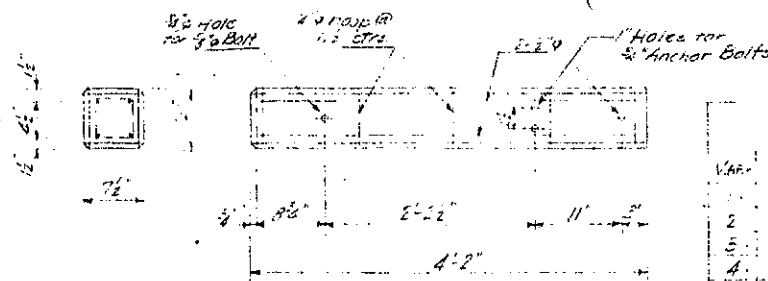
Embankment



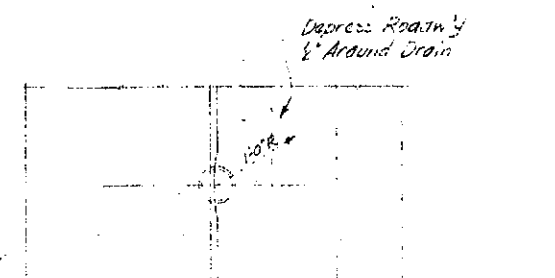
HALF ELEVATION BENTS 1 & 4
Scale 1/2" = 1'-0"



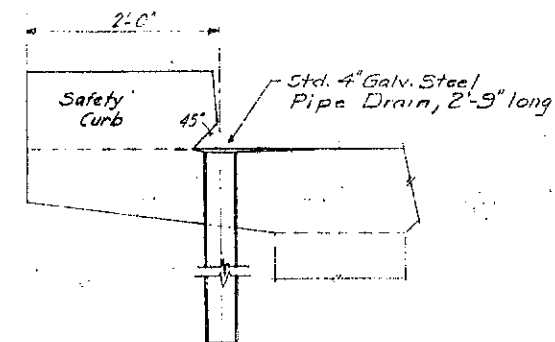
HALF ELEVATION BENTS 2 & 3
Scale 1/2" = 1'-0"



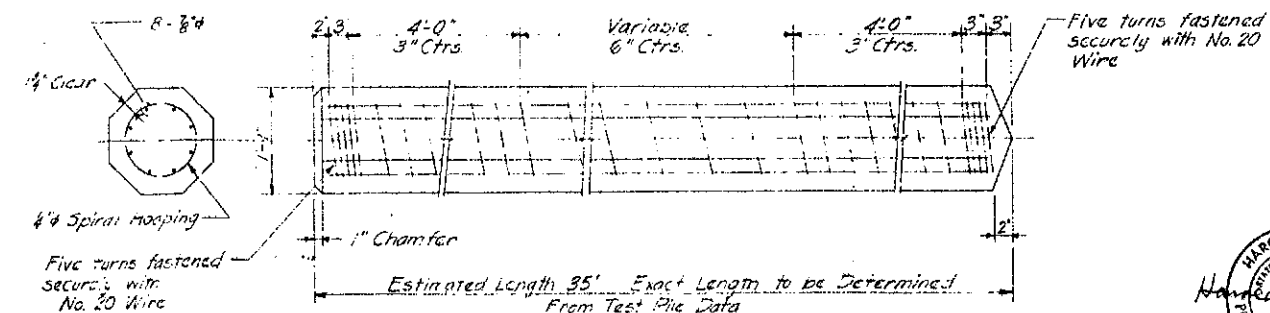
POST DETAIL
Scale 1" = 1'-0"
(Steel not included in Bar List)
40 REQUIRED



PLAN
Scale 1" = 1'-0"



DRAIN DETAIL
Scale 1" = 1'-0"
6" REQUIRED



PRECAST CONCRETE FILE
Scale 1" = 1'-0"
(Steel not included in Bar List)
20 REQUIRED

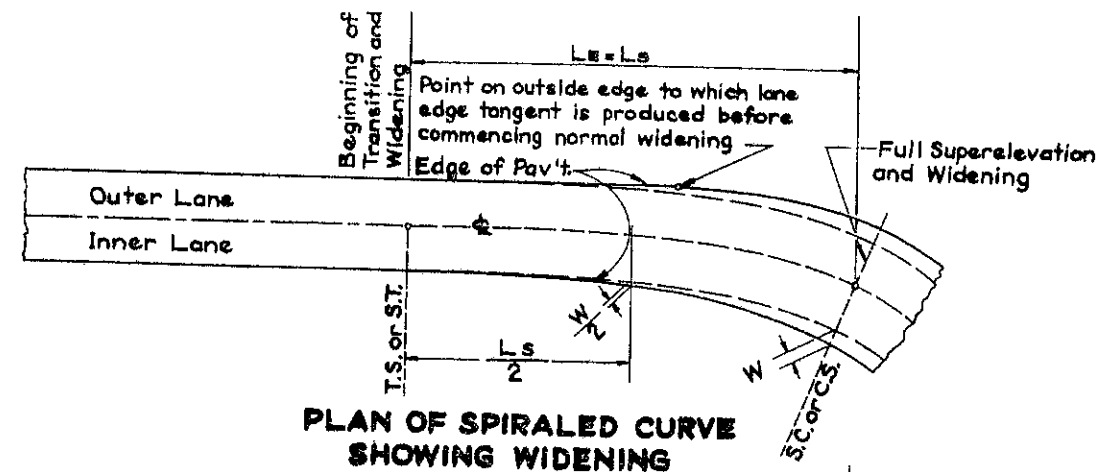
BAR LIST (All dimensions out to out)					BENDING DIAGRAM	
VAR.	LOCATION	No.	SIZE	LENGTH		
1	Top Beam Hoops	22	4"φ	24'-2"		
2	End Beam Longits.	8	4"φ	27'-8" Str.		
3	"	4	"	23'-4"		
4	"	4	"	25'-8"		
5	"	8	4"φ	8'-0"		
6	End Beam Stirrups	26	4"φ	10'-0"		
7	"	4	"	8'-6"		
8	"	4	"	6'-8"		
9	"	4	"	4'-11"		
10	Int. Beam Longits.	20	4"φ	25'-8"		
11	Int. Beam Stirrups	28	4"φ	13'-8"		
12	Girder Stirrups	308	4"φ	12'-25"		
13	Girder Longits. (Top)	16	4"φ	50'-0" Str.		
14	"	16	"	15'-0"		
15	"	16	"	33'-0"		
16	"	16	"	16'-0"		
17	Girder Longits. (Bottom)	16	"	38'-0"		
18	"	8	"	52'-0"		
19	"	16	4"φ	26'-0"		
20	"	16	"	16'-0"		
21	"	8	"	32'-0"		
22	"	8	"	20'-0"		
23	Intermediate Crossbeams Stirrups	60	4"φ	4'-8"		
24	" Longits.	16	4"φ	20'-6" Str.		
25	Deck Slab (Transv.)	368	4"φ	25'-8"		
26	" Longits.	64	4"φ	42'-6"		
27	"	74	"	43'-3"		
28	Safety Curb	182	4"φ	2'-0"		
29	"	190	"	1'-7" Str.		
30	"	48	"	12'-2"		
31	"	8	"	9'-6"		
32	"	4	"	6'-0"		
33	"	4	"	10'-11"		
34	Girder Longits. (Intern.)	32	4"φ	32'-0" Str.		

THIS PRINT HAS BEEN REDUCED
DO NOT SCALE

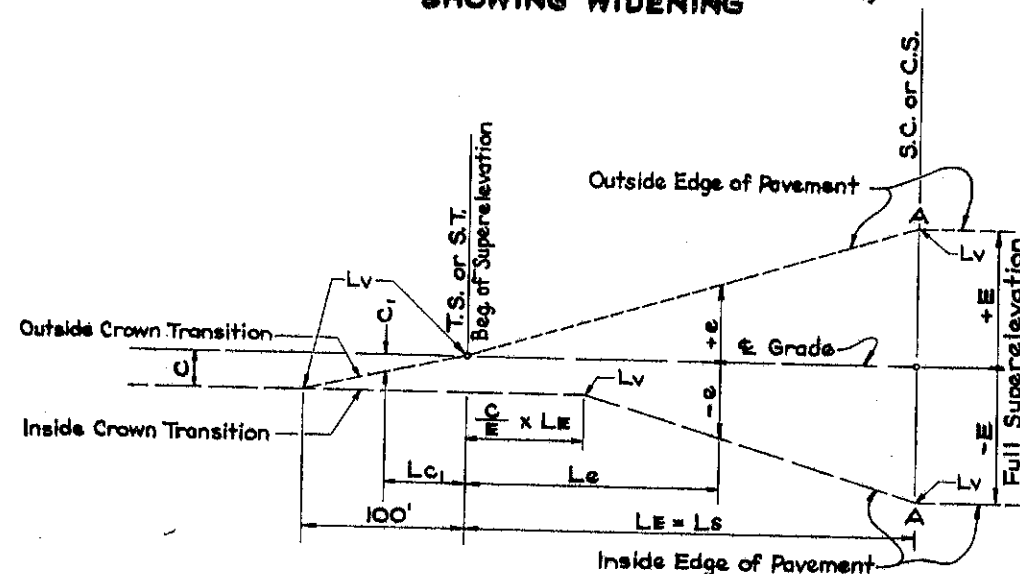
HAROLD F. SITS
PROFESSIONAL ENGINEER

APPROVED
Charles E. Mittle
LEWIS COUNTY ROAD ENGINEER

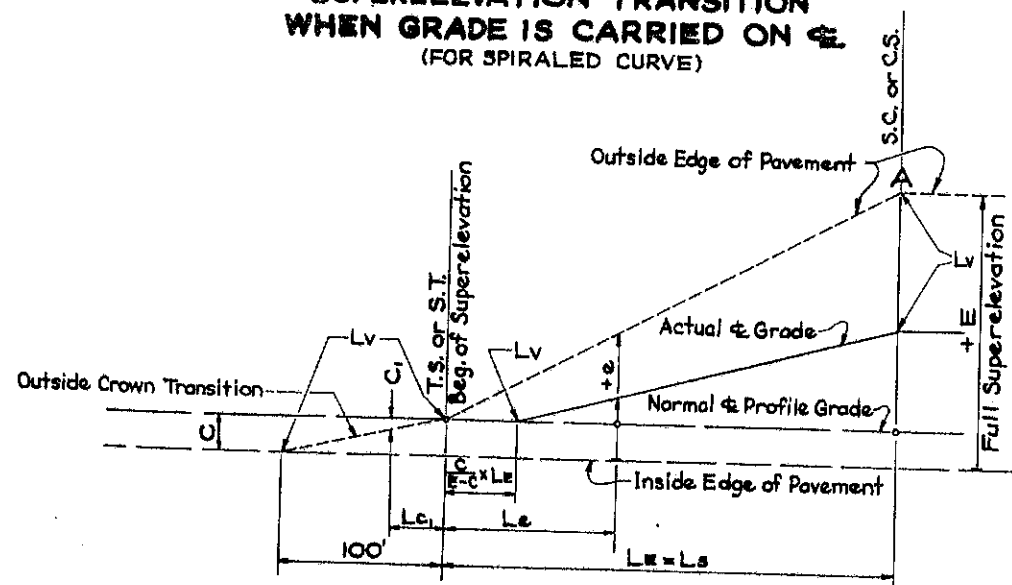
JAVORSKY BRIDGE
SOUTH FORK CHEHALIS
BENTS, BAR LIST & MISC.
FOR LEWIS COUNTY
CHEHALIS WASH.
HORACE J. WHITACRE & ASS.
Professional Engineers
CIVIL & STRUCTURAL
2807 "A" STREET TACOMA & WASH.
Drawn: J.P. Chkd: HFS
Scale: AS NOTED
Date: 7/12/54
212-3 SHEET



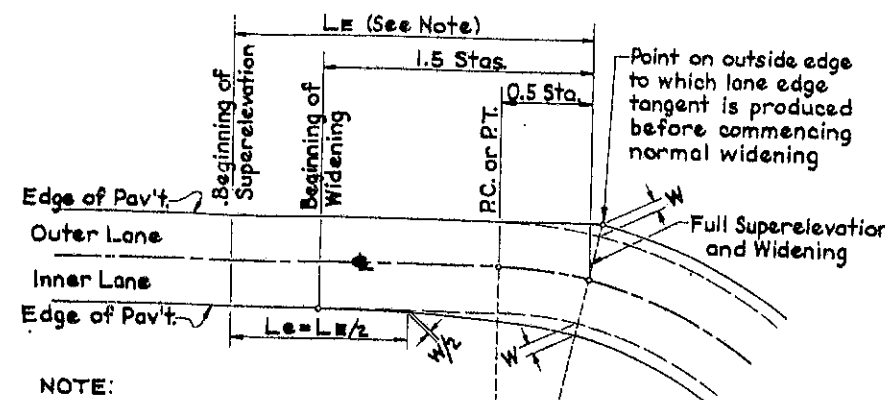
PLAN OF SPIRALED CURVE
SHOWING WIDENING



PROFILE SHOWING METHOD OF ATTAINING
SUPERELEVATION TRANSITION
WHEN GRADE IS CARRIED ON E
(FOR SPIRALED CURVE)



PROFILE SHOWING METHOD OF ATTAINING
SUPERELEVATION TRANSITION WHEN GRADE
IS CARRIED AT INSIDE EDGE OF PAVEMENT
(FOR SPIRALED CURVE)



NOTE:

Where tangent distance between curves is less than 5 Stas. $L_s = 1.5$ Stas.
Where tangent distance between curves is 5 Stas. or more $L_s = 3.0$ Stas.

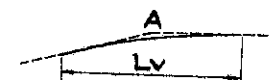
PLAN OF CIRCULAR CURVE (NOT SPIRALED)
SHOWING WIDENING

(SUPERELEVATION TRANSITION IS SIMILAR TO METHOD SHOWN FOR SPIRALED CURVES)

For transition through spiral $L_v = \frac{(V-30)(D)}{200}$

Note: Computed value L_v for approximation only.
Use a convenient curve length of approximately
equivalent value.

For transition to Circular Curve
150' Transition $L_v = 0.40$ Sta.
300' Transition $L_v = 0.80$ Sta.



CURVE FOR EASING BREAK IN STRAIGHT LINE TRANSITION
(See "Notes" below)

NOTES:

Transition to full superelevation shall be carried at a uniform rate of change from level section to full superelevation.
The roadway crown shall be eliminated uniformly through a length of 100 feet except as noted for the inside crown.
Value of L_v based on parabolic curve as used for vertical curves.
Since the factors of gradient, superelevation and crown may produce a condition that would not assure positive drainage along the ditch or gutter lines, each transition should be thoroughly checked for this condition.
Widening for each lane shall be proportioned through the length, L_s , except that no widening shall be applied on the outside of the outer lane tangent.
Ordinarily, the break at beginning or end of the straight line transition can be adjusted by eye in the field, and a curve of length, L_v , need be resorted to only in the case of structures or high type pavement.

LEGEND:

- D Degree of Circular Curve.
- E Rate of full superelevation in feet per foot of roadway width.
- e Rate of superelevation at any intermediate point in feet per foot.
- Lc Distance in stations from T.S. or S.T. to intermediate point in crown transition.
- Ls Length of transition from zero superelevation to full superelevation in stations.
- L Length of transition in stations from beginning to any intermediate superelevation rate.
- Ls Length of Spiral Curve in stations.
- Lv Length of a curve in stations for eliminating sharp break in straight line transition when required.
- C Rate of full crown in feet per foot of lane width.
- C1 Rate of crown on upper side at any intermediate point in transition in feet per foot of lane width.
- b Width of single lane, in feet.
- R Radius of Circular Curve in feet.
- V Velocity in miles per hour.
- W Widening required for one lane, in feet.

ADDITIONAL FOR WIDENING EQUATION (W)

- G Maximum width of vehicular body in feet (8 feet used)
- Z Maximum length of vehicular wheel base in feet (25 feet used)
- K Variable factor applied to maximum speed for determination of normal speed (approx. 0.75)

EQUATIONS:

$$E = 0.02D \text{ (Max. } = 0.10' \text{ per ft.)}$$

$$W = 3 + G - b + R - \sqrt{R^2 - Z^2} + \frac{KV}{\sqrt{R}}$$

WIDENING (W) FOR EACH LANE		DEGREE OF CURVE (D)													
Lane Width (b)		1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°
		0.7	1.1	1.3	1.5	1.6	1.8	1.8	1.9	2.0	2.0	2.0	2.0	2.1	2.3
11'		-	-	-	0.5	0.6	0.8	0.8	0.9	1.0	1.0	1.0	1.0	1.1	1.3
12'		-	-	-	-	-	-	-	-	-	-	-	-	-	-

STANDARD
SUPERELEVATION AND WIDENING

STATE OF WASHINGTON
DEPARTMENT OF HIGHWAYS
OLYMPIA, WASHINGTON

APPROVED: DEC. 1, 1950

W. S. Suggs
DIRECTOR OF HIGHWAYS

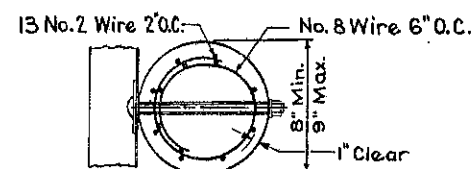
REINFORCED CONCRETE POSTS:

The reinforcement mesh shall contain 13 #2 Longitudinal Wires spaced at 2" O.C.

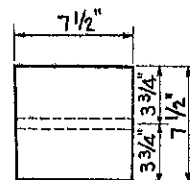
Guard rail posts shall be marked to indicate the overlap of wire on guard rail side.

ALTERNATE REINFORCEMENT:

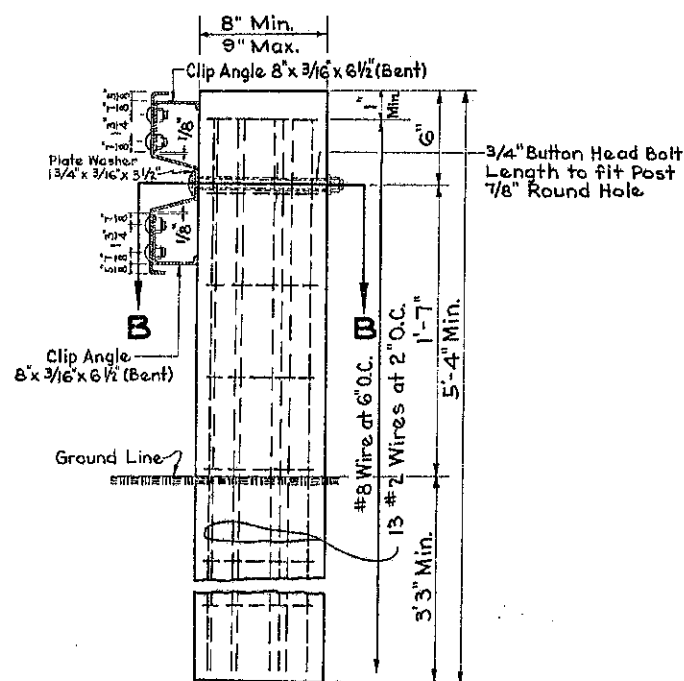
Use American Steel and Wire Co. Standard No. 216-28 with 2 additional circumferential No. 8 wires spaced equally between the 16" spacings of the mesh. Weld to longitudinal wires.



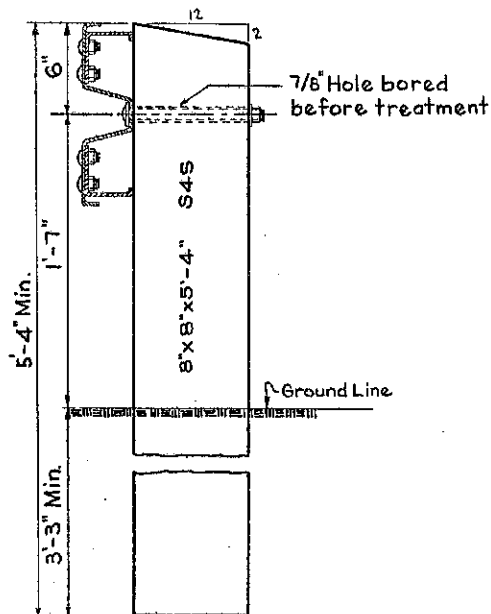
SECTION B-B



PLAN



ROUND REINFORCED
CONCRETE POST



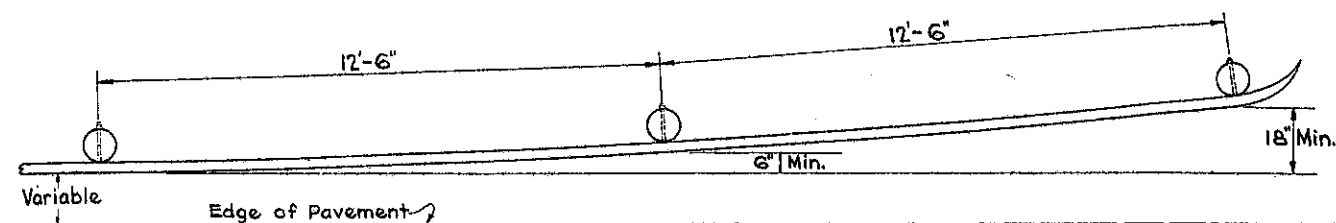
CREOSOTE TREATED
TIMBER POST

(Rail Dimensions shown on Concrete Post)

TIMBER POSTS:

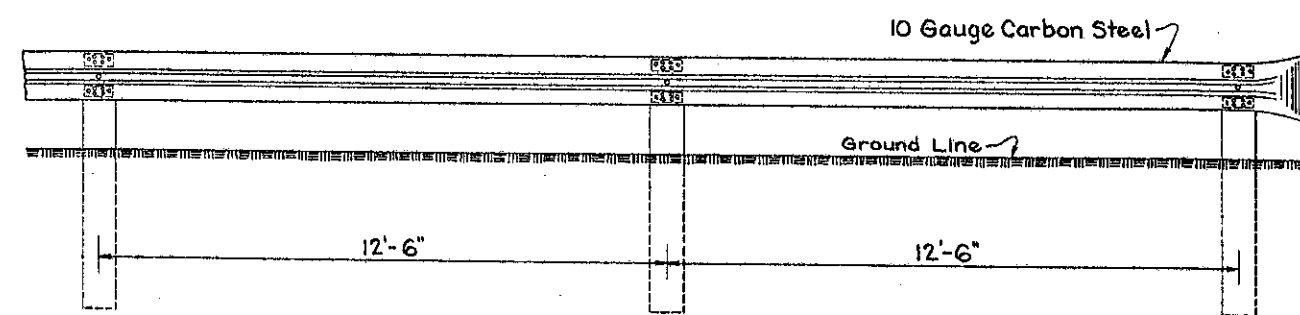
Timber Posts shall conform to the requirements of Section 70-2.02 A of the Standard Specifications.

They shall be given a creosote preservative treatment, using the empty cell process in accordance with Section 55 of the Standard Specifications.



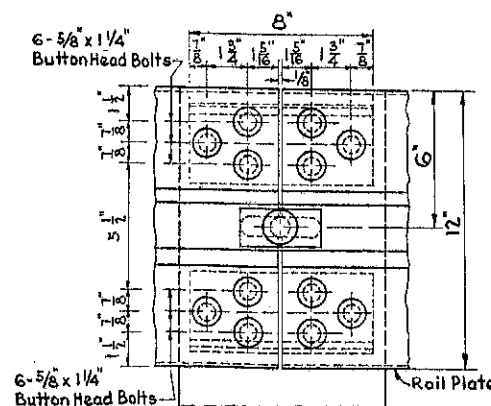
PLAN

Direction of Traffic



ELEVATION

RAIL PLATES AND PARTS
Rail Plates shall be No. 10 (U.S. Standard)
30% Carbon Steel, Hot Rolled - 70,000 Lbs.
Breaking strength at joints.



DETAIL OF SPLICE

NOTES:

The Contractor shall have the option of furnishing 8" Round Reinforced Concrete Post, 9" Round Reinforced Concrete Post or 8"x8" Creosote Treated Timber Post, however the same type of post shall be used throughout any one particular project.

Rail shall be painted with White Guard Rail Paint. Painting of Posts is not required.

See Section 72 of the 1948 Standard Specifications for further requirements.

PAYMENT:

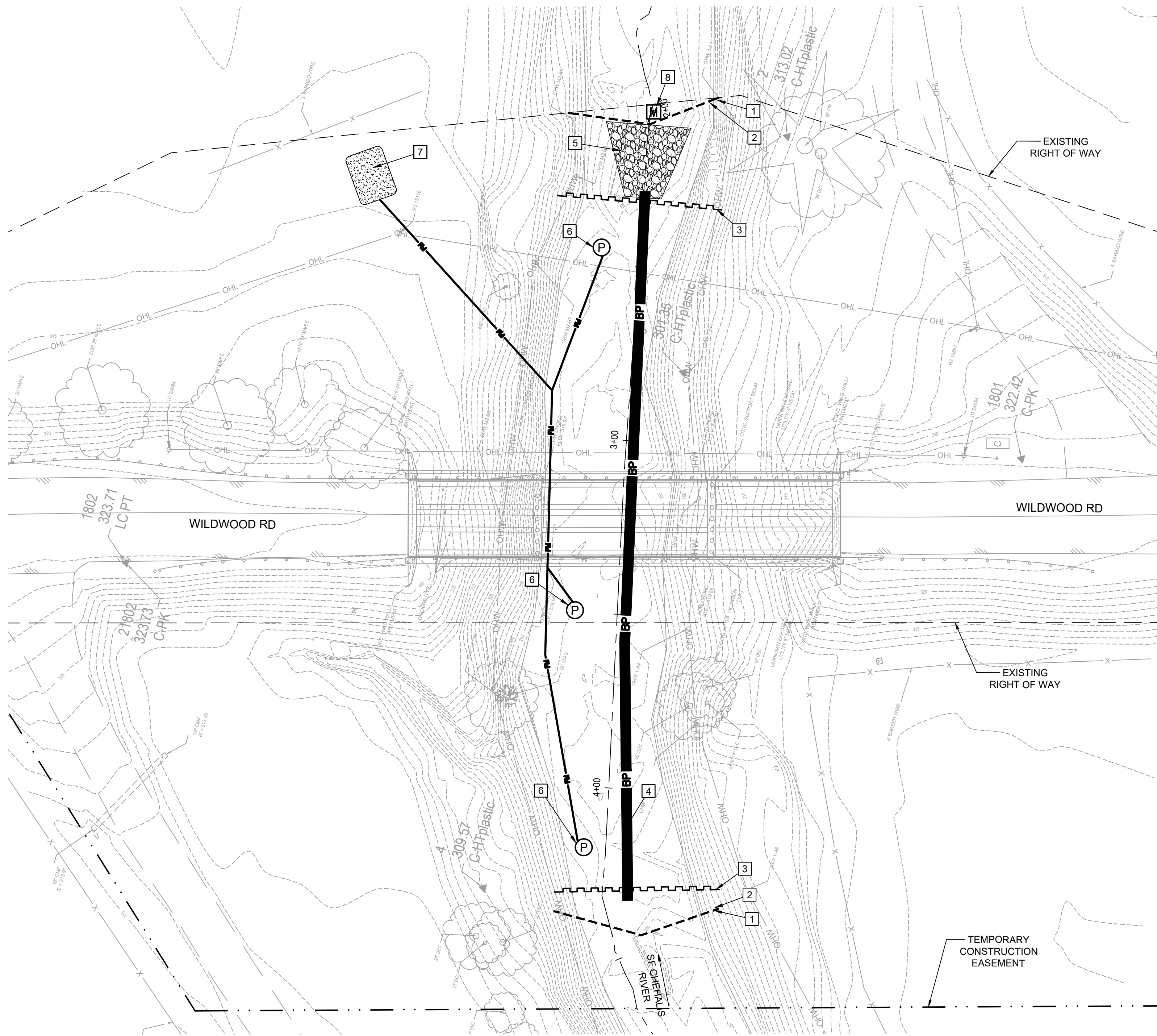
"Standard Beam Guard Rail in Place", per Lin. Ft.

STANDARD
BEAM GUARD RAIL
TYPE NO. 3

WASHINGTON STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS
OLYMPIA, WASHINGTON
APPROVED: JULY 9, 1948

W. S. Dugan
DIRECTOR OF HIGHWAYS

Appendix E: Proposed Plans



GENERAL NOTE:

1. ALL MATERIAL AND WORK SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION, "STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION" 2026 EDITION AND SPECIAL PROVISIONS.

TEMPORARY STREAM DIVERSION NOTES:

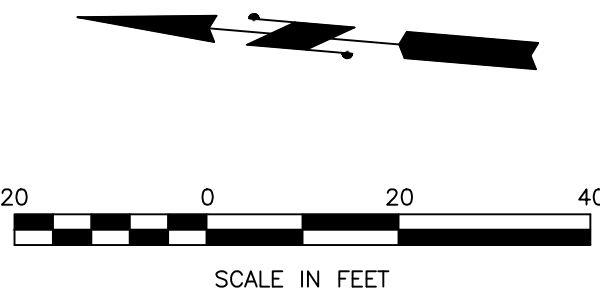
1. THE TEMPORARY STREAM DIVERSION SHOWN IS CONCEPTUAL. SEE SPECIAL PROVISIONS.
2. CONTRACTOR SHALL SUBMIT THE TEMPORARY STREAM DIVERSION PLAN TO THE ENGINEER FOR REVIEW AND APPROVAL WITHIN 7 DAYS OF NOTICE TO PROCEED.
3. THE TEMPORARY STREAM DIVERSION SHALL BE INSPECTED DAILY BY THE CONTRACTOR AND MAINTAINED TO ENSURE CONTINUED PROPER FUNCTIONING.
4. THE STREAM DIVERSION SYSTEM SHALL BE CAPABLE OF CONVEYING THE FLOW SPECIFIED IN THE CONTRACT DOCUMENTS.
5. FISH EXCLUSION AND FISH REMOVAL SHALL BE PERFORMED BY THE CONTRACTOR, BEFORE IN-WATER WORK IN ACCORDANCE WITH THE WASHINGTON DEPARTMENT OF FISH AND WILDLIFE HPA.
6. IF GRADING OR FILL IS REQUIRED TO INSTALL THE TEMPORARY STREAM DIVERSION, TEMPORARY PUMPS MAY BE REQUIRED TO DEWATER THE WORK AREA.

TEMPORARY STREAM DIVERSION KEY NOTES:

1. INSTALL FISH SCREEN.
2. CAPTURE AND REMOVE ALL FISH BETWEEN THE FISH SCREENS IN ACCORDANCE WITH THE HPA. FISH CAPTURE SHALL BE PERFORMED UNDER THE SUPERVISION OF AN EXPERIENCED FISHERY BIOLOGIST.
3. INSTALL COFFERDAM. SEE DETAIL 1 ON SHEET 6. UPSTREAM COFFERDAM LOCATED AT APPROXIMATELY STA 4+30 AND DOWNSTREAM COFFERDAM LOCATED AT APPROXIMATELY STA 2+32.
4. INSTALL TEMPORARY STREAM DIVERSION PIPE. ADJUST LOCATION OF DIVERSION PIPE AS NEEDED TO PERFORM WORK.
5. INSTALL OUTLET PROTECTION TO PREVENT EROSION AT TEMPORARY DIVERSION OUTFALL. OUTLET PROTECTION SHALL BE REMOVED WHEN CONSTRUCTION IS COMPLETE. SEE DETAIL 1 ON SHEET 6.
6. INSTALL DEWATERING PUMP(S) AND PIPES AS NEEDED DURING CONSTRUCTION. ADJUST LOCATION OF DEWATERING PUMPS AND PIPES AS NEEDED TO PERFORM WORK.
7. INSTALL FILTER BAG FOR SEDIMENT REMOVAL FROM ANY DEWATERING ACTIVITIES THAT MAY BE NECESSARY DURING CONSTRUCTION. SEE DETAIL 2 ON SHEET 6.
8. TURBIDITY MONITORING STATION. SEE SPECIAL PROVISIONS FOR TURBIDITY MONITORING REQUIREMENTS.

LEGEND

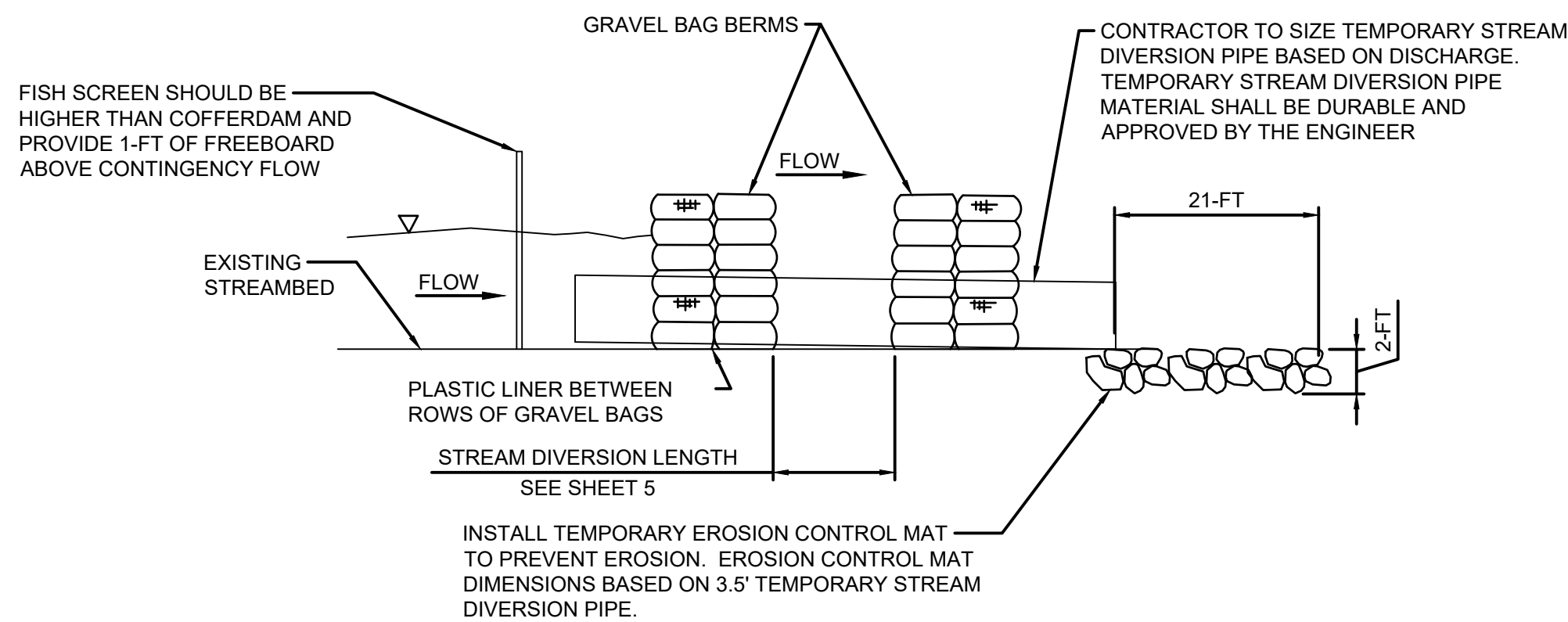
- COFFERDAM
- FISH SCREEN
- CONCEPTUAL 42-IN SMOOTH BORE HDPE GRAVITY BYPASS PIPE FOR THE TEMPORARY STREAM DIVERSION
- FORCE MAIN
- PUMP
- MONITORING POINT
- TEMPORARY QUARRY SPALLS
- FILTER BAG



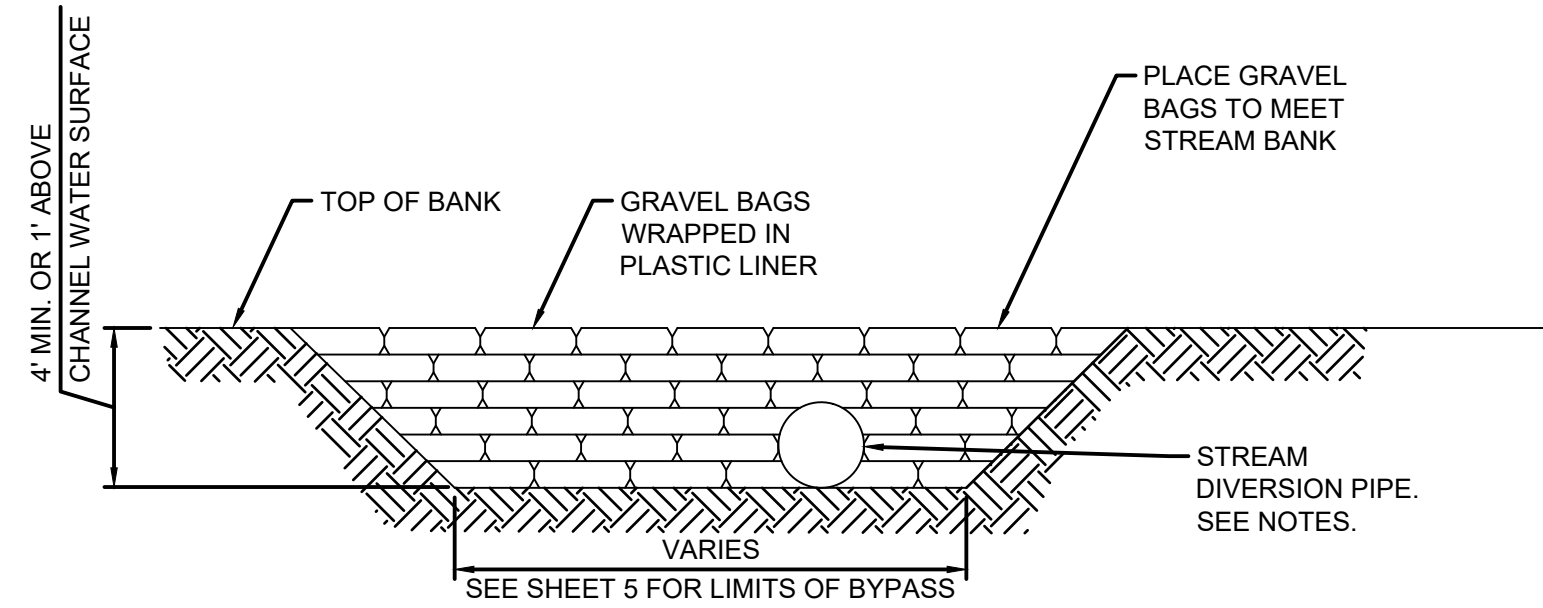
NO.	DATE	REVISION	BY	APP.

GENERAL NOTE:

1. THE TEMPORARY STREAM DIVERSION DETAILS SHOWN ARE CONCEPTUAL. SEE SPECIAL PROVISIONS.



SIDE VIEW



FRONT VIEW

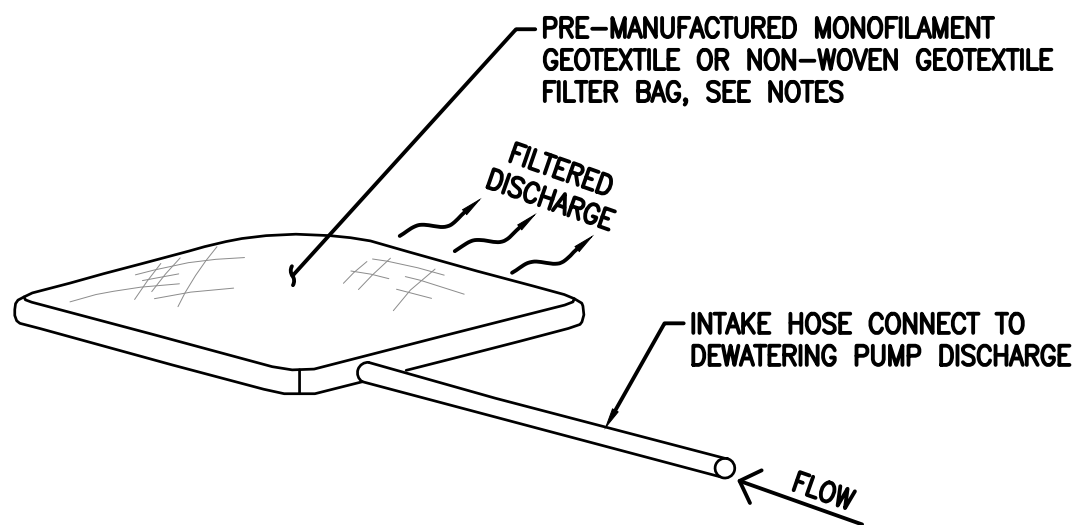
NOTES:

1. COFFERDAM SHALL BE CONSTRUCTED BY THE CONTRACTOR WITH ROUNDED PEA GRAVEL BAGS, OR OTHER MEANS PRE-APPROVED BY THE ENGINEER. GRAVEL BAGS SHALL BE CONSTRUCTED OF WOVEN SYNTHETIC FIBER. NO ANGULAR OR CRUSHED MATERIALS MAY BE USED. GRAVEL BAGS SHALL BE WASTEHAULED AFTER REMOVAL OF TEMPORARY STREAM DIVERSION.
2. THE HEIGHT AND WIDTH OF THE COFFERDAM SHALL BE DETERMINED BY THE CONTRACTOR BASED ON THE WATER SURFACE ELEVATION AND CHANNEL SHAPE AT THE TIME OF CONSTRUCTION. THE COFFERDAMS SHALL BE REVIEWED AND APPROVED BY THE ENGINEER. THE AVERAGE MAXIMUM DAILY FLOW AND MAXIMUM DAILY FLOW DURING THE IN-STREAM WORK WINDOW FROM USGS GAGE #12021000 IS 62 CFS (BASE FLOW) AND 130 CFS (CONTINGENCY FLOW), RESPECTIVELY.
3. REMOVE LOOSE COBBLES AND BOULDERS FROM THE STREAMBED PRIOR TO INSTALLING COFFERDAM.
4. EXTEND BOTH ENDS OF THE COFFERDAM UP THE BANKS OF THE CHANNEL AS NEEDED TO PREVENT THE STREAM FROM END-RUNNING THE COFFERDAM.
5. COFFERDAM SHALL BE MAINTAINED BY THE CONTRACTOR AND IMPROVED AS NECESSARY AND DIRECTED BY THE ENGINEER.
6. CONTRACTOR SHALL HAVE ON SITE, EMERGENCY DIVERSION PIPE AND APPURTENANCES IN THE EVENT OF HIGH FLOWS. SEE THE CONTRACT PROVISIONS AND HPA FOR ADDITIONAL INFORMATION ON TEMPORARY STREAM DIVERSION.
7. COFFERDAM MATERIALS SHALL BE REMOVED FROM THE SITE AND BECOME PROPERTY OF CONTRACTOR.

1
5

COFFER DAM DETAIL

NOT TO SCALE



NOTES:

1. FILTER BAG SHALL BE MINIMUM 10-FT X 15-FT AND REPLACED AS NEEDED TO ACCOMMODATE ACTUAL SEDIMENT LOAD CONDITIONS (I.E. VOLUME, TYPE OF SEDIMENT, ETC.)
2. DRAIN FILTER BAG TO COUNTY APPROVED RECEIVING AREA. RECEIVING AREA SHALL BE VEGETATED AND UPLAND OF THE OHWM AND TURBIDITY MONITORING STATION.
3. FILTER BAG SYSTEM TO BE INSPECTED DAILY WHEN IN USE TO VERIFY ADEQUATE PERFORMANCE.
4. TURBIDITY MONITORING STATION INSTALLED AND MAINTAINED. SEE SPECIAL PROVISIONS FOR TURBIDITY MONITORING REQUIREMENTS. SHOULD A TURBIDITY EXCEEDENCE OCCUR, THE FILTER BAG SYSTEM IS TO BE INSPECTED IMMEDIATELY AND REPLACED IF ANOTHER SEDIMENT SOURCE IS NOT IDENTIFIED.

2
5

FILTER BAG DETAIL

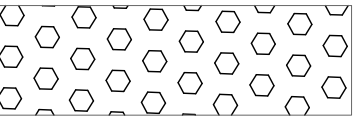
NOT TO SCALE

NO.	DATE	REVISION	BY	APP.

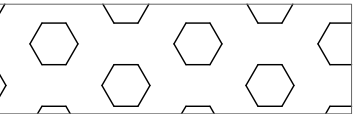
SCOUR COUNTERMEASURE NOTES:

- 1. SEE SCOUR COUNTERMEASURE LAYOUT TABLE ON THIS SHEET FOR LAYOUT POINTS AND TOP OF COUNTERMEASURE ELEVATIONS.
- 2. SEE SHEET 8 FOR SCOUR COUNTERMEASURE PROFILE.
- 3. SEE SHEETS 9 AND 10 FOR SCOUR COUNTERMEASURE SECTIONS.
- 4. MINIMIZE DISTURBANCE OF THE STREAMBED OUTSIDE OF THE SCOUR COUNTERMEASURE FOOTPRINT TO THE MAXIMUM EXTENT PRACTICABLE. STREAMBED OUTSIDE THE SCOUR COUNTERMEASURE LIMITS THAT IS DISTURBED SHALL BE RETURNED TO EXISTING CONDITIONS.
- 5. SEE SHEET 11 FOR ALIGNMENT LAYOUT TABLE.

LEGEND



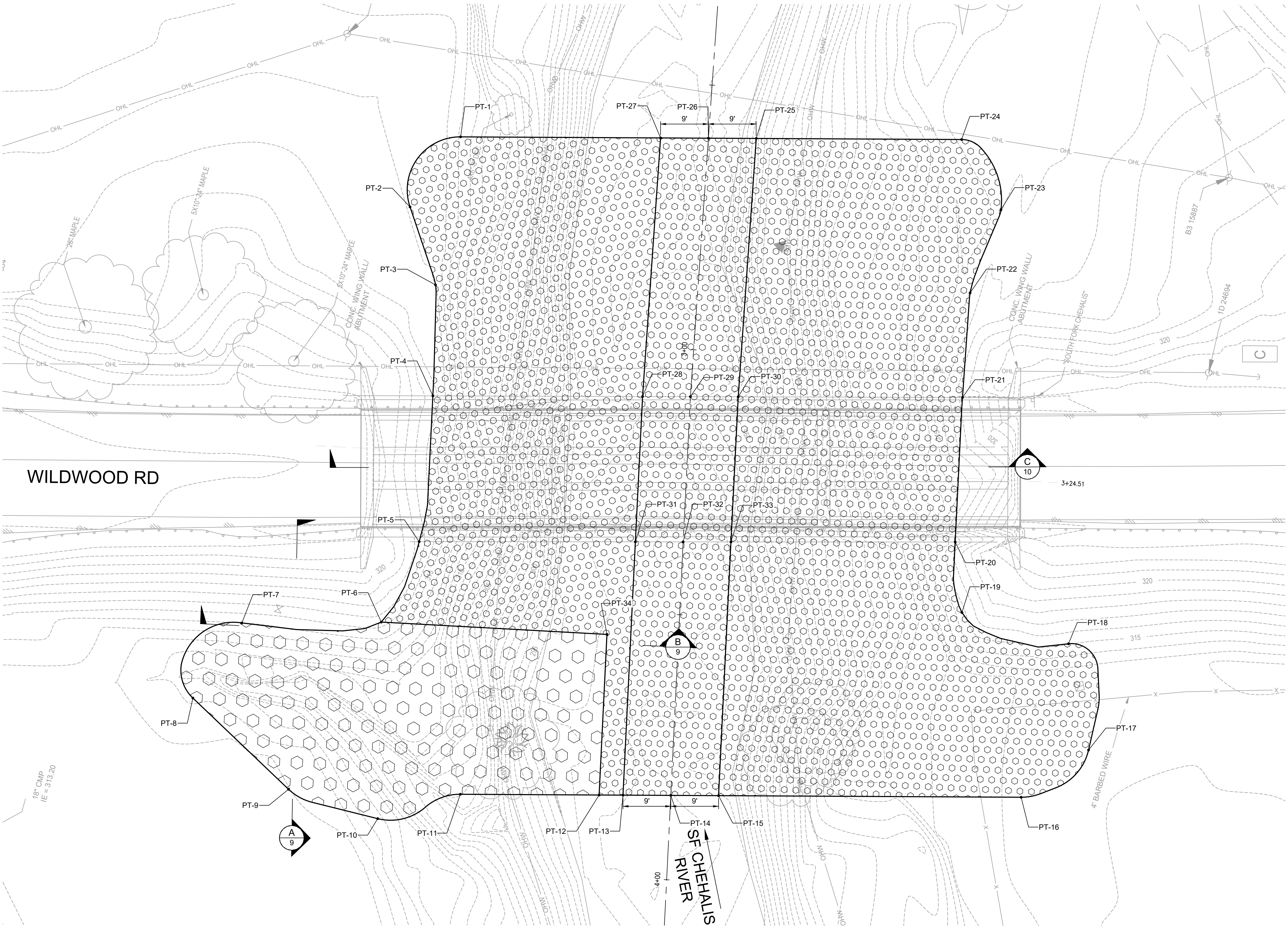
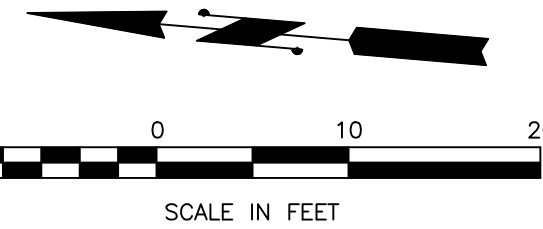
ROCK FOR EROSION AND SCOUR PROTECTION CLASS B, 3-FOOT THICKNESS (APPROXIMATELY 1005 TONS)



ROCK FOR EROSION AND SCOUR PROTECTION CLASS B, 6-FOOT THICKNESS (APPROXIMATELY 400 TONS)

CONTROL POINT TABLE

POINT ID	STA	OFFSET	TOP OF COUNTER MEASURE ELEVATION
PT-1	2+63.0	46.6' R	312.9'
PT-2	2+76.9	55.2' R	315.0'
PT-3	2+91.2	49.4' R	315.0'
PT-4	3+11.1	48.5' R	315.0'
PT-5	3+38.6	49.7' R	315.0'
PT-6	3+54.1	56.1' R	315.0'
PT-7	3+55.6	82.3' R	315.0'
PT-8	3+70.2	90.9' R	311.9'
PT-9	3+86.4	72.0' R	313.1'
PT-10	3+91.2	55.0' R	308.2'
PT-11	3+85.8	39.6' R	300.7'
PT-12	3+84.7	13.5' R	291.4'
PT-13	3+84.5	9.0' R	288.4'
PT-14	3+84.1	0.0' C	288.4'
PT-15	3+83.7	9.0' L	288.4'
PT-16	3+81.2	66.0' L	312.3'
PT-17	3+71.7	78.2' L	312.9'
PT-18	3+51.9	73.5' L	315.0'
PT-19	3+47.0	53.1' L	315.0'
PT-20	3+33.7	51.2' L	315.0'
PT-21	3+05.4	51.2' L	315.0'
PT-22	2+85.7	51.2' L	315.0'
PT-23	2+69.6	56.0' L	315.0'
PT-24	2+57.0	47.6' L	314.1'
PT-25	2+59.5	9.0' L	287.9'
PT-26	2+60.0	0.0' C	287.9'
PT-27	2+60.6	9.0' R	287.9'
PT-28	3+09.3	9.0' R	288.1'
PT-29	3+08.9	0.0' C	288.1'
PT-30	3+08.3	9.0' L	288.1'
PT-31	3+36.7	9.0' R	288.1'
PT-32	3+36.3	0.0' C	288.1'
PT-33	3+35.8	9.0' L	288.1'
PT-34	3+54.4	13.5' R	291.2'



57 W. MAIN ST.
CHEHALIS WA 98532
PHONE # (360) 740-1123
FAX # (360) 740-2719

DESIGNED BY : MNZ
DRAWN BY : JAR
CHECKED BY : LCR
DATE : 05/14/2026

NO.	DATE	REVISION	BY	APP.

WILDWOOD MP 10.14 BRIDGE
SCOUR REPAIR

99% CONSTRUCTION PLANS
COUNTY ROAD PROJECT NO: 2159S
SCOUR COUNTERMEASURE PLAN

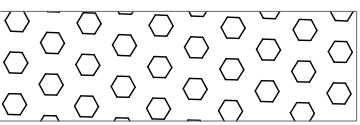
SHEET
7
OF
15



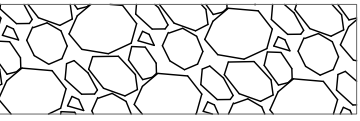
GENERAL NOTES:

1. ALL MATERIAL AND WORK SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION, "STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION" 2026 EDITION AND SPECIAL PROVISIONS.
2. SEE SHEETS 9 AND 10 FOR TYPICAL SCOUR COUNTERMEASURE AND STREAM RECONSTRUCTION SECTION.
3. SEE SHEET 12 FOR LARGE WOODY MATERIAL DETAILS.

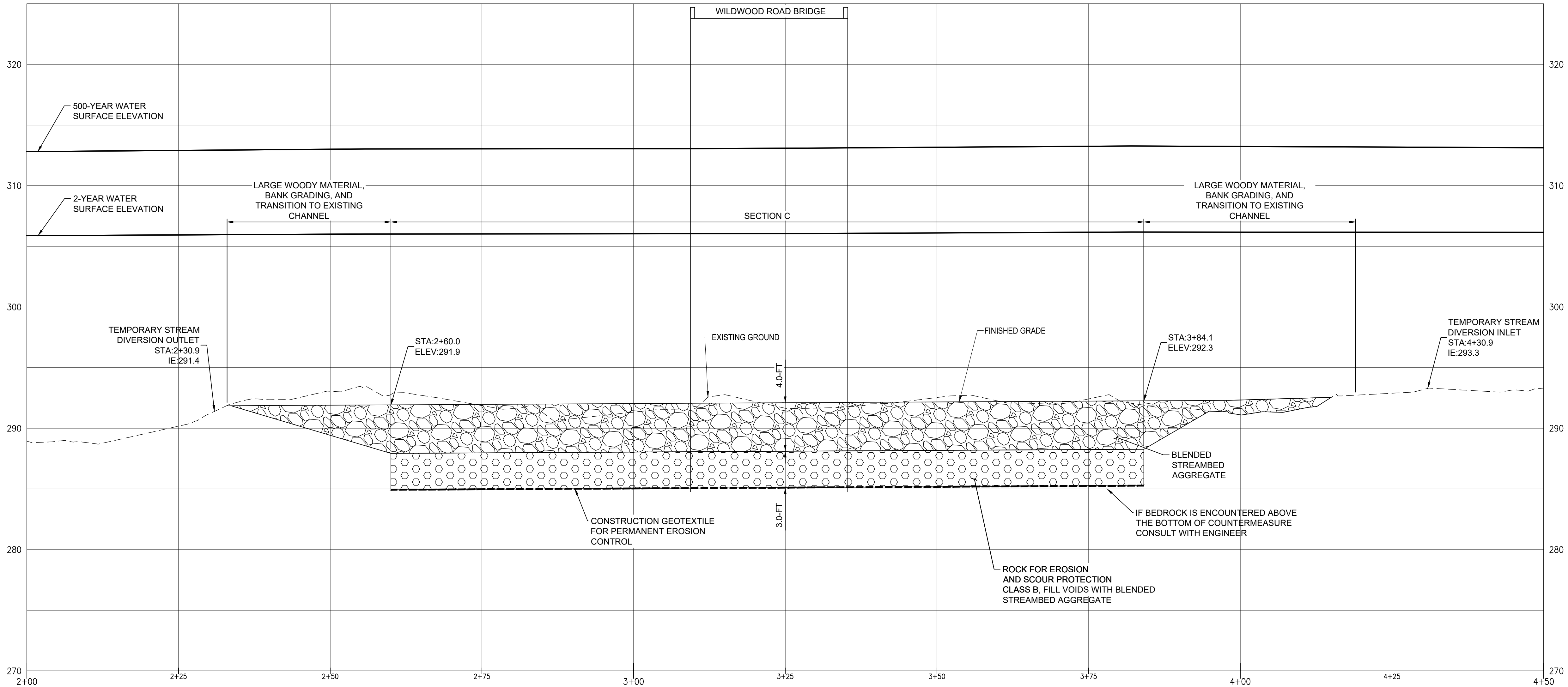
LEGEND



ROCK FOR EROSION AND SCOUR PROTECTION CLASS B, 3-FOOT THICKNESS



BLENDED STREAMBED AGGREGATE



PROFILE VIEW

H: 1"=10', V: 1"=5'



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CHEHALIS WA 98532
PHONE # (360) 740-1123
FAX # (360) 740-2719

DESIGNED BY : MNZ
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DATE : 05/14/2026

NO.	DATE	REVISION	BY	APP.

WILDWOOD MP 10.14 BRIDGE
SCOUR REPAIR

99% CONSTRUCTION PLANS
COUNTY ROAD PROJECT NO: 2159S

SCOUR COUNTERMEASURE PROFILE

SHEET

8
OF
15



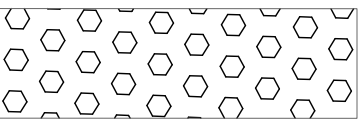
CALL 48 HOURS
BEFORE YOU DIG
1-800-
424-5555
"It's the Law"
Utilities
Underground
Location Center

Osborn
Consulting

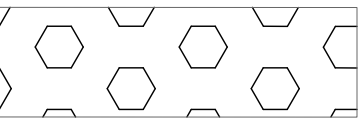
GENERAL NOTES:

1. BLENDED STREAMBED AGGREGATE IS 75% STREAMBED SEDIMENT AND 25% 4-INCH COBBLES. SEE STANDARD SPECIFICATION 8-30 "STREAMS, RIVERS, AND WATERBODIES."

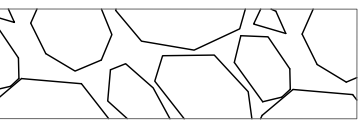
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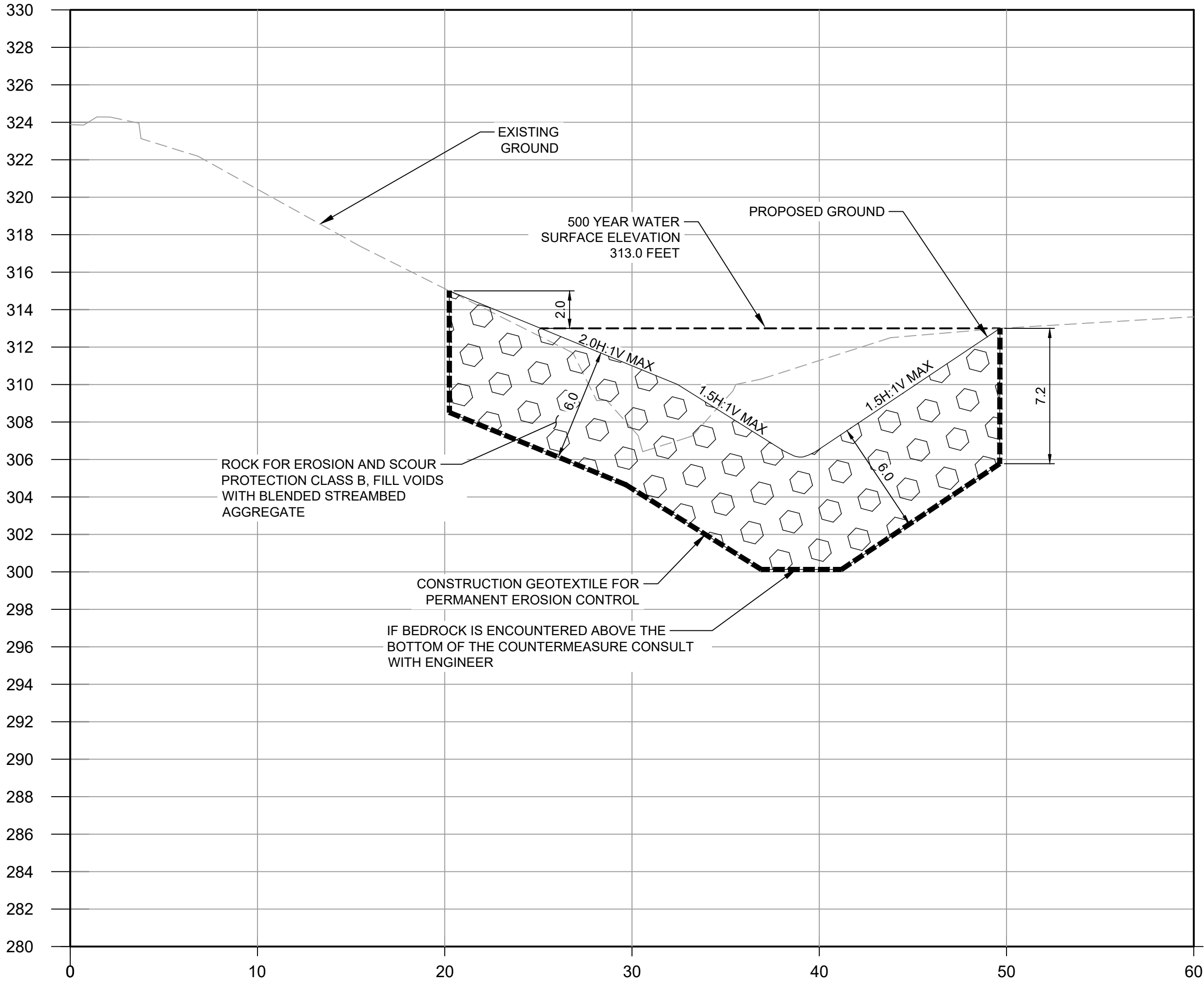
ROCK FOR EROSION AND SCOUR PROTECTION CLASS B, 3-FOOT THICKNESS



ROCK FOR EROSION AND SCOUR PROTECTION CLASS B, 6-FOOT THICKNESS

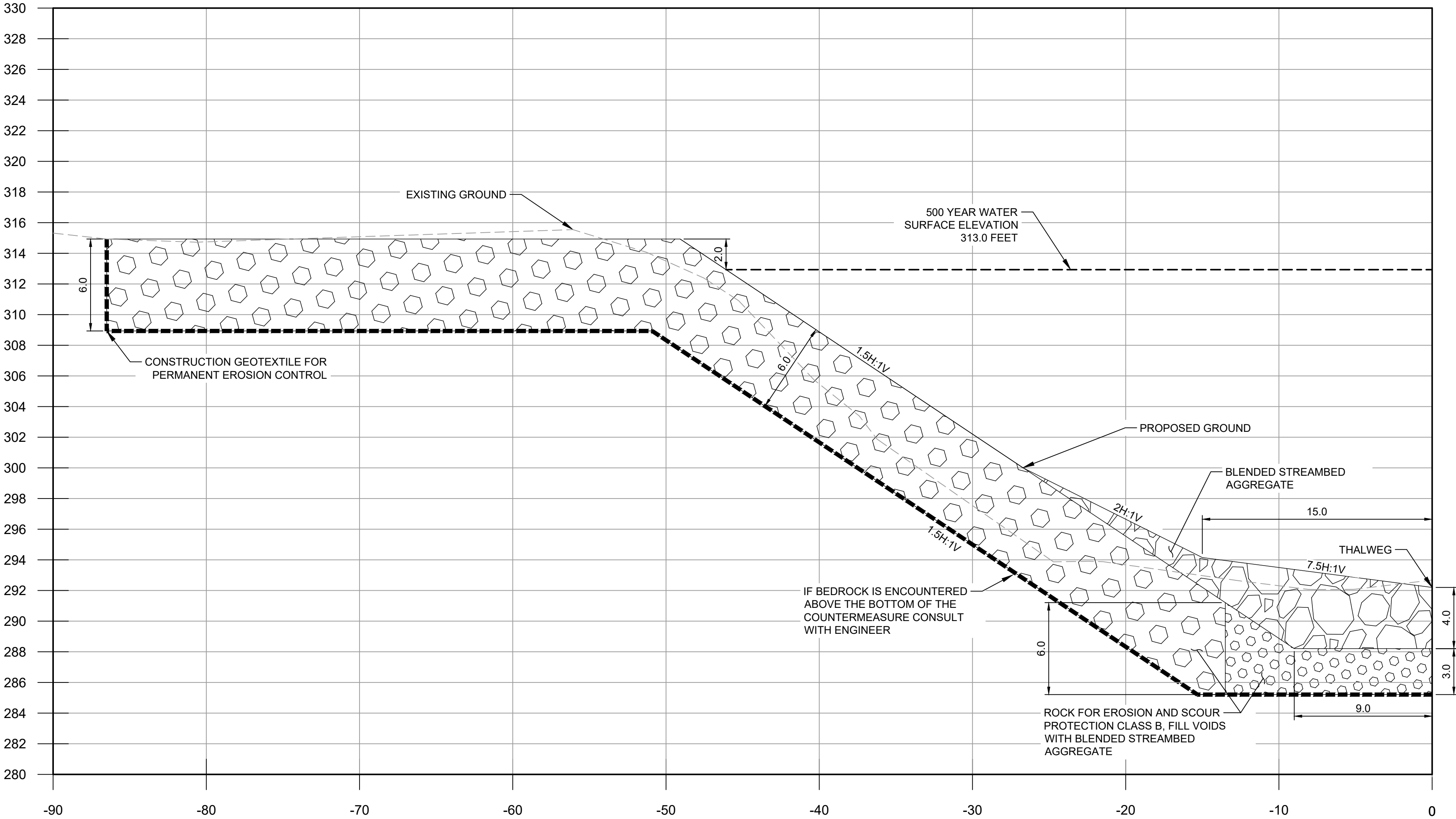


BLENDED STREAMBED AGGREGATE



SECTION A - SCOUR COUNTERMEASURE TYPICAL SECTION ALONG BRIDGE APPROACH

SCALE: 1"=5'



SECTION B - SCOUR COUNTERMEASURE TYPICAL SECTION WITH INCREASED RIPRAP THICKNESS

SCALE: 1"=5'



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NO.	DATE	REVISION	BY	APP.

WILDWOOD MP 10.14 BRIDGE
SCOUR REPAIR

99% CONSTRUCTION PLANS
COUNTY ROAD PROJECT NO: 2159S

SCOUR COUNTERMEASURE DETAILS

SHEET

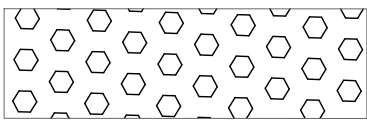
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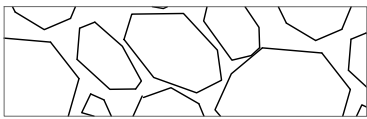
GENERAL NOTES:

1. BLENDED STREAMBED AGGREGATE IS 75% STREAMBED SEDIMENT AND 25% 4-INCH COBBLES. SEE STANDARD SPECIFICATION 8-30 "STREAMS, RIVERS, AND WATERBODIES."

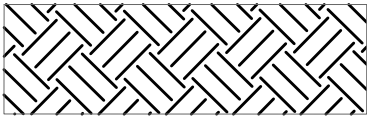
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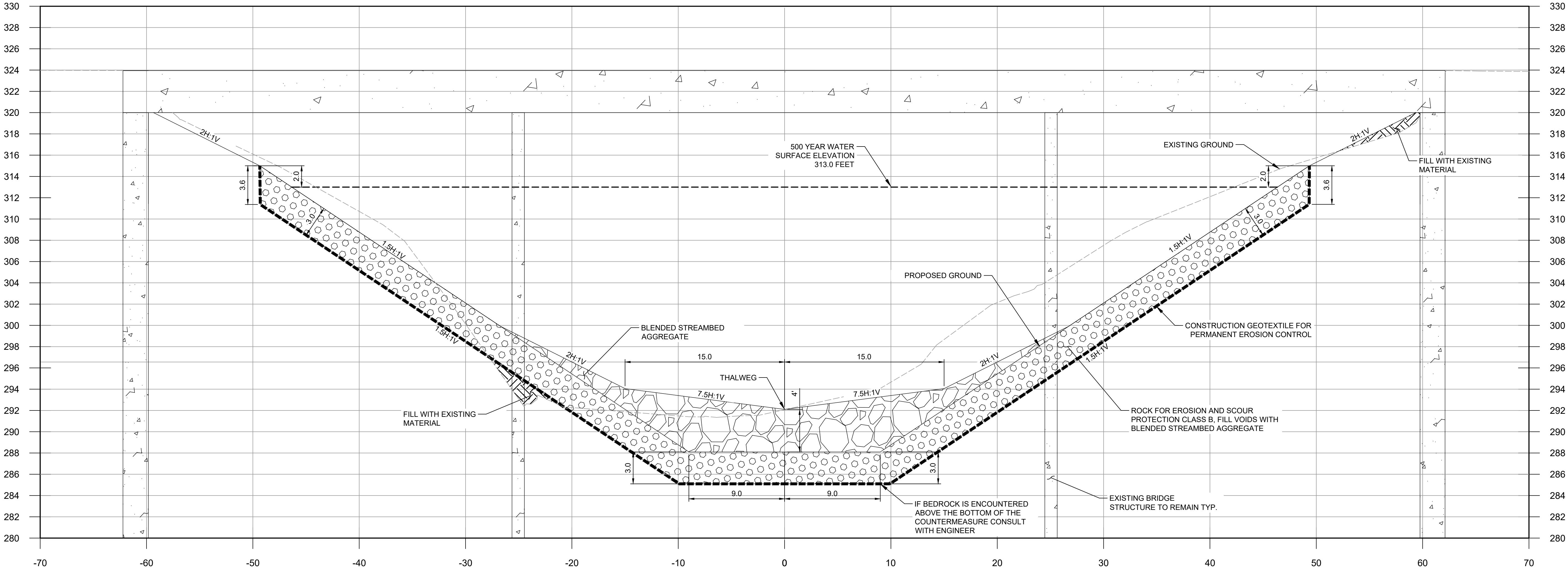
ROCK FOR EROSION AND SCOUR PROTECTION CLASS B, 3-FOOT THICKNESS



BLENDED STREAMBED AGGREGATE



EXISTING MATERIAL



SECTION C - TYPICAL SCOUR COUNTERMEASURE AND STREAM RECONSTRUCTION SECTION

SCALE: 1"=5'



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DATE : 05/14/2026

NO.	DATE	REVISION	BY	APP.

WILDWOOD MP 10.14 BRIDGE
SCOUR REPAIR

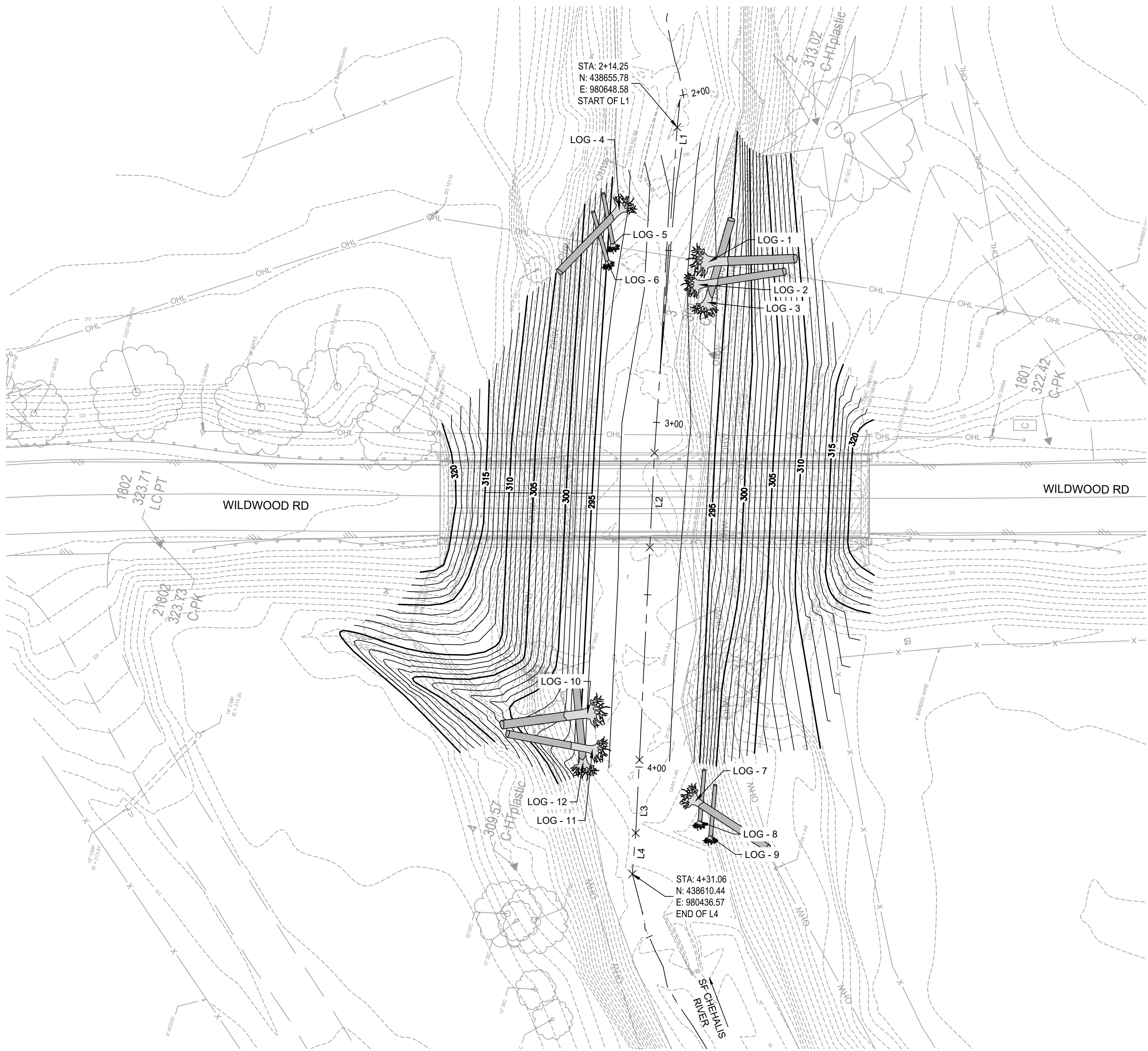
99% CONSTRUCTION PLANS
COUNTY ROAD PROJECT NO: 2159S

SCOUR COUNTERMEASURE DETAILS

SHEET

10
OF
15

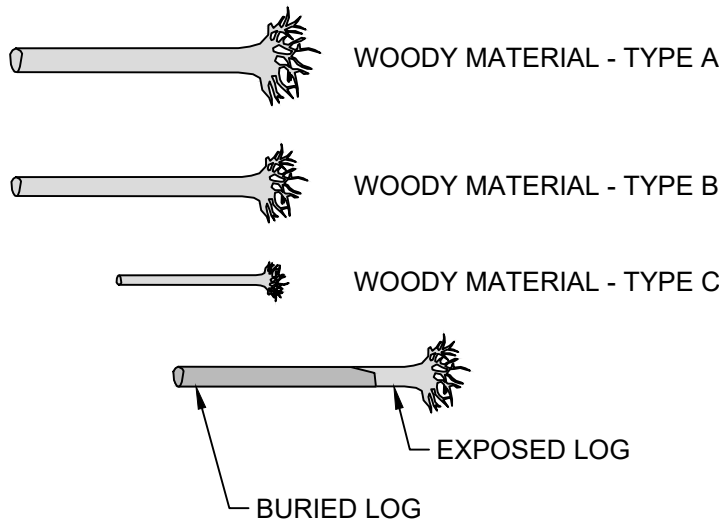




GENERAL NOTE:

- 1. ALL MATERIAL AND WORK SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION, "STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION" 2026 EDITION AND SPECIAL PROVISIONS.
- 2. LOCATIONS AND ORIENTATIONS OF LWM FEATURES ARE APPROXIMATE AND SHALL BE STAKED BY THE CONTRACTOR AND APPROVED BY THE FIELD STREAM DESIGN ENGINEER. FINAL LOCATION AND ORIENTATION OF THESE FEATURES SHALL BE APPROVED BY THE FIELD STREAM DESIGN ENGINEER.
- 3. SEE SHEET 12 FOR LARGE WOODY MATERIAL DETAILS.
- 4. SEE SHEET 10 FOR TYPICAL STREAM SECTION.
- 5. SEE SHEET 8 FOR STREAM PROFILE.

LEGEND



LOG LAYOUT TABLE

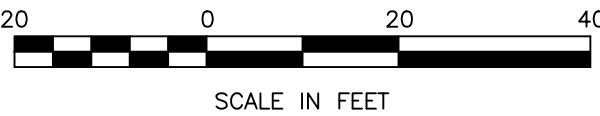
LOG ID	ROOTWAD CROWN STA OFFSET	ROOTWAD CROWN ELEVATION	LOG END STA OFFSET	LOG END ELEVATION	LWM TYPE AND DETAIL
1	2+52.5, 12.0' L	295.8'	2+49.9, 36.3' L	297.5'	LWM TYPE A, SEE DETAIL 1
2	2+59.3, 9.6' L	295.5'	2+53.9, 33.5' L	297.7'	LWM TYPE B, SEE DETAIL 1
3	2+64.3, 12.3' L	293.6'	2+40.3, 17.4' L	292.7'	LWM TYPE B, SEE DETAIL 1
4	2+39.2, 15.1' R	296.3'	2+58.1, 30.8' R	297.6'	LWM TYPE B, SEE DETAIL 2
5	2+49.4, 16.2' R	294.5'	2+35.1, 20.0' R	294.2'	LWM TYPE C, SEE DETAIL 2
6	2+54.5, 17.4' R	294.9'	2+40.6, 22.5' R	294.6'	LWM TYPE C, SEE DETAIL 2
7	4+09.0, 16.9' L	295.5'	4+13.8, 40.9' L	296.8'	LWM TYPE B, SEE DETAIL 2
8	4+14.9, 18.4' L	294.0'	4+00.1, 18.9' L	294.1'	LWM TYPE C, SEE DETAIL 2
9	4+19.1, 21.8' L	295.0'	4+04.3, 22.2' L	294.7'	LWM TYPE C, SEE DETAIL 2
10	3+85.2, 15.7' R	296.4'	3+89.3, 39.7' R	298.1'	LWM TYPE A, SEE DETAIL 1
11	3+95.6, 13.8' R	295.4'	3+92.3, 38.1' R	297.6'	LWM TYPE B, SEE DETAIL 1
12	3+99.5, 16.2' R	294.3'	3+74.9, 19.6' R	293.4'	LWM TYPE B, SEE DETAIL 1

LOG SCHEDULE

LOG TYPE	LOG SIZE	QUANTITY
A	25' LOG WITH ROOTWAD DBH 30"	2
B	25' LOG WITH ROOTWAD DBH 24"	6
C	15' LOG WITH ROOTWAD DBH 12"	4

CENTERLINE LINE DATA

NO.	BEARING	DISTANCE
L1	S78°28'57"W	94.60
L2	S77°20'46"W	27.41
L3	S77°22'10"W	21.16
L4	S79°12'38"W	11.96



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NO.	DATE	REVISION	BY	APP.

WILDWOOD MP 10.14 BRIDGE
SCOUR REPAIR

99% CONSTRUCTION PLANS
COUNTY ROAD PROJECT NO: 2159S
STREAM RECONSTRUCTION PLAN

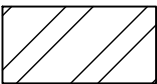
SHEET
11
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15

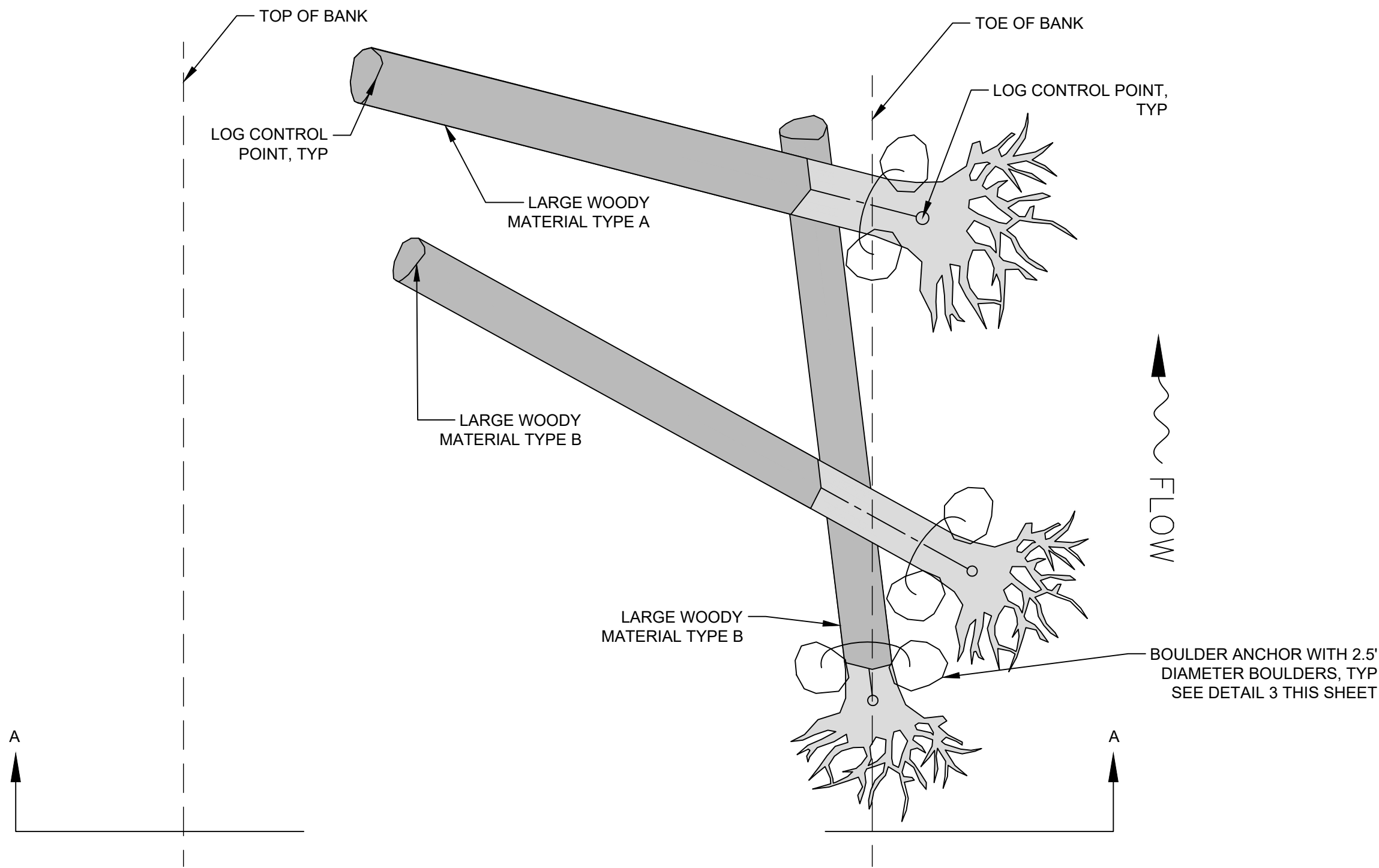


STREAM RECONSTRUCTION NOTES:

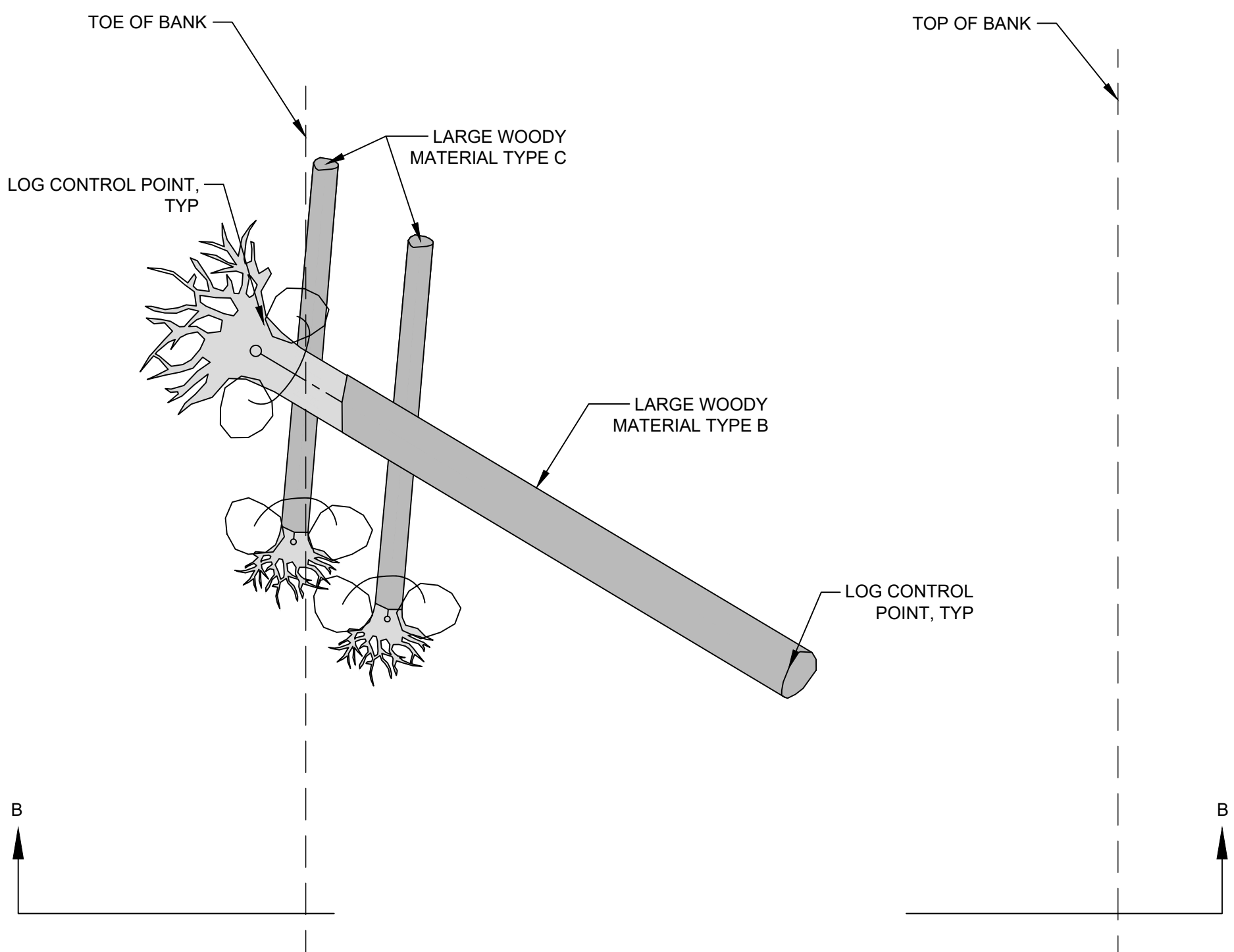
1. DETAILS SHOWN ON THIS SHEET MAY BE ROTATED OR MIRRORED. SEE SHEET 11 FOR LARGE WOODY MATERIAL (LWM) ORIENTATIONS.
2. SEE LWM LAYOUT TABLE AND LWM SCHEDULE ON SHEET 11 FOR LOG CONTROL POINTS, TOP OF LOG ELEVATIONS, AND LOG DIMMENSIONS.
3. SEE SPECIAL PROVISIONS 8-33 "LOG STRUCTURES" FOR LWM.
4. LOCATIONS AND ORIENTATIONS OF STREAMBED FEATURES ARE APPROXIMATE AND SHALL BE STAKED PER PLAN BY THE CONTRACTOR AND APPROVED BY THE FIELD STREAM DESIGN ENGINEER. FINAL LOCATION AND ORIENTATION OF THESE STREAMBED FEATURES SHALL BE APPROVED BY THE FIELD STREAM DESIGN ENGINEER.
5. BLENDED STREAMBED AGGREGATE IS 25% 4-INCH COBBLES AND 75% STREAMBED SEDIMENT. SEE STANDARD SPECIFICATIONS 8-30 "STREAM, RIVERS, AND WATERBODIES."
6. ALL LWM DETAIL SECTIONS ON THIS SHEET ARE LOOKING DOWNSTREAM.
7. LWM BANK FILL MIX IS 50% BLENDED STREAMBED AGGREGATE AND 50% ROCK FOR EROSION CONTROL AND SCOUR PROTECTION CLASS B

LEGEND:

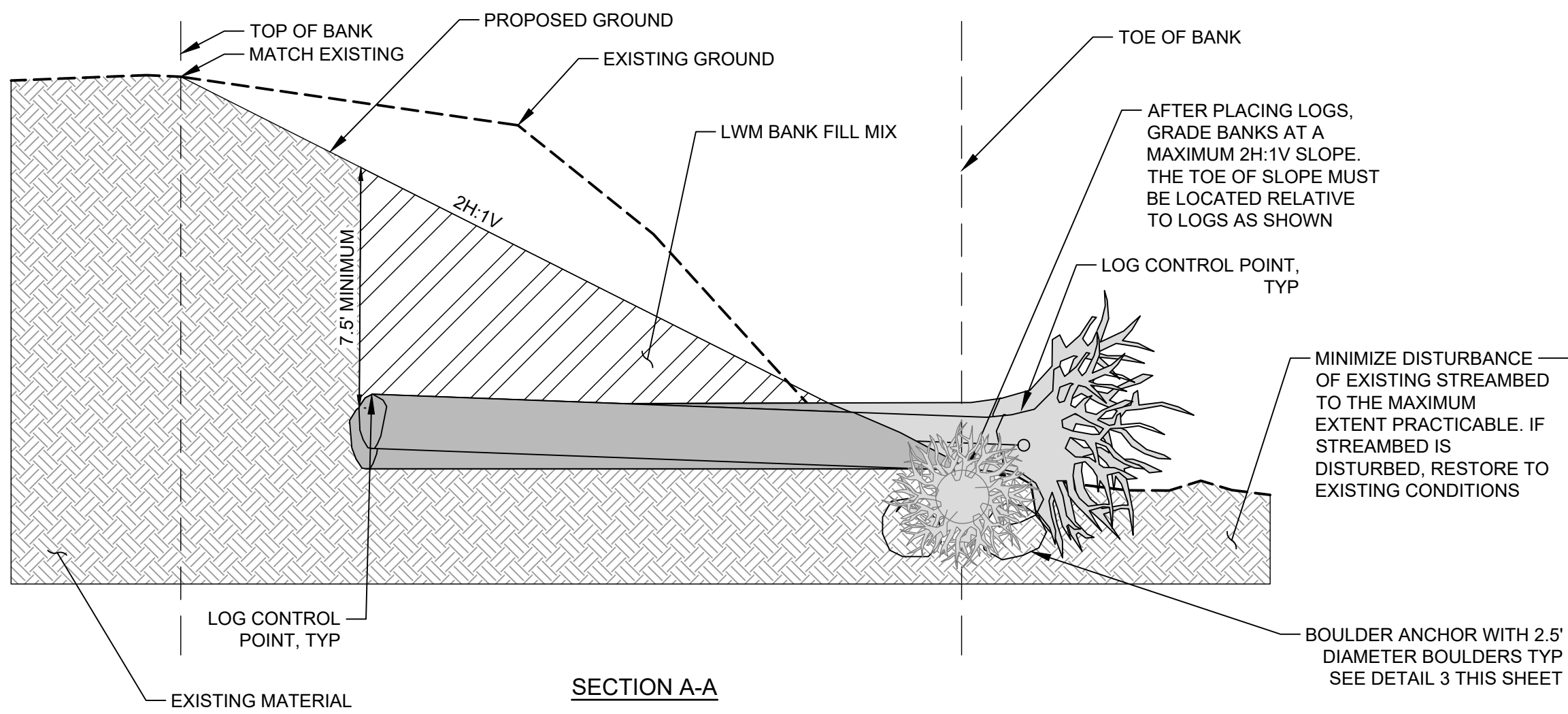
-  LWM BANK FILL MIX
-  EXISTING MATERIAL



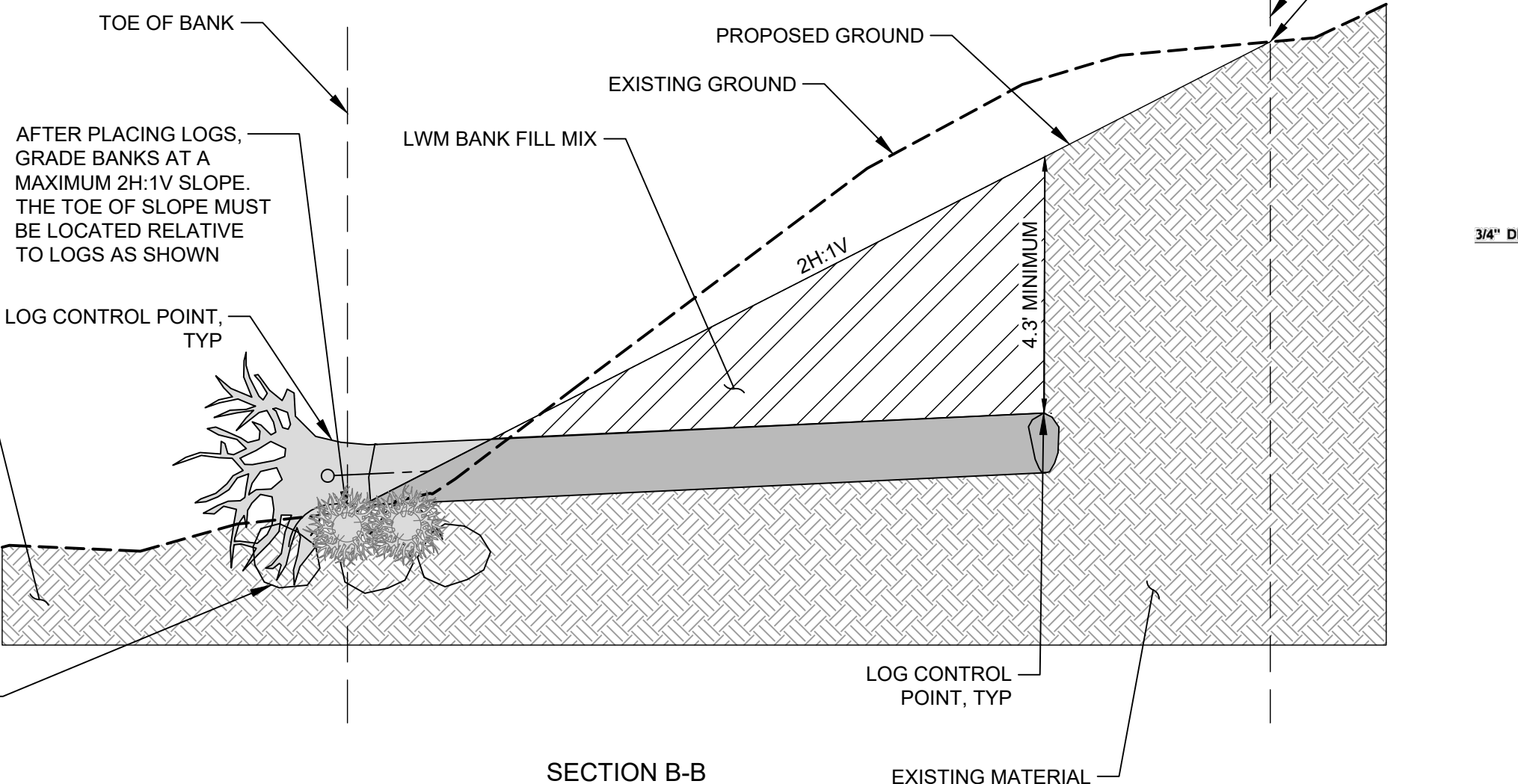
PLAN VIEW



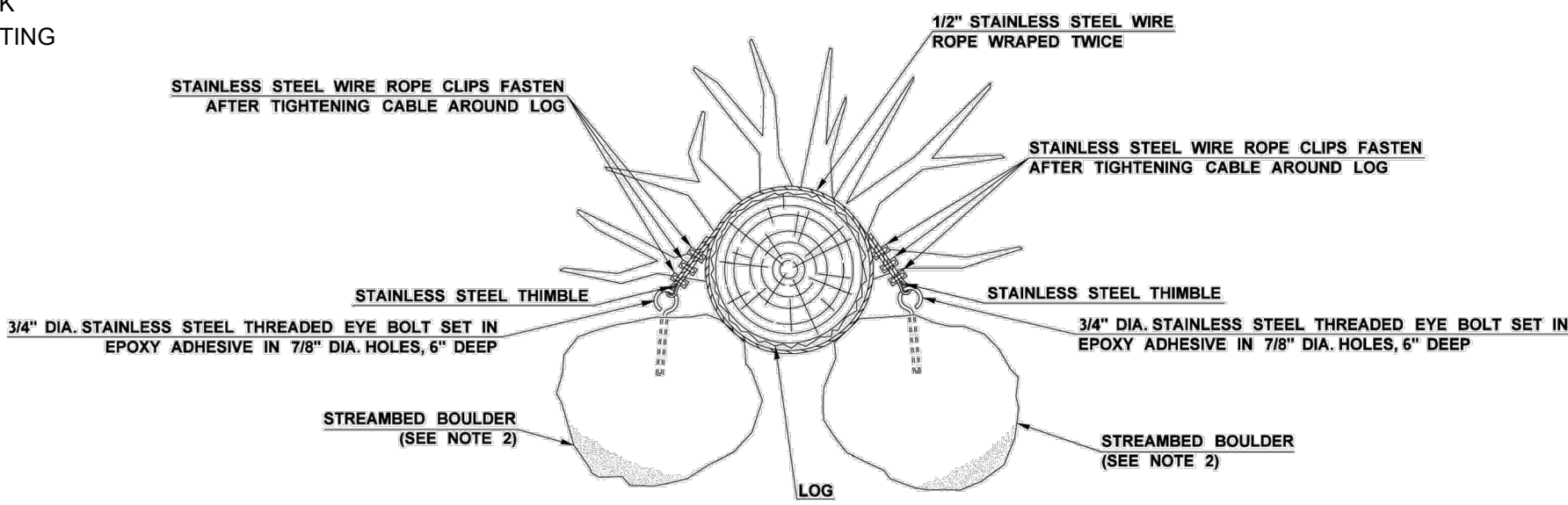
PLAN VIEW



SECTION A-A



SECTION B-B



NOTES:

1. SEE SPECIAL PROVISIONS "WOODY MATERIAL" FOR DESCRIPTION OF MATERIALS AND CONSTRUCTION REQUIREMENTS.
2. SEE STANDARD SPECIFICATIONS 8-30 "WATER CROSSINGS" FOR BOULDER DESCRIPTION.

1
11
LARGE WOODY MATERIAL (LWM) LOG JAM - DETAIL 1
NOT TO SCALE

2
11
LARGE WOODY MATERIAL (LWM) LOG JAM - DETAIL 2
NOT TO SCALE

3
12
BOULDER ANCHOR - DETAIL 3
NOT TO SCALE

NO.	DATE	REVISION	BY	APP.

Appendix F: Revetment Rock Sizing Calculations

Particle size for which 30% is finer by weight, ft (m)	d30	0.949	ft	
Local depth of flow, ft (m)	y	21.36	ft	
Safety factor (must be > 1.0)	Sf	2		
Stability coefficient (for blanket thickness = d100 or 1.5d50, whichever is greater, and uniformity ratio d85/d15 = 1.7 to 5.2)	Cs	0.3	<-- select which Cs to use	
	angular rock	0.3		
	rounded rock	0.375		
Velocity distribution coefficient	Cv	1.08	<-- select which Cv to use	
for straight channels or the inside of bends		1.00		Countermeasure not on bed. 2D model used
for the outside of bends (1.0 for Rc/W > 26)	Cv = 1.283 - 0.2log(Rc/W)	1.08		
downstream from concrete channels		1.25		
at the end of dikes		1.25		
Blanket thickness coefficient given as a function of the uniformity ratio d85/d15. CT = 1.0 is recommended because it is based on very limited data.	CT	1		
Characteristic velocity for design, defined as the depth-averaged velocity at a point 20% upslope from the toe of the revetment, ft/s (m/s)	Vdes	9.76	<-- select which Vdes to use	
For natural channels	Vdes = Vavg(1.74 – 0.52log(Rc/W))	9.76	ft/s	
	Vdes = Vavg for Rc/W > 26	6.24	ft/s	Countermeasure not on bed. 2D model used
For trapezoidal channels	Vdes = Vavg (1.71 – 0.78 log (Rc/W))	9.02	ft/s	
	Vdes = Vavg for Rc/W > 8	6.24	ft/s	
	Rc/W	2.18		
Channel cross-sectional average velocity, ft/s (m/s)	Vavg	6.24	ft/s	
Side slope correction factor	K1(see equation on right)	0.72		
bank angle in degrees	θ	33.70	degrees	1.5:1 slope = 33.7 degrees
Centerline radius of curvature of channel bend, ft (m)	Rc	240	ft	
Width of water surface at upstream end of channel bend, ft (m)	W	110	ft	
Specific gravity of riprap	Sg	2.65		
Acceleration due to gravity	g	32.2	ft/s2	
	d50	1.139	ft	

SMS Results - 500yr upstream observation line

Reach	Station	Velocity ft/s Ave	Water_Depth ft Max
reach_2	5+01	6.24	21.36

$$d_{30} = y(S_f C_S C_V C_T) \left[\frac{(V_{des})}{\sqrt{K_1(S_g - 1)gy}} \right]^{2.0} \quad (4.1)$$

- where:
- d_{30} = Particle size for which 30% is finer by weight, ft (m)
 - y = Local depth of flow, ft (m)
 - S_f = Safety factor (must be > 1.0)
 - C_S = Stability coefficient (for blanket thickness = d_{100} or $1.5d_{50}$, whichever is greater, and uniformity ratio d_{85}/d_{15} = 1.7 to 5.2)
 - = 0.30 for angular rock
 - = 0.375 for rounded rock
 - C_V = Velocity distribution coefficient
 - = 1.0 for straight channels or the inside of bends
 - = $1.283 - 0.2\log(R_c/W)$ for the outside of bends (1.0 for $R_c/W > 26$)
 - = 1.25 downstream from concrete channels
 - = 1.25 at the end of dikes
 - C_T = Blanket thickness coefficient given as a function of the uniformity ratio d_{85}/d_{15} . $C_T = 1.0$ is recommended because it is based on very limited data.
 - V_{des} = Characteristic velocity for design, defined as the depth-averaged velocity at a point 20% upslope from the toe of the revetment, ft/s (m/s)
 - For natural channels, $V_{des} = V_{avg}(1.74 - 0.52\log(R_c/W))$
 $V_{des} = V_{avg}$ for $R_c/W > 26$
 - For trapezoidal channels, $V_{des} = V_{avg}(1.71 - 0.78 \log(R_c/W))$
 $V_{des} = V_{avg}$ for $R_c/W > 8$
 - V_{avg} = Channel cross-sectional average velocity, ft/s (m/s)
 - K_1 = Side slope correction factor

$$K_1 = \sqrt{1 - \left(\frac{\sin(\theta - 14^\circ)}{\sin(32^\circ)} \right)^{1.6}}$$
 - where: θ is the bank angle in degrees
 - R_c = Centerline radius of curvature of channel bend, ft (m)
 - W = Width of water surface at upstream end of channel bend, ft (m)
 - S_g = Specific gravity of riprap (usually taken as 2.65)
 - g = Acceleration due to gravity, 32.2 ft/s² (9.81 m/s²)

$$d_{50} = 1.20 d_{30}$$

Appendix G: Pier Rock Sizing Calculations

Particle size for which 50% is finer by weight, ft (m)	d ₅₀	0.57 ft
Design velocity for local conditions at the pier, ft/s (m/s)	V _{des}	9.38 ft/s
Specific gravity of riprap (usually taken as 2.65)	S _g	2.65
Acceleration due to gravity	g	32.2 ft/s ²
Shape factor equal to	K ₁	1.5 <-- select which K ₁ to use
1.5 for round-nose piers		1.5
1.7 for square-faced piers		1.7
V _{max}		6.25 ft/s

11.3 SIZING ROCK RIPRAP AT BRIDGE PIERS

To determine the required size of stone for riprap at bridge piers, NCHRP Project 24-23 recommends using the rearranged Isbash equation from the Federal Highway Administration's Hydraulic Engineering Circular No. 23 (Second Edition) (Lagasse et al. 2001) to solve for the median stone diameter:

$$d_{50} = \frac{0.692(V_{des})^2}{(S_g - 1)2g} \quad (11.1)$$

where:

- d_{50} = Particle size for which 50% is finer by weight, ft (m)
- V_{des} = Design velocity for local conditions at the pier, ft/s (m/s)
- S_g = Specific gravity of riprap (usually taken as 2.65)
- g = Acceleration due to gravity, 32.2 ft/s² (9.81 m/s²)

It is important that the velocity used in Equation 11.1 is representative of conditions in the immediate vicinity of the bridge pier including the constriction caused by the bridge. If the cross-section or channel average velocity, V_{avg} , is used, then it must be multiplied by factors that are a function of the shape of the pier and its location in the channel:

$$V_{des} = K_1 K_2 V_{avg} \quad (11.2)$$

If a velocity is distribution available from stream tube or flow distribution output of a 1-D model or directly from a 2-D model, then only the pier shape coefficient should be used. The maximum velocity in the active channel V_{max} is often used since the channel could shift and the highest velocity could impact any pier.

$$V_{des} = K_1 V_{max} \quad (11.3)$$

where:

- V_{des} = Local velocity at pier, ft/s (m/s)
- K_1 = Shape factor equal to 1.5 for round-nose piers or 1.7 for square-faced piers
- K_2 = Velocity adjustment factor for location in the channel (ranges from 0.9 for a pier near the bank in a straight reach, to 1.7 for a pier located in the main current of flow around a sharp bend)
- V_{avg} = Channel average velocity at the bridge, ft/s (m/s)
- V_{max} = Maximum velocity in the active channel, ft/s (m/s)

SMS results

Proposed Conditions	500yr
Reach	Station Vel Max ft/s
reach_2	313.295 6.25

Appendix D

Critical Areas Report



Wildwood MP 10.14 Bridge Scour Project

Wetland and Stream Delineation Report

Submitted to:

Rodney Lakey
Lewis County
57 West Main Street
Chehalis, WA 98532

Prepared by:

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Project No. 21588.B

Executive Summary

The Lewis County Department of Public Works (County) is proposing to install scour countermeasures at the Wildwood Road Mile Post (MP) 10.14 Bridge spanning the South Fork Chehalis River (Lewis County Bridge No. 03) in unincorporated Lewis County. The 124-foot three span bridge was originally constructed in 1955 and is currently classified as scour critical.

The County requested Otak, Inc. (Otak) to identify, characterize, and delineate wetlands and stream boundaries and assess wildlife habitat at the Wildwood Road and South Fork Chehalis River crossing as part of the County's repair of Lewis County Bridge No. 03. This Wetland and Stream Delineation Report was completed for the project by reviewing background information, delineating wetland and stream boundaries in the field, classifying wetlands and stream habitats and assessing their functions, and determining buffer widths per the Lewis County Code (LCC) Chapter 17.38 (Critical Areas) and Shoreline Master Program at LCC 17.25. Critical areas covered in this report include wetlands, streams, and fish and wildlife habitat conservation areas (FWHCAs).

Otak biologists conducted field investigations on December 3, 2024. The study area for this report included areas along both sides of Wildwood Road and South Fork Chehalis River, upstream and downstream of Bridge No. 03. Areas immediately beyond the study area were also visually assessed to identify any wetlands and streams with buffers that could extend into the study area.

Utilizing techniques and methods published in the *1987 US Army Corps of Engineers (USACE) Wetlands Delineation Manual* (USACE 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (Version 2.0) (USACE 2010), no wetlands were observed in the project study area or in the adjacent areas.

One stream (South Fork Chehalis River) was identified in the study area. The South Fork Chehalis River is a Type S (Shoreline of the State) stream with an assigned buffer of 0 feet per the Lewis County Shoreline Master Program (Table 4-1, Section 4.04.02).

The project is located within the 100-year floodplain of the South Fork Chehalis River. The project area is within the Rural Conservancy Shoreline Environment Designation per the Lewis County Shoreline Master Program.

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Section 1. Introduction

Lewis County (County) requested Otak, Inc. (Otak) to identify, characterize, and delineate wetlands and streams and assess wildlife habitat for the County's repair of Lewis County Bridge No. 03. This Wetland and Stream Delineation Report was completed along the road right-of-way, South Fork Chehalis River, and potential access and staging areas by reviewing background information, delineating wetland and stream boundaries in the field, classifying wetlands and stream habitats and assessing their functions, and determining buffer widths per the Lewis County Code (LCC) Chapter 17.38 (Critical Areas) (Lewis County 2025a) and the Lewis County Shoreline Management program (LCC 17.25)(Lewis County 2021). This Wetland and Stream Delineation Report has been prepared in accordance with county, state, and federal standards to document baseline conditions regarding frequently flooded areas, wetlands, streams, and fish and wildlife habitat conservation areas (FWHCAs).

1.1. Project Location and Landscape Setting

The proposed project is located on Wildwood Road at the crossing of the South Fork Chehalis River in unincorporated Lewis County, Washington (Appendix B: Figure 1—Vicinity Map). It is located in Section 24, Township 12 North, Range 4 West, in Water Resource Inventory Area (WRIA) 23 – Upper Chehalis. The project area generally includes areas along Wildwood Road within 100 feet of the South Fork Chehalis River bridge. Land abutting the project area includes agricultural and undeveloped areas. The South Fork Chehalis River flows through the project area from southwest to northeast passing under Wildwood Road at mile post (MP) 10.14. The project area is within the 100-year floodplain of the South Fork Chehalis River.

1.2. Project Description

The County is proposing to install scour countermeasures at Lewis County Bridge No. 03 in unincorporated Lewis County. The 124-foot three span bridge was originally constructed in 1955 and is currently classified as scour critical. The project intends to complete necessary repairs to the bridge in order to maintain vehicular access and protect public safety along Wildwood Road.

Section 2. Methods

This chapter summarizes the methods used in accordance with local, state, and federal guidance in delineating wetland and stream boundaries in Washington State. While no wetlands were present, the study area was evaluated for the presence of wetlands using the methodology outlined in this section. See Table A-1 in Appendix A for further details regarding the methods used to produce this report.

2.1. Review of Available Published Information

Available published information was reviewed prior to the field investigation to identify any previously documented wetlands, streams, or other pertinent site characteristics (e.g., vegetation community patterns, topography, soils, or water courses) that would indicate the presence of wetlands, streams and other critical areas within the project site. These maps are typically used as guidance, and do not supersede conditions in the field. As part of this effort Otak biologists reviewed the following sources:

- Soil survey from the United States Natural Resources Conservation Service (NRCS) (NRCS 2025a);
- National Wetlands Inventory (NWI) map (USFWS 2025a);
- United States Geological Survey (USGS) topographic maps (USGS 2025)
- Washington Department of Natural Resources (WDNR) Forest Practices Application Mapping Tool (WDNR 2025);
- Lewis County GIS Web Map (Lewis County 2025b);
- Washington Department of Fish and Wildlife (WDFW) Priority Habitat and Species (PHS) maps (WDFW 2025a);
- Statewide Washington Integrated Fish Distribution Map (SWIFD) (WDFW 2025b);
- U.S. Fish & Wildlife Service (USFWS) Information for Planning and Consultation Tool (IPaC) (USFWS 2025b).

Appendix B contains figures associated with the background review, including: 2024 aerial photography of the study area (Figure 2) (Maxar 2024), USGS Topographic map (Figure 3), NWI map (Figure 4), NRCS Soils map (Figure 5), Lewis County Critical Areas Inventory (Figure 6), and Lewis County Shoreline Environment Designations (Figure 7).

Soil units mapped within the study area include three soil series: Chehalis silty clay, Melbourne loam, and Newberg fine sandy loam (Table 2-1)(Figure 5). Major soil components of the map unit soil series are classified non-hydric. Minor components of the soil series are classified as hydric.

Table 2-1 – NRCS Soil Units Mapped in Study Area.

Mapped Soil Unit	Slope %	Drainage Class	Landform	Parent Material	Hydric?
Chehalis silty clay	0-3	Well drained	Flood Plains & Terraces	Alluvium	No (10% hydric minor components)
Melbourne loam	0-8	Well drained	Terraces	Residuum from siltstone	No (5% hydric minor components)
Newberg fine sandy loam	0-3	Well drained	Terraces & Flood Plains	-	No (15% hydric minor components)

The NWI map identifies the South Fork Chehalis River corridor as a permanently flooded, unconsolidated bottom, upper perennial riverine (R3UBH) habitat. Additionally, a persistent, seasonally flooded, palustrine emergent freshwater wetland (PEM1C) is mapped northeast of the study area.

The WDNR Forest Practices Application Mapping Tool maps the South Fork Chehalis River as a Type S (Shoreline of the State) waterbody. A wetland is mapped by Lewis County offsite and northeast of the study area. Species identified by the WDFW PHS mapper include occurrence and migration of rainbow trout and winter steelhead trout (*Oncorhynchus mykiss*), occurrence and breeding of fall and spring Chinook salmon (*Oncorhynchus tshawytscha*), occurrence and migration of resident coastal cutthroat (*Oncorhynchus clarki*), and occurrence and migration of coho salmon (*Oncorhynchus kisutch*) in the South Fork Chehalis River. The WDFW PHS mapper also identified regular concentrations (winter range) of the Willapa Herd of Roosevelt elk (*Cervus elaphus roosevelti*) in the general vicinity.

Regarding species listed under the Endangered Species Act (ESA), the USFWS IPaC tool maps the potential presence of marbled murrelet (*Brachyramphus marmoratus*), yellow-billed cuckoo (*Coccyzus americanus*), bull trout (*Salvelinus confluentus*), monarch butterfly (*Danaus plexippus*), Suckley's cuckoo bumble bee (*Bombus suckleyi*) and Kincaid's lupine (*Lupinus sulphureus ssp. kincaidii*). However, suitable habitats for these ESA-listed species do not occur in the study area, and no designated critical habitats for ESA-listed species are mapped at this location.

2.2. Precipitation Data and Analysis

2.2.1. Evaluation of Growing Season

Wetland hydrologic conditions are considered present if soils are inundated or saturated to the surface continuously for at least 5 percent of the growing season in most years (50 percent probability of recurrence) (USACE 1987). The technical standard for disturbed or problematic sites requires 14 or more consecutive days of flooding or ponding, or a water table 12 inches or less below the soil surface, during the growing season, at a minimum frequency of 5 years in 10 (USACE 2010).

The beginning and ending dates of the growing season can be defined based on two indicators of biological activity that are readily observable in the field: (1) above ground growth and development of vascular plants, and (2) soil temperature. However, due to seasonal fluctuations from year to year the growing season dates may also be approximated by the number of frost-free days, defined as the time from the last date in spring when the ambient air temperature drops to 28°F, to the first date in fall when it drops to 28°F, over a 30-year period (USACE 2010).

Due to insufficient data, the beginning and ending dates for the growing season for the project site were not estimated from long-term weather records (1994-2023) at the Mayfield Power Plant Climate Station as the median dates (70 percent probability) for the first and last 28°F days. The estimated dates corresponding with the growing season are based on historical climate data and information obtained from the nearest climate station with sufficient data. The nearest climate station with complete historical monthly precipitation data for the 30-year period prior to the site visit is the Centralia Climate Station (NRCS 2025b). Based on long-term weather records at this station, the average start and end dates for the growing season for the area are March 23 and November 15, respectively, for a total growing season of 237 days (NRCS 2025b). As such, continuing wetland hydrologic conditions must be present for at least 12 consecutive days during the growing season for this site.

2.2.2. Precipitation Data during Field Investigation

The field survey for the project was conducted on December 3, 2024. The area received 3.51 inches of precipitation in the two-week period (November 18 – December 2) prior to the field survey as measured at

the Mayfield Power Plant Climate Station (NRCS 2025c). The Mayfield Power Plant Climate Station was used to evaluate recent precipitation during the field visit because the Centralia Climate Station did not have recent data available. Precipitation amounts for the three months preceding the field survey were normal in September 2024, above normal in October 2024, and normal in November 2024 (Table 2-2) as measured at the Mayfield Power Plant Climate Station.

Table 2-2—Summary of Precipitation Data from September 1 to November 30, 2024

Category	September 2024	October 2024	November 2024
Recorded Precipitation (inches)	1.40	5.38	7.57
Precipitation Average	1.63	4.01	6.59
30-70% Normal Range (inches) from 1995-2024	0.61 – 1.92	2.94 – 4.72	4.17 – 7.80
Comparison to Normal Range	Normal	Above Normal	Normal

Source: NRCS 2025b & NRCS 2025c.

2.3. Field Investigation

Stream boundaries were delineated in the field by Otak biologists on December 3, 2024. The OHWM of the South Fork Chehalis River was marked with sequentially numbered orange flagging. Two data points were assessed for wetland indicators and recorded in the field. Latitude and longitude were recorded for each data point. Data point locations are shown on Figure 8 (Appendix B).

2.3.1. Wetlands

The delineation was conducted utilizing techniques published in the *1987 US Army Corps of Engineers Wetlands Delineation Manual* (USACE 1987), and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)* (USACE 2010). Following routine methodology, data on vegetation, soils, and hydrology were collected at multiple locations.

Vegetation

Representative upland and wetland vegetation communities were documented during the field survey. Typically, three vegetation strata are inventoried, including trees within a 30-foot diameter plot, shrubs within a 15-foot diameter plot, and non-woody herbaceous plants (including forbs, grasses, sedges, and rushes) within a 5-foot diameter plot. Plant species in each stratum were identified and absolute percent cover was visually assessed. Each species was listed following the scientific nomenclature given in the United States Department of Agriculture (USDA) PLANTS database (NRCS 2025d). The wetland indicator status for each species was assigned using the *2022 National Wetland Plant List for the Western Mountains, Valleys & Coast Region* (USACE 2022).

The dominance test was the primary indicator used to determine the presence or absence of hydrophytic vegetation. A data point is considered to have a hydrophytic vegetation community if more than 50 percent of the dominant species have an indicator status of facultative (FAC), facultative-wetland (FACW), or obligate (OBL). Dominant species are defined as those that individually or collectively account for more than 50 percent of the total areal coverage of vegetation in the stratum, plus any other species that, by itself, accounts for at least 20 percent of the total areal coverage (USACE 2010). If more than 50 percent of the dominant plant species in a community have wetland indicator status of OBL, FACW, or FAC, then the plant community is considered hydrophytic (wetland).

Soils

Per USACE protocol, soil samples were obtained at representative data points by digging a pit to a depth of at least 18 inches (if possible). The Field Indicators of Hydric Soils in the United States, Version 9.0 (NRCS 2024) was used to determine the presence or absence of hydric soil. Soil colors were evaluated using a Munsell® soil color chart (Munsell Color 2010) to distinguish hydric from non-hydric soils. Soils were textured using the Guide to Texture by Feel chart (NRCS 2022).

Hydric soils are defined as soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part of the soil profile (USACE 2010). Hydric soils may exhibit certain characteristics that can be observed in the field, such as: high organic content, accumulation of sulfidic material, greenish or bluish-gray color (gleyed formation), depleted matrices, and development of redoximorphic features.

Hydrology

Wetland hydrologic conditions are considered present if, during the growing season, an area has 14 or more consecutive days of flooding or ponding; or a water table 12 inches or less below the soil surface, during the growing season at a minimum frequency of 5 years in 10 (USACE 1987 and 2010). The presence of primary and secondary wetland hydrologic indicators was determined at each wetland data point.

Primary indicators of wetland hydrology may include, but are not limited to, surface water, soil saturation within 12 inches of the surface, shallow water table, and evidence of previous water inundation or saturation (e.g., watermarks, algal mats, sediment deposits). Secondary indicators may include wetland drainage patterns, geomorphic position, stunted or stressed plants, and water-stained leaves. When at least one primary or two secondary indicators were observed, wetland hydrology was determined to occur during the growing season long enough to result in wetland hydrology conditions.

2.3.2. Ordinary High-Water Mark

The OHWM along streams within the study area were determined in the field based on the methodology outlined in the *National Ordinary High Water Mark Field Delineation Manual for Rivers and Streams* (USACE 2025) and *Determining the Ordinary High Water Mark for Shoreline Management Act Compliance in Washington State* (Ecology 2016). Identification of OHWM was based on the evaluation of stream physical characteristics, such as: presence of bed and banks, a natural line impressed on the bank, change in sediment and vegetation characteristics, wracking, erosion/scour, and silt deposits.

2.3.3. Fish and Wildlife Habitat Conservation Areas

Fish and Wildlife Habitat Conservation Areas (FWHCAs) are regulated per LCC 17.38 Article 4. Regulated FWHCAs include Aquatic Priority Habitat, WDFW Priority Habitats and Species, Locally Important Habitat and Species, and Designated Wildlife Areas (LCC 17.38.420)(Lewis County 2025a). Presence of listed species was visually assessed on December 3, 2024, during the field visit by Otak biologists (USFWS 2025b).

2.4. Wetland and Stream Classification and Ratings

Wetlands were not observed in the study area. Stream classifications were identified using WDNR's Forest Practices Activity Mapping Tool (WDNR 2025) and classified in accordance with LCC 17.38.470 and the Shoreline Master Program at LCC 17.25 (Lewis County 2021 and 2025a). Buffer widths were determined according to LCC 17.38.470 (Fish and Wildlife Habitat Conservation Areas –

Classification), Table 17.38-6 (Fish and Wildlife Habitat Conservation Areas – Regulated Areas), and the Lewis County Shoreline Master Program (Table 4-1, Section 4.04.02).

2.5. Mapping Methods

Stream OHWM flags were collected using traditional survey methods as part of the civil survey for engineering design. Survey data was converted to GIS files and imported to project maps for this report.

Section 3. Existing Conditions

3.1. Delineated Wetlands

Utilizing techniques published in the *1987 US Army Corps of Engineers Wetlands Delineation Manual* (USACE 1987), and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (Version 2.0) (USACE 2010), it was determined that no wetlands are present in the project study area. Soil samples in the study area lacked any hydric soil indicators with a matrix color of 10YR 4/3 and a lack of redoximorphic features to a depth of 20 inches. Vegetation in the study area outside the OHWM of the South Fork Chehalis River included typical upland species such as big-leaf maple (*Acer macrophyllum*), Douglas-fir (*Pseudotsuga menziesii*), snowberry (*Symphoricarpos albus*), and Nootka rose (*Rosa nutkana*).

3.2. Delineated Watercourses and Riparian Buffers

Otak biologists identified and delineated one watercourse (South Fork Chehalis River) in the study area as shown in Figure 8 in Appendix B. The South Fork Chehalis River does not have a stream buffer for the bridge scour protection project per the Lewis County Shoreline Master Program (SMP). Per the SMP, shoreline buffers for bridge projects are 0 feet regardless of the land use intensity or shoreline designation (Lewis County 2021). Stream characteristics, water type, and buffer width for South Fork Chehalis River are summarized in Table 3-1. Site photographs are provided in Appendix C.

Table 3-1–South Fork Chehalis River Summary

South Fork Chehalis River Information Summary			
Location:		Looking south/downstream, upstream of bridge	
	Stream Name		South Fork Chehalis River
	Local Jurisdiction		Lewis County
	Stream Type		Type S
	Buffer Width		0 Feet
	Cowardin Class		R3UBH
Documented Fish Use	The Statewide Integrated Fish Distribution (SWIFD) (WDFW 2025b) inventory lists the documented spawning of Chinook salmon (<i>Oncorhynchus tshawytscha</i>), the documented presence of coho salmon (<i>Oncorhynchus kisutch</i>), the presumed presence of rainbow trout (<i>Oncorhynchus mykiss</i>), and the documented presence of steelhead (<i>Oncorhynchus mykiss</i>). According to NOAA Fisheries, the South Fork Chehalis River is not Critical Habitat for nor are there any fish present which are protected under the Endangered Species Act.		
Stream Buffer Condition	The South Fork Chehalis River does not have a stream buffer for the bridge scour protection project per the Lewis County Shoreline Master Program (SMP). Per the SMP, shoreline buffers for bridge projects are 0 feet regardless of the land use intensity or shoreline designation. The South Fork Chehalis River riparian area is mostly in agricultural land use. The steep banks of the South Fork Chehalis River are dominated by red osier dogwood (<i>Cornus sericia</i>), invasive Himalayan Blackberry (<i>Rubus armeniacus</i>), and invasive reed canarygrass (<i>Phalaris arundinacea</i>) with scattered big-leaf maple and Douglas-fir trees.		
Flow Regime and Flow Path	The South Fork Chehalis River originates in forested hills approximately 12 miles southwest of the study area. The South Fork Chehalis River continues north of the study area approximately 7 miles before discharging into the Chehalis River. The Chehalis River flows generally northwest for approximately 65 miles and outlets to Grays Harbor.		

Section 4. Regulatory Summary

4.1. U.S. Army Corps of Engineers

The Environmental Protection Agency (EPA) and USACE regulate wetlands and other waters of the United States (WOTUS) under Section 404 of the CWA. The agencies are currently interpreting “waters of the United States” per the “Revised definition of Waters of the United States rule” as published on January 18, 2023. This rule became effective on September 8, 2023. Tributaries of waters of the United States and wetlands adjacent to waters of the United States are included in the definition.

The South Fork Chehalis River is a tributary to a traditionally navigable water. Discharge of fill material into the South Fork Chehalis River is regulated under Section 404 and 401 of the CWA.

4.2. Washington State Department of Fish and Wildlife

WDFW requires issuance of a Hydraulic Permit Approval (HPA) prior to any activities that may directly or indirectly affect streams or associated aquatic resources considered as waters of the state per the Revised Code of Washington (RCW) 90.48.020. Construction in or near state waters that will “use, divert, obstruct, or change the natural flow or bed of any of the salt or fresh waters in the state” (RCW 77.55.011(11)) require an HPA. The South Fork Chehalis is considered a water of the state, and any work within or over the OHWM of these watercourses will require an HPA per the Hydraulic Code Rules (WAC 220-660).

4.3. Washington State Department of Ecology

Ecology regulates activities in wetlands and streams under Section 401 of the CWA through the Water Quality Certification process. Ecology has authority over discharge into all wetlands and streams and can impose buffers and compensatory mitigation for impacts per RCW 90.48 (Water Pollution Act) depending on the proposed project and impacts to aquatic resources.

4.4. Local Jurisdiction – Lewis County

Wetlands, streams, associated buffers, floodplains, and FWHCAs are regulated by Lewis County under LCC 17.38 – Critical Areas and the Lewis County Shoreline Management program. South Fork Chehalis is classified as a Type S (Shoreline of the State) and has a mapped FEMA effective 100-year floodplain.

The South Fork Chehalis River is a shoreline of the state (Type S) and regulated under the Lewis County Shoreline Master Program along with all shorelands within 200 feet of the ordinary high water of the South Fork Chehalis River. Shoreline jurisdiction extends for 200 feet from the OHWM at a minimum or the extent of the floodway, whichever is larger. A floodway is not mapped on this stretch of the South Fork Chehalis River, but the entire study area is within shoreline jurisdiction as it is within 200 feet of the OHWM on each bank. The study area is located in the rural conservancy shoreline environment designation. Under the Lewis County SMP, the South Fork Chehalis River has a Standard Shoreline Buffer from the OHWM of 0 feet per Table 4-1 in Section 4.04.02 for projects that include transportation facilities, including bridges for motorized or non-motorized uses.

Section 5. References

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Appendix A: Methods and Tools

Table A-1—Methods and Tools Used to Prepare the Report

Parameter	Method or Tool	Website	Reference
Wetland Delineation	Corps of Engineers Wetlands Delineation Manual	https://www.sac.usace.army.mil/portals/43/docs/regulatory/1987_wetland_delineation_manual_reg.pdf	U.S. Army Corps of Engineers. 1987. <i>Corps of Engineers Wetland Delineation Manual</i> . Environmental Laboratory Wetlands Research Program Technical Report Y-87-1, U.S. Army Corps of Engineers, Engineer Waterways Experiment Station, Vicksburg, Mississippi.
	Regional Supplement to the Corps of Engineers Wetland Delineation Manual: WMVC	https://usace.contentdm.oclc.org/utis/getfile/collection/p266001coll1/id/7646	U.S. Army Corps of Engineers. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0), ed. J.S. Wakely, R. W. Lichvar, and C.V. noble. ERDC/EL TR-10-3. Vicksburg, MS: U.S. Army Engineer Research and Development Center.
Wetland Classification	USFWS / Cowardin Classification System	https://www.epa.gov/sites/default/files/2017-05/documents/cowardin_1979.pdf	Cowardin, L. M., V. Carter, F. C. Golet, E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. Government Printing Office, Washington, D.C.
	Hydrogeomorphic Classification (HGM) System	https://usace.contentdm.oclc.org/digital/collection/p266001coll1/id/3348/	Brinson, M. M. 1993. "A hydrogeomorphic classification for wetlands," Technical Report WRP-DE-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. NTIS No. AD A270 053.
Wetland Rating	Washington State Wetland Rating System: Western WA	https://apps.ecology.wa.gov/publications/SummaryPages/2306009.html	Hruby & Yhanke. 2023. Washington State Wetland Rating System for Western Washington –2014 Update Version 2.0. Publication # 23-06-009.
	Lewis County Code	https://www.codepublishing.com/WA/LewisCounty/#!/LewisCounty17/LewisCounty1738.html#17.38	Website. Requires compliance with Lewis County Code (17.38) and use of 2014 Ecology rating system or revised and approved by Ecology.
Stream Delineation	OHW	https://erdc-library.erdc.dren.mil/items/76c61f8f-6d75-4a35-aaf3-39aa64918afb	U.S. Army Corps of Engineers. National Ordinary High Water Mark Field Delineation Manual for Rivers and Streams (National OHWM Manual). ERDC/CRREL TR-25-1, US Army Engineer Research and Development Center Cold Regions Research and Engineering Laboratory. Hanover, NH:
	OHW	https://www.ecfr.gov/current/title-33/chapter-II/part-328?toc=1	Congressional Federal Register 33 Part 328 Definition of Waters of the United States.
	OHW	https://fortress.wa.gov/ecy/publications/documents/1606029.pdf	Washington State Department of Ecology. 2016. Determining the Ordinary High Water Mark for Shoreline Management Act Compliance in Washington State – Revised October 2016. Ecology publication #16-06-

Parameter	Method or Tool	Website	Reference
Stream Classification	Department of Natural Resources (DNR) Water Typing System	Forest Practices Water Typing: https://dnr.wa.gov/forest-regulation/forest-practices-application/forest-practices-water-typing WAC 222-16-030: https://app.leg.wa.gov/WAC/default.aspx?cite=222-16-030 Water Type Mapping: https://fpamt.dnr.wa.gov/default.aspx	Washington Administrative Code (WAC) 222-16-030. DNR Water typing system.
	Lewis County Code	https://www.codepublishing.com/WA/LewisCounty/#!/LewisCounty17/LewisCounty1738.html#17.38.470	Lewis County Code 17.38.470 – Classification of Fish and Wildlife Habitat.
Wetland Indicator Status	WMVC 2022 Regional Wetland Plant List	https://wetland-plants.sec.usace.army.mil/static/reports/NWPL%20Cover%20Page%20Nationalv3.pdf	USACE. 2022. Western Mountains, Valleys & Coasts: 2020 Regional Plant List. Version 3.6.
Plant Names	USDA PLANTS Database	https://plants.usda.gov/	Website
Soils Data	Soil Survey	Web Soil Survey: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx	Website
Threatened and Endangered Species	WDNR - WA Wetlands of High Conservation Value Mapper	http://wadnr.maps.arcgis.com/apps/webappviewer/index.html?id=5cf9e5b22f584ad7a4e2aebc63c47bda	Website
	Washington Priority Habitats and Species	https://geodataservices.wdfw.wa.gov/hp/phs/	Priority Habitats and Species (PHS) Program – August 2008 Washington State Priority Habitats and Species List (revised June 2023)
	NOAA National NMFS ESA Critical Habitat Mapper	https://www.fisheries.noaa.gov/resource/map/national-esa-critical-habitat-mapper	Website
	USFWS IPaC species lists	https://ecos.fws.gov/ipac/	Website

Appendix B: Background Information and Figures

Figure 1: Vicinity Map

Figure 2: Study Area

Figure 3: USGS Topo Map

Figure 4: National Wetland Inventory

Figure 5: NRCS Soil Survey

Figure 6: Lewis County Wetland Inventory

Figure 7: Lewis County Shoreline Designation

Figure 8: Delineated Streams



FIGURE 1
VICINITY MAP

WILDWOOD ROAD BRIDGE SCOUR REPAIR | 21588B
LEWIS COUNTY, WASHINGTON

LEGEND

Study Area

0 2,000 ft

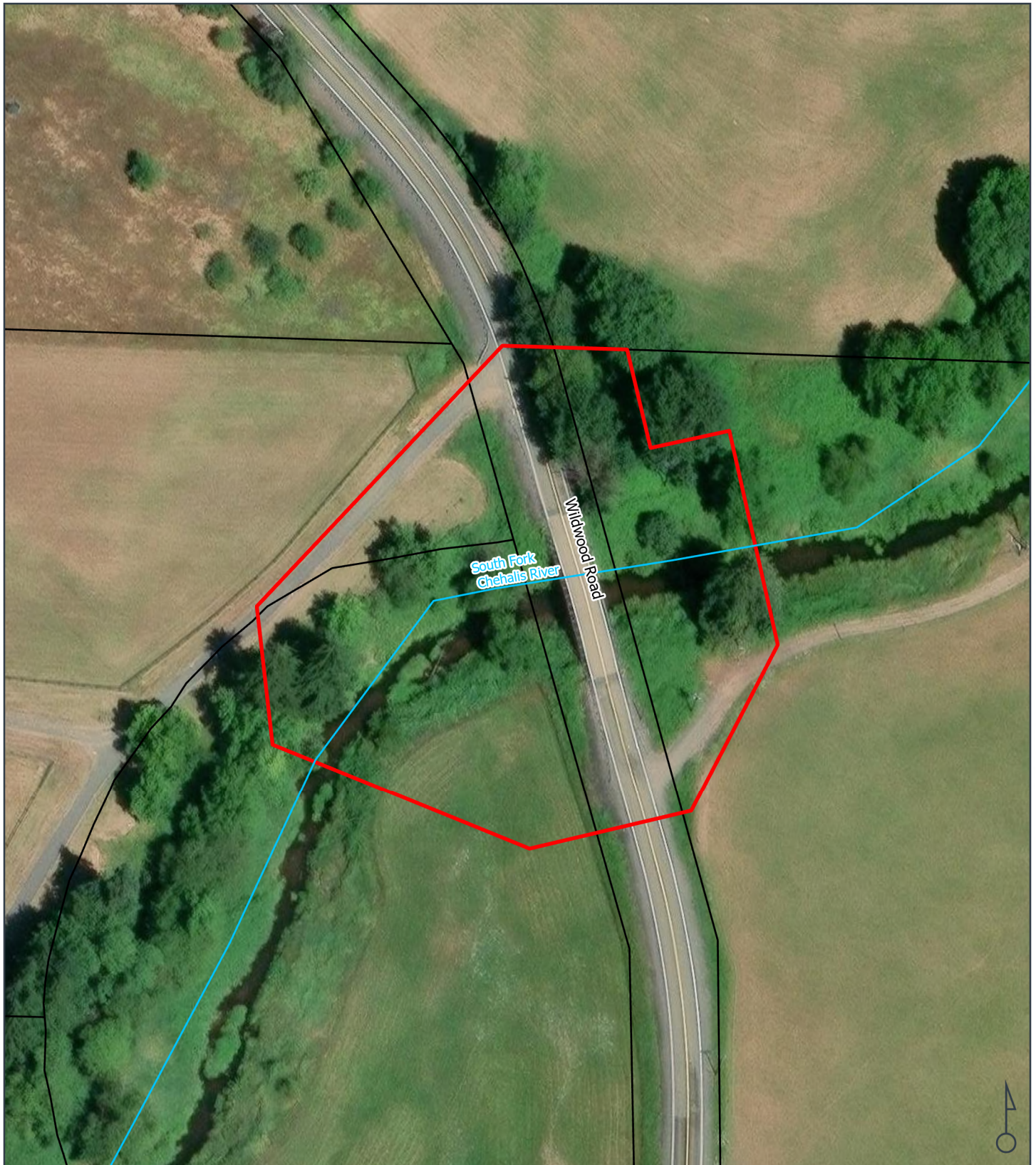


FIGURE 2 SITE OVERVIEW

WILDWOOD ROAD BRIDGE SCOUR REPAIR | 21588B
LEWIS COUNTY, WASHINGTON

LEGEND

- ▭ Study Area
- WA DNR Stream Inventory

0 100 ft

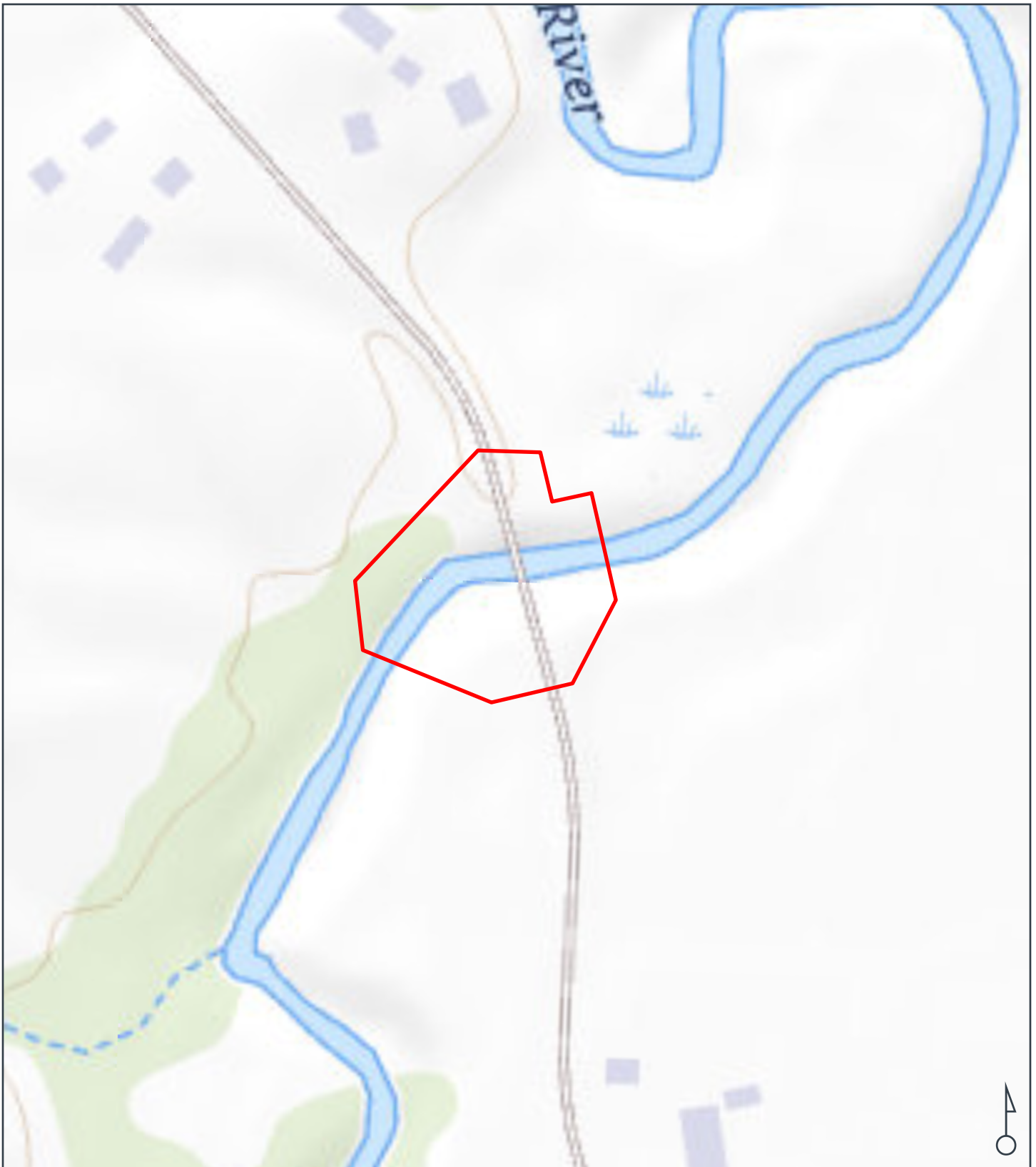


FIGURE 3
USGS TOPO

WILDWOOD ROAD BRIDGE SCOUR REPAIR | 21588B
LEWIS COUNTY, WASHINGTON

LEGEND

 Study Area

0 200 ft



FIGURE 4
NATIONAL WETLANDS INVENTORY
 WILDWOOD ROAD BRIDGE SCOUR REPAIR | 21588B
 LEWIS COUNTY, WASHINGTON

LEGEND

- National Wetlands Inventory
- WA DNR Stream Inventory
- Study Area

0 100 ft



FIGURE 5
NRCS SOIL SURVEY
WILDWOOD ROAD BRIDGE SCOUR REPAIR | 21588B
LEWIS COUNTY, WASHINGTON

LEGEND

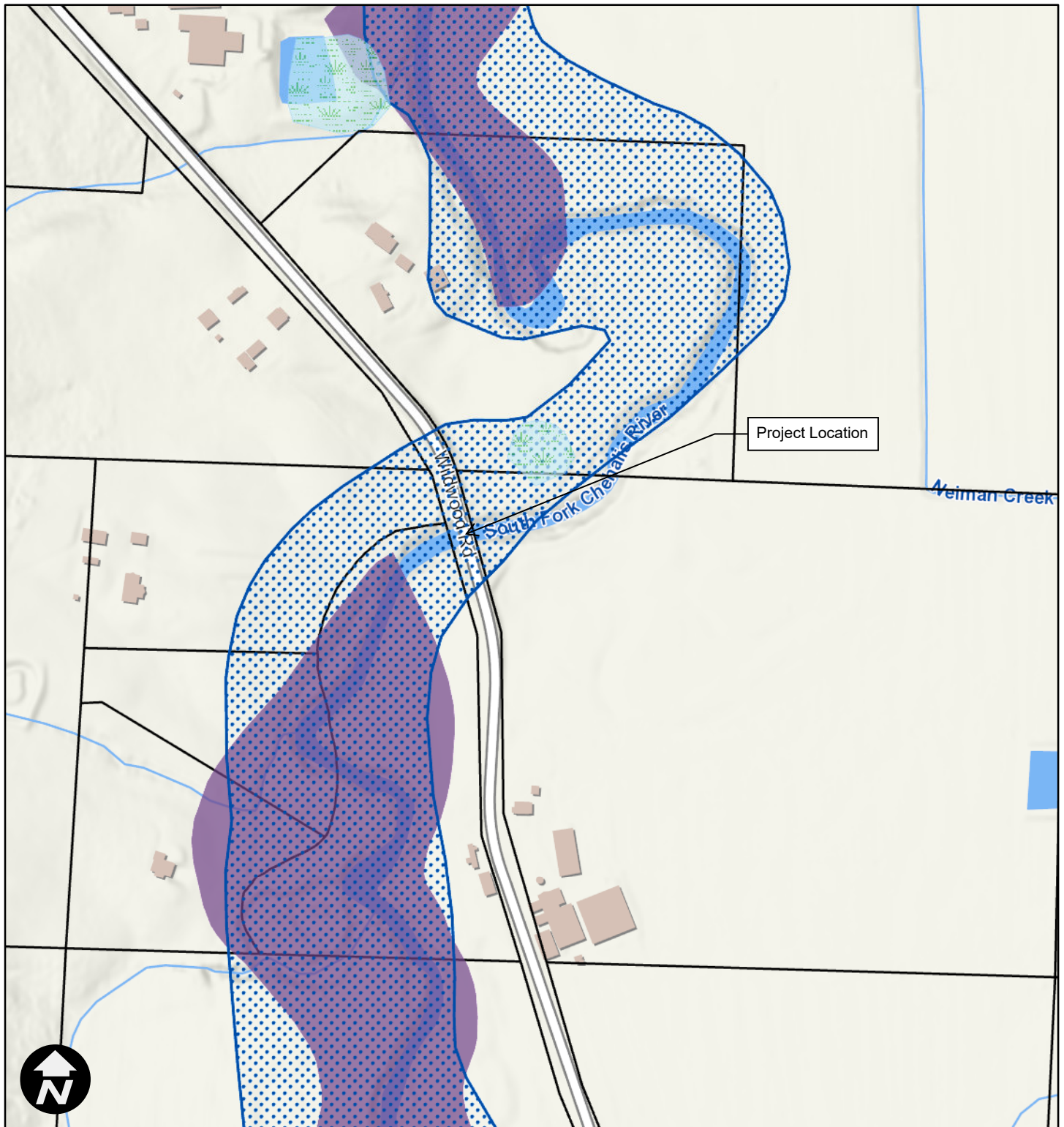
- USGS Soil Survey Map Units
- Study Area

130 - Melbourne loam, 0 to 8 percent slopes
 148 - Newberg fine sandy loam
 48 - Chehalis silty clay

Data Sources:
 Date: 7/3/2025
 Disclaimer: This data is not to survey accuracy and is meant for planning purposes only.
 O:\PROJECT\21500\21588B\04 CAD\GIS\MXD\21588B_WildwoodRd.aprx



Figure 6 - Lewis County Critical Areas Inventory



8/23/2024, 1:20:19 PM

1:4,514

-  Wetlands
-  FEMA 100-Year
-  CARA Category I
-  CARA Category II
-  Category III
-  Parcels

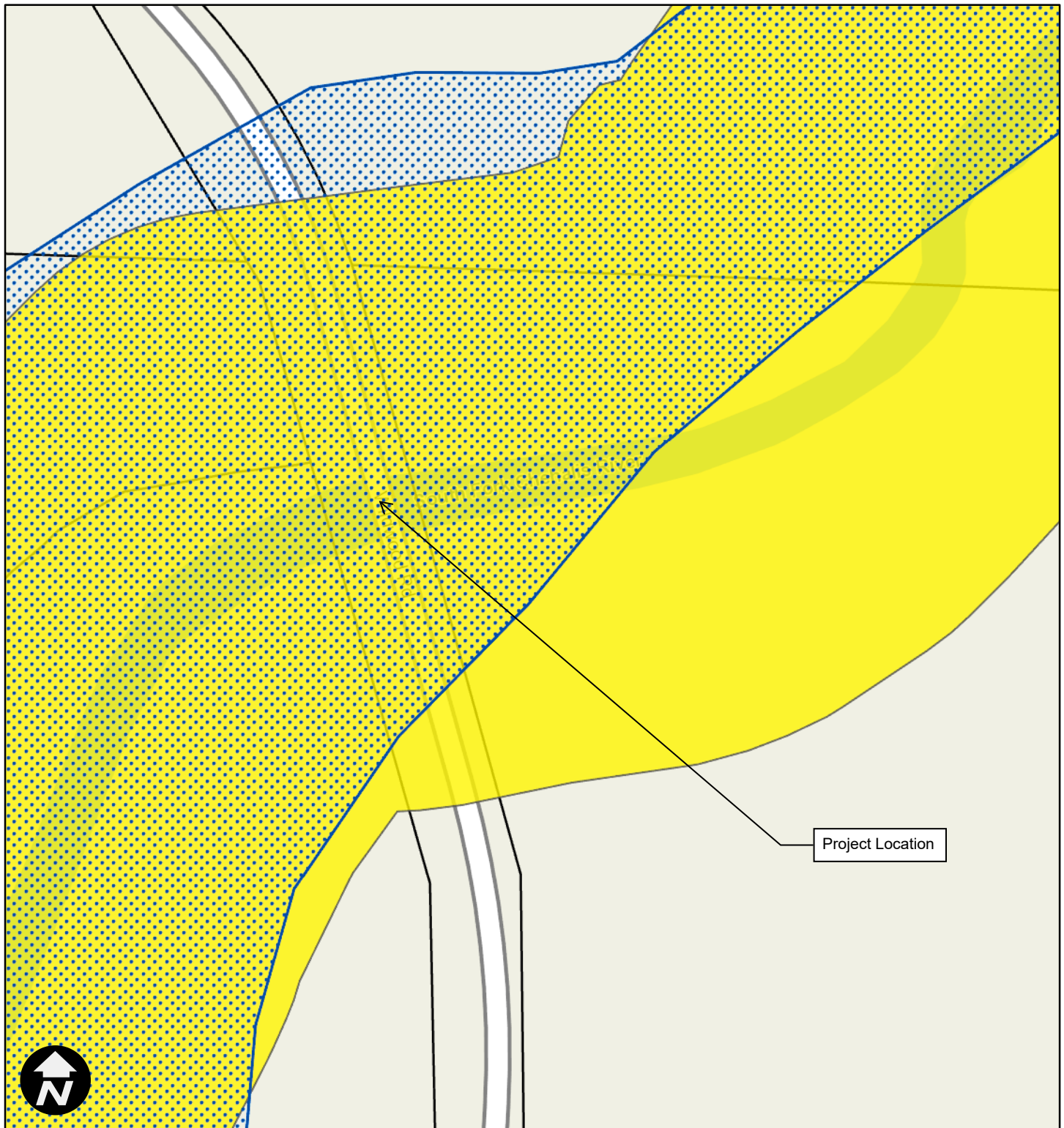
0 205 410 820 ft
NAD 1983 StatePlane Washington South FIPS 4602 Feet



Lewis County does not guarantee the accuracy of the information shown on this map and is not responsible for any use or misuse by others regarding this material. It is provided for general informational purposes only. This map does not meet legal, engineering, or survey standards. Please practice due diligence and consult with licensed experts before making decisions.

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Figure 7: Lewis County Shoreline Designation



2/9/2025, 5:57:13 PM

1:1,200

- | | |
|---------------------|-------------------------------|
| — FEMA BFE (NAVD88) | Shoreline Environments |
| □ FEMA Panels | □ Aquatic |
| ■ FEMA 100-Year | ■ Natural |
| ■ FEMA 500-Year | ■ Rural or Urban Conservancy |
| ■ Floodway | ■ Shoreline Residential |
| | ■ High Intensity |

0 50 100 200 ft
NAD 1983 StatePlane Washington South FIPS 4602 Feet



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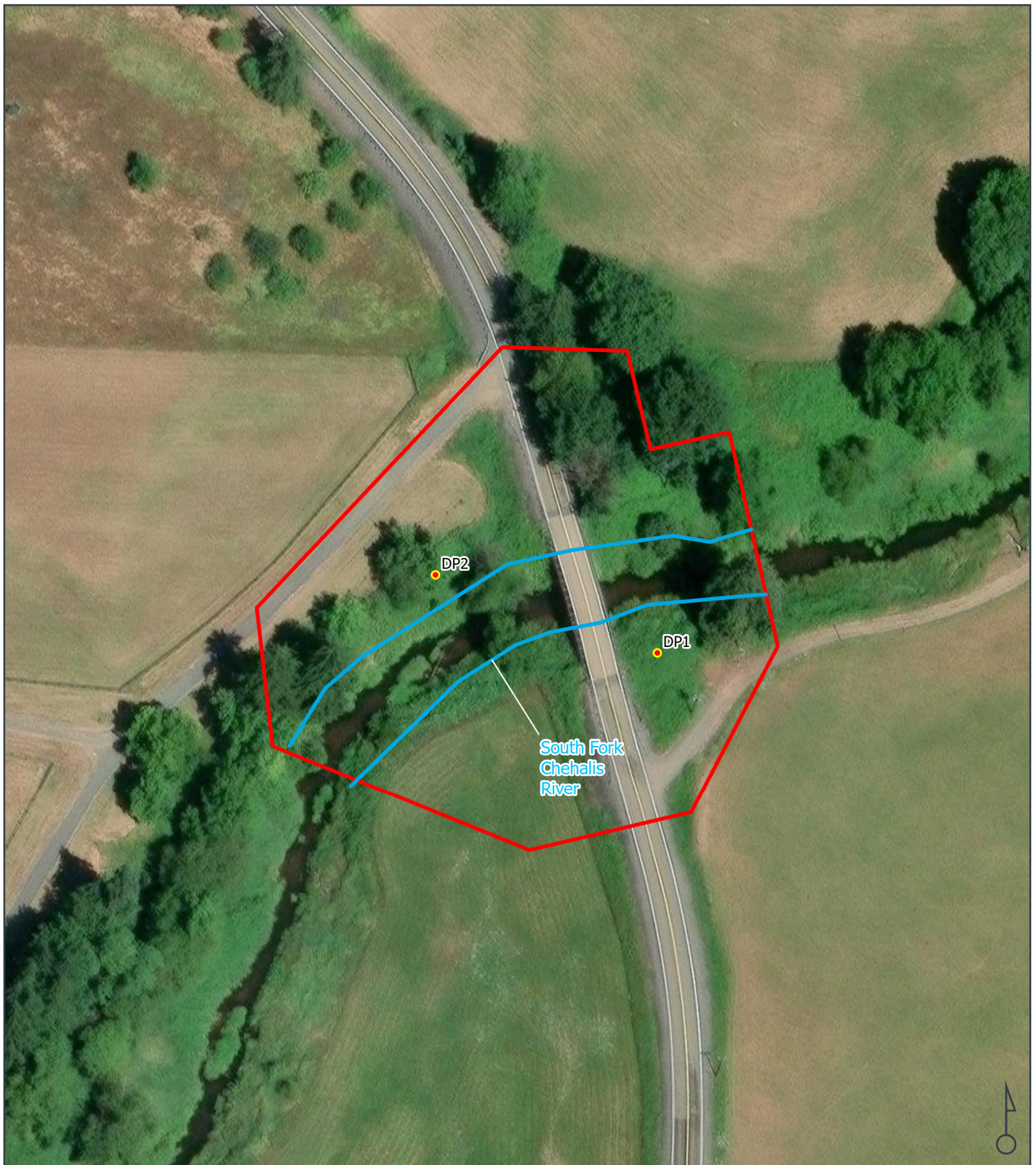


FIGURE 8
DELINEATED STREAMS

WILDWOOD ROAD BRIDGE SCOUR REPAIR | 21588B
LEWIS COUNTY, WASHINGTON

LEGEND

- Data Point
- Ordinary High Water
- Study Area

0 100 ft

Appendix C: Site Photos

Site Photographs – December 3, 2024



1. North bank of the South Fork Chehalis River, east of Wildwood Rd and Lewis County Bridge No.3



2. Lewis County Bridge No. 3 and the South Fork Chehalis River, looking west from south bank of South Fork Chehalis River



3. North bank of South Fork Chehalis River and piles of Lewis County Bridge No. 03, viewed from south bank



4. North bank of South Fork Chehalis River and piles of Lewis County Bridge No. 03, viewed from south bank



5. Agricultural fields south of South Fork Chehalis River and west of Wildwood Rd., viewed from Wildwood Rd. looking northwest



6. South Fork Chehalis River and Lewis County Bridge No. 3 looking northeast from the top of the south bank



7. Top of south bank of South Fork Chehalis River looking east toward Lewis County Bridge No. 03 with livestock fields to the south



8. South Fork Chehalis River looking south from the top of the south bank



9. Gravel driveway along top of south bank of South Fork Chehalis River east of Wildwood Rd., view looking northeast



10. Wildwood Road and Lewis County Bridge No. 03 looking north

Appendix D: Wetland Determination Data Forms

DP1

DP2

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

Project Site: Wildwood Road City/County: ____/Lewis County Sampling Date: 12/3/2024
 Applicant/Owner: Lewis County State: WA Sampling Point: DP1
 Investigator(s): J. Gray, K. Corrigan Section, Township, Range: S24 T12N R4W
 Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): none Slope (%): 10
 Subregion (LRR): A Lat: 46.505871 Long: -123.121315 Datum: NAD83
 Soil Map Unit Name: Chehalis silty clay NWI classification: R3UBH

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)
 Are Vegetation ☐, Soil ☐, or Hydrology ☐, significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
 Are Vegetation ☐, Soil ☐, or Hydrology ☐, naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes ☒ No ☐	Is the Sampled Area within a Wetland?	Yes ☐ No ☐
Hydric Soil Present?	Yes ☐ No ☒		
Wetland Hydrology Present?	Yes ☐ No ☒		
Remarks: DP1 is located approximately 30 ft east of the Wildwood Rd bridge and approximately 35 ft south of the South Fork Chehalis River OHWM on the roght bank. Hydrophytic vegetation indicators were observed at DP1. Hydric soil and wetland hydrology indicators were not observed at DP1.			

VEGETATION – Use scientific names of plants

Tree Stratum (Plot size: <u>30-ft diam.</u>)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test Worksheet:	
1. <u>==</u>	_____	_____	_____	Number of Dominant Species That Are OBL, FACW, or FAC:	<u>2</u> (A)
2. _____	_____	_____	_____	Total Number of Dominant Species Across All Strata:	<u>2</u> (B)
3. _____	_____	_____	_____	Percent of Dominant Species That Are OBL, FACW, or FAC:	<u>100</u> (A/B)
4. _____	_____	_____	_____		
50% = <u>____</u> , 20% = <u>____</u>	<u>0</u>	= Total Cover			
Sapling/Shrub Stratum (Plot size: <u>15-ft diam.</u>)				Prevalence Index worksheet:	
1. <u>Rubus armeniacus</u>	<u>50</u>	<u>yes</u>	<u>FAC</u>	Total % Cover of: _____ Multiply by: _____	
2. _____	_____	_____	_____	OBL species	_____ x1 = _____
3. _____	_____	_____	_____	FACW species	_____ x2 = _____
4. _____	_____	_____	_____	FAC species	_____ x3 = _____
5. _____	_____	_____	_____	FACU species	_____ x4 = _____
50% = <u>25</u> , 20% = <u>10</u>	<u>50</u>	= Total Cover		UPL species	_____ x5 = _____
Herb Stratum (Plot size: <u>5-ft diam.</u>)				Column Totals:	_____ (A) _____ (B)
1. <u>Phalaris arundinacea</u>	<u>80</u>	<u>yes</u>	<u>FACW</u>	Prevalence Index = B/A = _____	
2. _____	_____	_____	_____	Hydrophytic Vegetation Indicators:	
3. _____	_____	_____	_____	☐ 1 – Rapid Test for Hydrophytic Vegetation	
4. _____	_____	_____	_____	☒ 2 - Dominance Test is >50%	
5. _____	_____	_____	_____	☐ 3 - Prevalence Index is ≤3.0 ¹	
6. _____	_____	_____	_____	☐ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet)	
7. _____	_____	_____	_____	☐ 5 - Wetland Non-Vascular Plants ¹	
8. _____	_____	_____	_____	☐ Problematic Hydrophytic Vegetation ¹ (Explain)	
9. _____	_____	_____	_____	¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
10. _____	_____	_____	_____		
11. _____	_____	_____	_____		
50% = <u>40</u> , 20% = <u>16</u>	<u>80</u>	= Total Cover			
Woody Vine Stratum (Plot size: <u>15-ft diam.</u>)				Hydrophytic Vegetation Present? Yes ☒ No ☐	
1. <u>==</u>	_____	_____	_____		
2. _____	_____	_____	_____		
50% = <u>____</u> , 20% = <u>____</u>	<u>0</u>	= Total Cover			
% Bare Ground in Herb Stratum <u>20</u>					
Remarks: Vegetation at DP1 passes the Dominance Test hydrophytic vegetation indicator.					

Project Site: Wildwood Road

SOIL

Sampling Point: DP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-4	10YR 3/2	100	_____	_____	_____	_____	Silt Loam	_____
4-20	10YR 4/3	100	_____	_____	_____	_____	Silt Loam	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____

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

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)		Indicators for Problematic Hydric Soils ³ :
☐ Histosol (A1)	☐ Sandy Redox (S5)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Stripped Matrix (S6)	☐ Red Parent Material (TF2)
☐ Black Histic (A3)	☐ Loamy Mucky Mineral (F1) (except MLRA 1)	☐ Very Shallow Dark Surface (TF12)
☐ Hydrogen Sulfide (A4)	☐ Loamy Gleyed Matrix (F2)	☐ Other (Explain in Remarks)
☐ Depleted Below Dark Surface (A11)	☐ Depleted Matrix (F3)	
☐ Thick Dark Surface (A12)	☐ Redox Dark Surface (F6)	
☐ Sandy Mucky Mineral (S1)	☐ Depleted Dark Surface (F7)	
☐ Sandy Gleyed Matrix (S4)	☐ Redox Depressions (F8)	

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

Restrictive Layer (if present): Type: _____ Depth (inches): _____	Hydric Soils Present? Yes ☐ No ☒
--	--

Remarks: No hydric soil indicators observed at DP1.

HYDROLOGY

Wetland Hydrology Indicators:	
Primary Indicators (minimum of one required; check all that apply)	Secondary Indicators (2 or more required)
☐ Surface Water (A1) ☐ Water-Stained Leaves (B9) ☐ High Water Table (A2) (except MLRA 1, 2, 4A, and 4B) ☐ Saturation (A3) ☐ Salt Crust (B11) ☐ Water Marks (B1) ☐ Aquatic Invertebrates (B13) ☐ Sediment Deposits (B2) ☐ Hydrogen Sulfide Odor (C1) ☐ Drift Deposits (B3) ☐ Oxidized Rhizospheres along Living Roots (C3) ☐ Algal Mat or Crust (B4) ☐ Presence of Reduced Iron (C4) ☐ Iron Deposits (B5) ☐ Recent Iron Reduction in Tilled Soils (C6) ☐ Surface Soil Cracks (B6) ☐ Stunted or Stresses Plants (D1) (LRR A) ☐ Inundation Visible on Aerial Imagery (B7) ☐ Other (Explain in Remarks) ☐ Sparsely Vegetated Concave Surface (B8)	☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B) ☐ Drainage Patterns (B10) ☐ Dry-Season Water Table (C2) ☐ Saturation Visible on Aerial Imagery (C9) ☐ Geomorphic Position (D2) ☐ Shallow Aquitard (D3) ☒ FAC-Neutral Test (D5) ☐ Raised Ant Mounds (D6) (LRR A) ☐ Frost-Heave Hummocks (D7)

Field Observations: Surface Water Present? Yes ☐ No ☒ Depth (inches): _____ Water Table Present? Yes ☐ No ☒ Depth (inches): _____ Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____	Wetland Hydrology Present? Yes ☐ No ☒
--	---

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

Remarks: No primary wetland hydrology indicators observed at DP1.
 Only 1 secondary wetland hydrology indicator observed at DP1 (FAC-Neutral Test (D5)).

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

Project Site: Wildwood Road City/County: ____/Lewis County Sampling Date: 12/3/2024
 Applicant/Owner: Lewis County State: WA Sampling Point: DP2
 Investigator(s): J. Gray, K. Corrigan Section, Township, Range: S24 T12N R4W
 Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): none Slope (%): 10
 Subregion (LRR): A Lat: 46.506012 Long: -123.121966 Datum: NAD83
 Soil Map Unit Name: Melbourne loam, 0-8% slopes NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)
 Are Vegetation ☐, Soil ☐, or Hydrology ☐, significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
 Are Vegetation ☐, Soil ☐, or Hydrology ☐, naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes ☐ No ☒	Is the Sampled Area within a Wetland? Yes ☐ No ☒
Hydric Soil Present?	Yes ☐ No ☒	
Wetland Hydrology Present?	Yes ☐ No ☒	
Remarks: DP2 is located approximately 75 ft west of the Wildwood Rd bridge and approximately 35 ft north of the South Fork Chehalis River OHWM on the left bank. No wetland indicators were observed. Data point is upland.		

VEGETATION – Use scientific names of plants

Tree Stratum (Plot size: 30-ft diam.)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test Worksheet:
1. <u>Acer macrophyllum</u>	<u>40</u>	<u>yes</u>	<u>FACU</u>	
2. <u>Pseudotsuga menziesii</u>	<u>20</u>	<u>yes</u>	<u>FACU</u>	Total Number of Dominant Species Across All Strata: <u>4</u> (B)
3. _____	_____	_____	_____	Percent of Dominant Species That Are OBL, FACW, or FAC: <u>25</u> (A/B)
4. _____	_____	_____	_____	
50% = <u>30</u> , 20% = <u>12</u>	<u>60</u>	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15-ft diam.)				Prevalence Index worksheet:
1. <u>Symphoricarpos albus</u>	<u>50</u>	<u>yes</u>	<u>FACU</u>	
2. <u>Rosa nutkana</u>	<u>50</u>	<u>yes</u>	<u>FAC</u>	OBL species _____ x1 = _____
3. _____	_____	_____	_____	FACW species _____ x2 = _____
4. _____	_____	_____	_____	FAC species _____ x3 = _____
5. _____	_____	_____	_____	FACU species _____ x4 = _____
50% = <u>50</u> , 20% = <u>20</u>	<u>100</u>	= Total Cover		UPL species _____ x5 = _____
Herb Stratum (Plot size: 5-ft diam.)				Column Totals: _____ (A) _____ (B)
1. _____	_____	_____	_____	Prevalence Index = B/A = _____
2. _____	_____	_____	_____	Hydrophytic Vegetation Indicators: ☐ 1 – Rapid Test for Hydrophytic Vegetation ☐ 2 - Dominance Test is >50% ☐ 3 - Prevalence Index is ≤3.0 ¹ ☐ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ☐ 5 - Wetland Non-Vascular Plants ¹ ☐ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
50% = _____, 20% = _____	<u>0</u>	= Total Cover		
Woody Vine Stratum (Plot size: 15-ft diam.)				Hydrophytic Vegetation Present? Yes ☐ No ☒
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
50% = _____, 20% = _____	<u>0</u>	= Total Cover		
% Bare Ground in Herb Stratum <u>100</u>				

Remarks: No hydrophytic vegetation indicators observed at DP2.

Project Site: Wildwood Road

SOIL

Sampling Point: DP2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-20	10YR 4/3	100					Silt Loam	

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

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)		Indicators for Problematic Hydric Soils ³ :	
☐ Histosol (A1)	☐ Sandy Redox (S5)	☐ 2 cm Muck (A10)	
☐ Histic Epipedon (A2)	☐ Stripped Matrix (S6)	☐ Red Parent Material (TF2)	
☐ Black Histic (A3)	☐ Loamy Mucky Mineral (F1) (except MLRA 1)	☐ Very Shallow Dark Surface (TF12)	
☐ Hydrogen Sulfide (A4)	☐ Loamy Gleyed Matrix (F2)	☐ Other (Explain in Remarks)	
☐ Depleted Below Dark Surface (A11)	☐ Depleted Matrix (F3)		
☐ Thick Dark Surface (A12)	☐ Redox Dark Surface (F6)		
☐ Sandy Mucky Mineral (S1)	☐ Depleted Dark Surface (F7)		
☐ Sandy Gleyed Matrix (S4)	☐ Redox Depressions (F8)		

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

Restrictive Layer (if present): Type: _____ Depth (inches): _____	Hydric Soils Present? Yes ☐ No ☒
--	--

Remarks: No hydric soil indicators observed at DP2.

HYDROLOGY

Wetland Hydrology Indicators:	
Primary Indicators (minimum of one required; check all that apply)	Secondary Indicators (2 or more required)
☐ Surface Water (A1) ☐ Water-Stained Leaves (B9) ☐ High Water Table (A2) (except MLRA 1, 2, 4A, and 4B) ☐ Saturation (A3) ☐ Salt Crust (B11) ☐ Water Marks (B1) ☐ Aquatic Invertebrates (B13) ☐ Sediment Deposits (B2) ☐ Hydrogen Sulfide Odor (C1) ☐ Drift Deposits (B3) ☐ Oxidized Rhizospheres along Living Roots (C3) ☐ Algal Mat or Crust (B4) ☐ Presence of Reduced Iron (C4) ☐ Iron Deposits (B5) ☐ Recent Iron Reduction in Tilled Soils (C6) ☐ Surface Soil Cracks (B6) ☐ Stunted or Stresses Plants (D1) (LRR A) ☐ Inundation Visible on Aerial Imagery (B7) ☐ Other (Explain in Remarks) ☐ Sparsely Vegetated Concave Surface (B8)	☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B) ☐ Drainage Patterns (B10) ☐ Dry-Season Water Table (C2) ☐ Saturation Visible on Aerial Imagery (C9) ☐ Geomorphic Position (D2) ☐ Shallow Aquitard (D3) ☐ FAC-Neutral Test (D5) ☐ Raised Ant Mounds (D6) (LRR A) ☐ Frost-Heave Hummocks (D7)

Field Observations: Surface Water Present? Yes ☐ No ☒ Depth (inches): _____ Water Table Present? Yes ☐ No ☒ Depth (inches): _____ Saturation Present? Yes ☐ No ☒ Depth (inches): _____ (includes capillary fringe)	Wetland Hydrology Present? Yes ☐ No ☒
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Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No primary wetland hydrology indicators observed at DP2.
 No secondary wetland hydrology indicator observed at DP2.

Appendix E

Cultural Resources Report

CULTURAL RESOURCES REPORT COVER SHEET

DAHP Project Number: 2025-04-02249

Author: Emily Boutain, Jessica Gardner, and Margaret Berger

Title of Report: Cultural Resources Assessment for the Wildwood MP 10.14 Scour
Repair Project, Lewis County, Washington

Date of Report: June 26, 2025

County(ies): Lewis Section: 24 Township: 12 N Range: 04 W

Quad: Curtis, WA Acres: 2.23 acres

PDF of report submitted (REQUIRED) ☒ Yes

Historic Property Inventory Forms to be Approved Online? ☐ Yes ☒ No

Archaeological Site(s)/Isolate(s) Found or Amended? ☐ Yes ☒ No

TCP(s) found? ☐ Yes ☒ No

Replace a draft? ☐ Yes ☒ No

Satisfy a DAHP Archaeological Excavation Permit requirement? ☐ Yes # ☒ No

Were Human Remains Found? ☐ Yes DAHP Case # ☒ No

DAHP Archaeological Site #:

- Submission of PDFs is required.
- Please be sure that any PDF submitted to DAHP has its cover sheet, figures, graphics, appendices, attachments, correspondence, etc., compiled into one single PDF file.
- Please check that the PDF displays correctly when opened.



Cultural Resource Consultants

Cultural Resources Assessment for the Wildwood MP 10.14 Scour Repair Project, Lewis County, Washington

Report Prepared by
Emily Boutain and Jessica Gardner

Principal Investigator
Margaret Berger

June 26, 2025

Technical Memo 2403G-1
DAHP PROJECT: 2025-04-02249

Report Submitted to
Jeff Gray
Otak, Inc.

Cultural Resource Consultants, LLC
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Seattle, Washington 98194

Cultural Resources Assessment for the Wildwood MP 10.14 Scour Repair Project, Lewis County, Washington

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I. Management Summary

This report provides a cultural resources assessment for the Wildwood MP 10.14 Scour Repair Project, Lewis County, Washington. Otak, Inc., on behalf of Lewis County, requested that Cultural Resource Consultants, LLC (CRC) complete a cultural resources assessment prior to proposed excavation and filling along the banks of the South Fork Chehalis River to provide scour protection and bank stability. The Wildwood Bridge is classified as scour critical due to abutment/interior pile tip elevations within 10 feet of the stream's thalweg. Lewis County proposes to conduct scour analysis, including geomorphic, geotechnical, hydrologic, and hydraulic analyses, and develop three mitigation alternatives. Ground disturbance at the project's Area of Potential Effects (APE) will likely include excavation in the channel and along the banks of South Fork Chehalis River and tracking from movement of machinery. Staging areas will be located within the boundaries of the project APE.

This assessment was developed to document recorded and unrecorded archaeological sites, historic built environment resources, and other cultural resources and to evaluate the potential for project activities to affect cultural resources. Background research and field investigation conducted by CRC did not result in the identification of archaeological sites, historic built environment resources, or other cultural resources in the APE. The existing three-span bridge, supported by concrete piles, Wildwood Bridge was built in 1955 and meets the Advisory Council on Historic Preservation's Program Comment on Common Post-1945 Concrete and Steel Bridges; it is therefore exempt from Section 106 review.

Six shovel probes were excavated to an average depth of 116 cm (3.8 ft) below surface, with four of the probes reaching depths of 140 to 160 cm (4.6 to 5.25 feet) below surface. Probes generally contained alluvial sediments consistent with locally mapped soils and surface geology. None of the probes contained archaeological material. Most ground disturbance is anticipated to be within 3 to 5 ft below surface, comparable to the depths reached by the shovel probes, and the maximum depth of ground disturbance will be up to 8 feet below surface. No additional cultural resources investigation is recommended at this time. CRC recommends a finding of "no historic properties affected." If project activities result in the discovery of archaeological materials or human skeletal remains, CRC recommends project staff follow the inadvertent discovery protocol outlined in Appendix D.

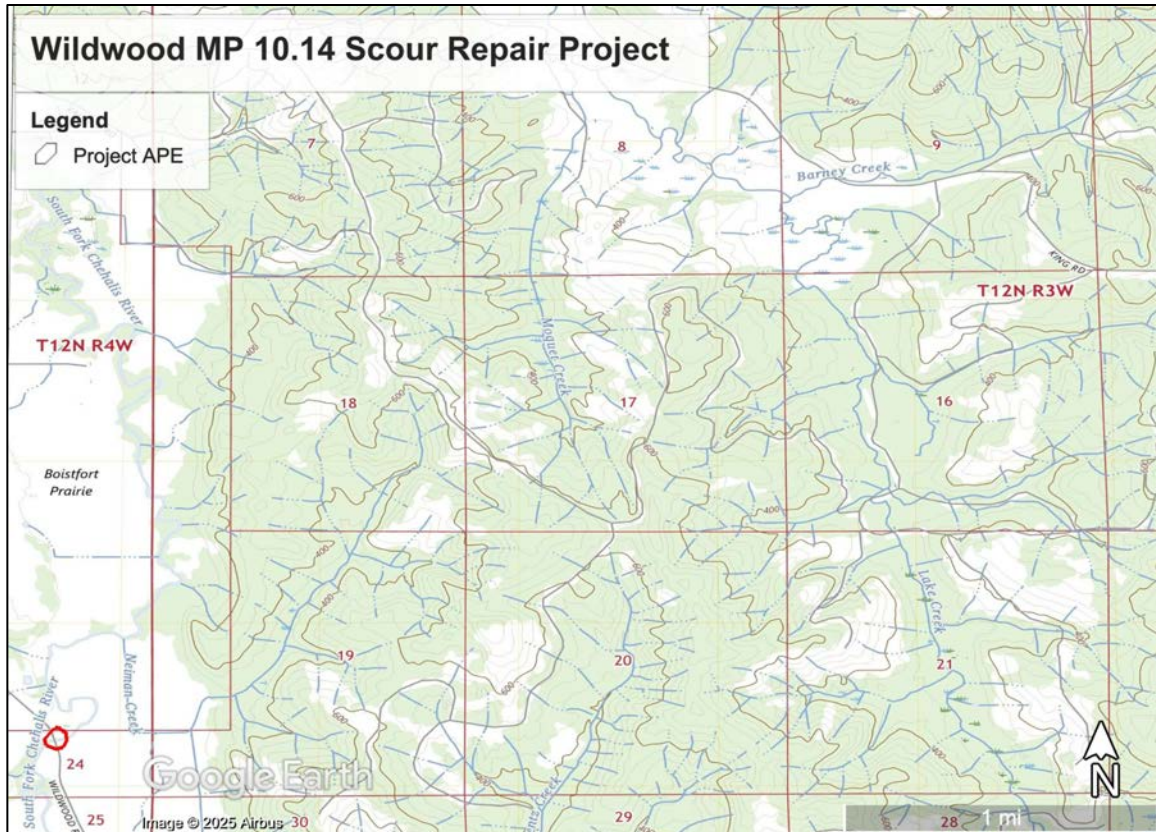


Figure 1. Project location on the Curtis, Washington, topographic quadrangle (United States Geological Survey [USGS] 2023).

1.1 Regulatory Context

This cultural resources assessment was developed as a component of preconstruction environmental review for the Wildwood MP 10.14 Scour Repair Project. It sought to prevent adverse impacts to cultural resources during ground disturbing activities by evaluating whether archaeological sites, historic built environment resources (i.e., buildings or structures at least 50 years old), or other cultural resources exist within the boundaries of the project. CRC's work was intended, in part, to assist in addressing state regulations pertaining to the identification and protection of cultural resources. The Archaeological Sites and Resources Act (RCW 27.53) prohibits knowingly disturbing archaeological sites without a permit from the Washington State Department of Archaeology and Historic Preservation (DAHP); the Indian Graves and Records Act (RCW 27.44) prohibits knowingly disturbing Native American or historic graves; and the Abandoned and Historic Cemeteries and Historic Graves Act (RCW 68.60) calls for the protection and preservation of historic era cemeteries and graves.

The project will make use of federal funds awarded by the Federal Highway Administration (FHWA)—through the Washington State Department of Transportation (WSDOT)—and will require involvement by the United States Army Corps of Engineers (USACE). The project therefore qualifies as a federal undertaking subject to Section 106 of the National Historic Preservation Act (NHPA). Agencies involved in a federal undertaking must consider the undertaking's potential effects to historic properties within a defined Area of Potential Effects (APE) (36 CFR 800.16(l)(1)). Historic properties are defined as buildings, districts, sites, structures or objects, typically more than 50 years old, that are deemed eligible for listing on the National Register of Historic Places (NRHP). The Section 106 process involves identifying and inventorying historic properties within the APE and evaluating whether those properties satisfy NRHP eligibility criteria and integrity considerations. If NRHP-eligible historic properties are identified within the APE, potential adverse effects to historic properties must be assessed and a resolution of adverse effects recommended. WSDOT is acting on behalf of FHWA in processing the federal environmental compliance documentation and has been delegated the authority from FHWA to manage the cultural resources studies as part of the Section 106 compliance.

1.2 Research Design

CRC's investigation consisted of (1) review of available project information and correspondence provided by the project proponent; (2) examination of local environmental, historical, and archaeological datasets; and (3) field investigation. On April 14, 2025, CRC contacted cultural resources personnel at Confederated Tribes of the Chehalis Reservation, Cowlitz Indian Tribe, Nisqually Indian Tribe, and Quinault Indian Nation on a technical staff to technical staff basis to inquire about project-related cultural information or concerns (Appendix A). This correspondence was not intended to be or replace formal government-

to-government consultation. Information provided by Tribes' cultural resources personnel subsequent to the submission of this report will be included in a revised version. This assessment considered comments provided by Tribes, previous studies in the project vicinity, the magnitude and nature of the undertaking, the nature and extent of potential effects on historic properties, and the likely nature and location of historic properties at the project location, as well as other applicable laws, standards, and guidelines (per 36 CFR 800.4(b)(1)) (DAHP 2023).

1.3 Project Information

1.3.1 Project Location

The project encompasses approximately 2.23 acres in unincorporated Lewis County, located 7.9 miles west of City of Winlock and 10.9 miles southwest of City of Napavine. It encompasses the right-of-way of Wildwood Road and portions of Lewis County parcel numbers 016274002007, 016273001000, and 016274002009. The project is located in the SE¹/₄ of Section 24 in Township 12 North, Range 04 West, Willamette Meridian (Figure 1).

1.3.2 Project Description

As part of the Wildwood MP 10.14 Scour Repair Project, Lewis County proposes to excavate and fill along the banks of South Fork Chehalis River to provide scour protection and bank stability. Lewis County proposes to conduct scour analysis, including geomorphic, geotechnical, hydrologic, and hydraulic analyses, and develop three mitigation alternatives. Ground disturbance at the project APE will likely include excavation in the channel and along the banks of South Fork Chehalis River and tracking from movement of machinery. Most ground disturbance is anticipated to be within 3 to 5 ft below surface, and the maximum depth of ground disturbance will be up to 8 feet below surface.. Staging areas will be located within the boundaries of the project APE.

For the purposes of this assessment, the area of interest for cultural resources (hereafter, “the project” or “the project location”) is understood to be the 2.23-acre APE described above and depicted in Figures 1 – 2. The APE was defined on April 2, 2025, through consultation with WSDOT on behalf of FHWA. DAHP concurred with the APE on April 8, 2025 (Appendix B).



Figure 2. Satellite imagery of the project location (Google, Inc. 2025).

2. Background Research

2.1 Overview

Background research was conducted in May 2025.

Recorded Cultural Resources Present: Yes ☐ No ☒

According to the Washington Information System for Architectural and Archaeological Records Data (WISAARD), no archaeological sites, register-listed historic properties, or other cultural resources have been recorded at the project location (DAHP 2025).

The following context overview summarizes environmental, historical, and archaeological information contained in local cultural resource reports; archaeological and historical data from DAHP and the Washington Information System for Architectural and Archaeological Records Data (WISAARD); ethnographic resources; geological and soils surveys; historical maps and documents from the United States Bureau of Land Management (BLM) and United States Surveyor General (USSG) Land Status & Cadastral Survey Records database; HistoryLink; Historic Map Works; HistoricAerials; University of Washington's Digital Collection; Washington State University's Early Washington Maps Collection; and CRC's library. This report's discussion of geology, archaeology, and history at the project location

incorporates context information from CRC's previous work in Lewis County (e.g., Carlson 2025; Oreste and Berger 2024).

In this report, dates are presented in calendar years ago. Dates based on radiocarbon data that have been calibrated to yield a calendrical age are represented as "cal BP" (before present); those that have not been calibrated are represented as "uncal BP."

2.2 Environmental Context

The Wildwood MP 10.14 Scour Repair Project encompasses approximately 2.23 acres in unincorporated Lewis County between Napavine and Winlock. It is situated along the South Fork Chehalis River and located approximately 8.79 miles west of State Route (SR) 603, 11.68 miles west of Interstate 5 (I-5), 14.65 miles southwest of U.S. Highway 12, and 12.03 miles southwest of the Newaukum River. The South Fork Chehalis River flows into the river's main stem approximately 12.47 miles north of the project.

The project is situated within the Cowlitz/Newaukum Prairie and Boistfort Prairie Floodplains (Pater et al. 1998). The region is a transitional zone between the Puget Lowland and Willamette Valley ecoregions, and consists of well-drained soils with forests, prairies, cropland, floodplains, and pastureland. The area did not experience continental glaciation.

2.2.1 Geomorphology

The landscape of western Washington is a product of crustal deformation initiated by the Cascadia subduction zone; repeated glacial scouring and deposition; landslides and erosion; and Holocene human activity. The project is located within the Puget Trough physiographic province, which extends from the Canadian border to the Willamette Valley in Oregon. The central and southern Puget Trough encompasses the drainage of the upper Chehalis River and the Cowlitz River (Franklin and Dyrness 1988). During the late Pleistocene (110,000 to 12,000 years cal BP), much of the northern Pacific Northwest was scoured by repeated advances and retreats of the Cordilleran Ice Sheet, and alpine glaciers from the Cascade range extended into and shaped the central Puget Trough (Kopperl 2004; Kruckeberg 1991; Thorson 1980; Troost and Booth 2008). The Puget Trough was formed by these glacial events, as moving ice up to thousands of feet thick sculpted a series of north-south trending valleys within a wide basin between the Coast and Cascade Ranges (McKee 1972).

The ice sheet's Puget Lobe most recently advanced during the Vashon Stade of the Fraser glaciation, the latter of which began approximately 25,000 years ago. The Puget Lobe reached Seattle 17,590 years cal BP, and achieved its maximum extent near Tenino 16,950 years cal BP. The onset of climatic warming caused the ice sheet to rapidly retreat to the north (Booth et al. 2004; Borden and Troost 2001; Porter and Swanson 1998). As the glacier receded, meltwater became impounded behind the ice, forming a series of meltwater

channels that flowed across a broad outwash plain. Glacial meltwater ponded to form a series of proglacial lakes (Collins and Montgomery 2011). Many of these lakes later merged into glacial Lake Russell, which drained via the Black Lake spillway into the Chehalis River. As glacial retreat continued, meltwater coalesced into glacial Lake Bretz, which at its maximum extended from the southern margin of Whidbey Island to Olympia. As the ice sheet retreated north, new spillways emerged, carrying meltwater into the Strait of Juan de Fuca (Bretz 1913; Thorson 1989; Waitt and Thorson 1983). Till, outwash, and ice-contact sediments were deposited throughout the region during glacial retreat and meltwater recession (Booth 1994).

Though not glaciated, the central Puget Trough and Willapa Hills were shaped by the flow of glacial meltwater and outwash, large volumes of which entered the Chehalis River via the Skookumchuck River and the Cowlitz River via the Cowlitz Glacier on Mount Rainier (Bretz 1913; Kruckeberg 1991; McKee 1972). Active deposition during the Holocene has been confined to river valleys and the base of steep slopes (Booth et al. 2003:20-21). River processes such as flooding, erosion, transportation, and deposition of sediments have shaped the postglacial geomorphology of the Chehalis and Cowlitz River areas and have introduced and increased alluvial deposition in the area (Foutch et al. 2012; Kopperl 2004). An alluvial fan developed at the confluence of the Chehalis and Skookumchuck Rivers near present-day Centralia. As the fan expanded, it forced the Chehalis River channel to the west. During high water flows, the fan partially dammed the Chehalis, which raised and flattened the Chehalis River Valley (Bretz 1913; Kopperl et al. 2011:5-6)

In subsequent centuries, changes in global sea levels and climate altered the character and course of the Chehalis River. As sea levels rose, the gradient of the river decreased, leading to aggradation, or the deposition fine-grained sediments, in adjacent lowlands. Shifts toward warmer and wetter climate conditions further increased the volume of sediment introduced into the river. After sea levels stabilized, the river began to move laterally across the valley floor, creating point bars and eroding meander bends. Today, the relatively flat, slightly rolling surface of the Chehalis River floodplain consists of previous channel meanders, abandoned channels, oxbow lakes, point bars, and alluvial fans that developed over the course of the middle and late Holocene. Many of these landforms are currently covered by recent alluvium. Kopperl et al. (2011:6) identified three geomorphic surfaces in the Chehalis River floodplain. From oldest to youngest, the floodplain consists of (1) flat, open portions, (2) gently sloping surfaces, and (3) undulating surfaces along the current river channel.

Flooding has affected low-lying areas along the Chehalis and Newaukum Rivers throughout the Holocene. Flood events eroded some surfaces and buried others, creating a mosaic of buried and truncated landforms in the Chehalis River Basin (Foutch et al. 2012:9). Soils developed on stable surfaces between flood events. Today, as during the terminal

Pleistocene, sediments deposited at the mouth of the Skookumchuck River during high water flows can block the main channel of the Chehalis River, leading to increased water elevations upstream. Urban development and agricultural operations, which have removed surface vegetation and reduced riparian areas, have exacerbated the severity of recent flood events by increasing surface runoff (Kopperl et al. 2011:6).

Stratigraphic markers of subduction-thrust earthquakes and associated uplift, subsidence, and deformation have been observed at multiple locations on the Washington coast and around Puget Sound. Southwestern Washington has been affected by several seismic events and coastal tsunamis, including a large earthquake approximately 250 years cal BP (Atwater 1987; Atwater et al. 2004; Losey 2005). Accounts of this and other seismic events, such as those along the Seattle Fault, are preserved in Tribes' oral histories (Losey 2007; Ludwin et al. 2005).

While oral storytelling traditions vary across Tribes, among the Cowlitz people there is a notable account involving Mount St. Helens (Lawelatla), Mount Rainier (Takhoma), and Mount Adams (Patu), which explains the origins of the mountains and the eruption of Lawelatla (Wilson 1998). These stories emphasize the dynamic relationship between people and the land, illustrating how natural events—such as the 1980 eruption of Mount St. Helens and previous eruptions—transform the landscape. Through such transformations, new life and environmental variation emerge, reinforcing a deep respect and enduring connection to the land.

2.2.2 Surface Geology

At 1:100,000-scale, one surface geologic unit—Qal, Holocene alluvium—is mapped at the project location. This consists of silt, sand, and gravel deposited in stream beds and fans. Low-level terraces and lacustrine deposits may be present as well (Schasse 1987; Washington State Department of Natural Resources [WA DNR] 2025).

2.2.3 Soils

Three soil units are mapped at the project location: Chehalis silty clay, Melbourne loam, and Newberg fine sandy loam (United States Department of Agriculture Natural Resources Conservation Service [USDA NRCS] 2025). The majority of the project is mapped as Chehalis silty clay while a small portion at the northwest end is mapped as Melbourne loam and the southwest corner is mapped as Newberg fine sandy loam.

Chehalis silty clay develops from alluvium parent material and forms on floodplains and terraces. It is moderately well drained, with the water table present more than 80 inches below surface, though flooding has been occasionally recorded. A typical profile consists of one A horizon of yellowish-brown silty clay from 0 to 17 inches (0 to 43 centimeters [cm]) below surface; one B horizon of dark yellowish brown silty clay loam from 17 to 44 inches

(43 to 112 cm) below surface; and one C horizon of dark yellowish brown to grayish brown stratified fine sandy loam to silty clay loam from 44 to 60 inches (112 to 152 cm) below surface (USDA NRCS 2025).

Melbourne loam, 0 to 8 percent slopes, forms on terraces from a parent material of residuum from siltstone. It is moderately well drained, with the water table present more than 80 inches below surface, though flooding has been occasionally recorded. A typical profile consists of one A horizon of dark brown loam from 0 to 4 inches (0 to 10 cm) below surface; two B horizons of olive gray clay loam, are present from 4 to 18 inches (10 to 45 cm) below surface, followed by a B horizon of olive gray clay from 18 to 42 inches (45 to 106 cm) below surface, and one C horizon of olive gray clay loam from 42 to 60 inches (106 to 152 cm) below surface (USDA NRCS 2025).

Newberg fine sandy loam forms on terraces and floodplains from a parent material of mixed alluvium. It is well drained, with the water table more than 80 inches below surface, though flooding occurs occasionally. A typical soil profile is described as an Ap horizon of very dark grayish brown fine sandy loam from 0 to 7 inches (0 to 18 cm) below surface, an A horizon of dark brown fine sandy loam from 7 to 16 inches (18 to 41 cm) below surface, and two C horizons of dark yellowish brown loamy very fine sand from 17 to 60 inches (41 to 152 cm) below surface (USDA NRCS 2025).

2.3 Climate and Vegetation

The paleoclimate of the Pacific Northwest during the late Pleistocene and Holocene is defined by four periods, which exhibit general trends based on variations in temperature and moisture (Kopperl et al. 2016:37-38).

- o 17,000 to 13,000 years cal BP: the region was much cooler and drier compared to the present.
- o 13,000 to 7000 years cal BP: the retreat of glacial ice and increased solar radiation led to higher temperatures, less precipitation, colder winters, and more severe summer droughts compared to the present.
- o 7000 years cal BP to 5000 years ago: cooler, moister conditions returned to the region, with temperature ranges similar to the present. The current maritime climate regime of the Puget Sound region was fully established by the end of this period.
- o 5000 years ago to present: climatic conditions have undergone short-term fluctuations such as the Little Ice Age (500 to 100 years ago) and the Medieval Climatic Anomaly (1100 to 700 years ago).

In southwestern Washington, changes in temperature and moisture have supported different plant communities through time (Herbel and Schalk 2002:2.6-2.8; Kopperl et al. 2016:37-38;

Kopperl et al. 2014:9-12). Following glacial recession and meltwater subsidence, landforms stabilized and vegetation began to return. Lodgepole pine (*Pinus contorta*) colonized newly exposed soils. These trees thrived in the gravelly, outwash soils south of Puget Sound and benefited from the lack of competition with other tree taxa. Around 12,000 years ago, Douglas fir and western Hemlock emerged as the dominant tree species of lowland forests. Prairies also developed during this period. They consisted of stands of grasses, beaked hazelnut (*Corylus cornuta*), and scattered Oregon white oaks (*Quercus garryana*). The warmer, drier climate conditions of the early to middle Holocene prevented the further spread of Douglas fir and resulted in the expansion of prairies. As noted by Herbel and Schalk (2002:2.7), shifting climate conditions benefited oaks, which are tap-rooted species and are thus able to survive droughts better than Douglas fir. Present-day vegetation communities emerged after 6000 years ago. Western redcedar (*Thuja plicata*) joined western hemlock and Douglas fir as primary components of lowland forests, although the spread of these trees appears to have been more prominent around Puget Sound than in southwestern Washington. The persistence of prairie ecosystems in the Chehalis River Basin in recent millennia likely stems from the use of controlled burns by Native peoples (see below) (Herbel and Schalk 2002:2.9-2.11).

Today, the project location is situated within western Washington's western hemlock vegetation zone, which extends south from British Columbia through the Olympic Peninsula, Coast Ranges, Puget Trough, and Cascade physiographic provinces (Franklin and Dyrness 1988). The zone's wet, mild, maritime climate supports diverse plant taxa. In the Chehalis River Basin, vegetation communities commonly consist of western hemlock, Douglas fir, and western redcedar, red alder (*Alnus rubra*), bigleaf maple (*Acer macrophyllum*), Oregon White Oak, camas (*Camassia* sp.), bracken fern, and various species of berries (especially *Rubus* sp.), grasses, rushes (especially *Juncus* sp.), and sedges (especially *Carex* sp.) (Herbel and Schalk 2002:2.8).

Before the arrival of Euro-American settlers, prairies were an ecologically and culturally significant part of the landscape in southwestern Washington. Prairies were dominated by Idaho fescue (*Festuca idahoensis*) and a thick layer of moss (especially *Racomitrium canescens*), with smaller quantities of sedge (*Carex pensylvanica*), camas, saxifrage (*Micranthes integrifolia*), and other plants (Franklin and Dyrness 1988:89). Prairies supported dozens of food plants utilized by local Native groups (Storm and Shebitz 2006:262). These included wild celery (*Lomatium* sp.), camas, wild carrot (*Perideridia gairdneri*), wild onion (*Allium* sp.), bracken fern (*Pteridium aquilinum*), oak acorns, hazelnuts (*Corylus cornuta*), prairie huckleberry (*Vaccinium caespitosum*), several species of *Rubus*, and wild strawberry (*Fragaria virginiana*). Prairies' specific vegetation composition depended on drainage. Wet prairies in low-lying areas with seasonally high water tables offered more suitable habitat for some plants compared to dry prairies in well-drained, higher elevation areas (Kopperl et al. 2011:12; Norton et al.

1983:125-126). The historical prairies in the Chehalis vicinity were likely wet prairies given their elevation and the presence of poorly drained soils.

2.4 Archaeological Context

Thousands of years of human occupation in western Washington have been summarized in a number of archaeological, ethnographic, and historical investigations over the past several decades. These studies provide regional context for evaluating the potential of archaeological deposits at the project location (e.g., Ames and Maschner 1999; Carlson 1990; Greengo 1983; Kopperl et al. 2016; Larson and Lewarch 1995; Nelson 1990).

Human history in western Washington extends to at least 14,000 years ago, a period corresponding with the most recent retreat of glacial ice in the region. Over the next six millennia, Native peoples lived in small, mobile groups that moved seasonally between productive hunting, fishing, and gathering locations. Archaeological evidence dating to immediate postglacial periods is limited to isolated projectile points (Meltzer and Dunnell 1987). Sites dated to the early Holocene generally consist of small resource processing camps. Late Pleistocene and early Holocene sites have been identified on upland drift plains, landforms that experienced little deposition in subsequent millennia. Habitation sites and other site types may have existed in lowland areas and along marine shorelines, but they have likely been destroyed by alluvial erosion and inundated by sea level rise, respectively (Kopperl et al. 2016:114-115). One exception is the Bear Creek Site (45KI839) near Lake Sammamish, which contained concave-based and stemmed projectile points situated below peat deposits dated to approximately 11,000 years cal BP (Kopperl et al. 2015).

Middle and late Holocene sites are better represented in Washington's archaeological record due to the stabilization of sea levels and, in recent millennia, regional population increases. During the middle Holocene, roughly 8000 to 3000 years ago, Native peoples established a broader range of residential and resource procurement site types and sizes. Middle Holocene sites have been identified on upland glacial landforms, in lowland river valleys, and along marine shorelines. Lithic assemblages consisting of chipped flake tools and large, leaf-shaped and stemmed points fashioned from coarse-grained raw materials are present at sites predating approximately 5000 years ago. After this period, lithic assemblages exhibit greater variation in form and raw material. Harvest of and occupation near littoral resources—activities that often produced sizable shell middens—emerged approximately 4500 years ago. The expansion in site type and size during the middle Holocene coincided with decreased mobility as Native groups developed specialized adaptations to local environments. Middle Holocene archaeological deposits were identified at the West Point Site (45KI428/429) near Discovery Park in Seattle. The site contained large quantities of faunal remains, stone projectile points, and shell and stone beads. The presence of fish, shellfish, bird, and mammal remains pointed to year-round utilization as Native peoples took advantage of the

site's sheltered bluff and abundant nearby resources (Larson and Lewarch 1995). Other notable middle Holocene sites include the Marymoor Site (45KI9) near the confluence of Bear Creek and the Sammamish River (Greengo and Houston 1970) and the DuPont Southwest Site (45PI72) along the Puget Sound shoreline in DuPont (Wessen 1989).

Middle Holocene patterns intensified during the late Holocene. After around 3000 years ago, the archaeological record is characterized by diverse site and artifact types located in a range of environments. Semi-permanent winter village sites appear for the first time. Villages contained large shed- or gable-roofed plank houses built along marine shorelines and major waterways. During the non-winter months, Native peoples established single- and multiple-resource acquisition camps in lowland and upland areas. They harvested an array of plant and animal foods, and some sites, especially large coastal shell middens, exhibit evidence of intensive collection of resources such as salmon and shellfish. Lithic assemblages are characterized by local and imported raw material fashioned into chipped and ground tools, ground slate knives, and generally small, triangular projectile points. Organic materials such as basketry, wood and bone tools, and structural elements from this period are more likely to be preserved, both in sealed storage pits and in submerged anaerobic sites. Notable late Holocene archaeological sites in western Washington include the Mellen Site (45LE125) near Centralia (Kennedy 1978; Kopperl et al. 2014), Ozette (45CA24) on the Olympic Peninsula (Samuels 1994), Cathlapotle (45CL1) along the Columbia River near Ridgefield (Ames et al. 1999), late components of the West Point Site (45KI428/429) (Larson and Lewarch 1995), and Old Man House (45KP2) near Suquamish (Schalk and Rhode 1985).

The arrival of Euro-Americans and other newcomers in the late eighteenth century marked the beginning of the colonial period. The establishment of the Pacific fur trade and later the transformation of Washington and Oregon into U.S. settler colonies upended regional demography and ecology. Beginning around 1850, Native people and non-Native newcomers established new archaeological site types, including forts, logging camps, industrial areas, and urban centers. Materials and structures associated with these sites dominate the archaeological record of the late nineteenth and twentieth centuries. Notable sites dating to the colonial period include Fort Vancouver (45CL163) along the Columbia River (Wilson 2018) and the Dearborn South Tideland Site (45KI924) in downtown Seattle (Schneyder et al. 2011).

2.5 Native Peoples

The project is located within the ancestral homelands of the Cowlitz-speaking Newaukum and Cowlitz peoples, whose territory spanned from just south of Chehalis to just north of the confluence of the Cowlitz River with the Columbia River. It is likely that the Cowlitz jointly inhabited their villages with their neighbors, including the Chinook-speaking peoples

to the south and Upper Chehalis-speaking peoples to the north (Hajda 1990; Ruby et al. 2010).

The Upper Chehalis were five bands who spoke three dialects known as Satsop, Downriver Oakville, and Upriver Tenino (Miller 2012:168). Ethnographers identified these five bands as the stacawams, on the Chehalis River from Cloquallum Creek to the mouth of Black River, the sq ayayiq on the Black River and north to Eld Inlet; the Imzsluwa, near Tenino; the ?ilawiqs, near the city of Chehalis, and caxasn⁹ on the Upper Chehalis River around Pe Ell (Hajda 1990:503). The Cowlitz Indian Tribe were four distinct bands that have now come together as one (Wilson 1998). The land that Cowlitz people originally cared for ranges from the Columbia River to the Puget Sound to the Cascades for one group (Dupres 2014:15). Another group could be found from the Lewis River to Mount Saint Helens or Mount Adams. A third group could be found from Sauvie Island to a town, now known as Battle Ground, which honors the place where Cowlitz Chief Umtuch was murdered. The Lower Cowlitz lived along the lower Cowlitz River drainage along its tributaries and the Newaukum River Valley (Williams et al. 2014:4). The Lower Cowlitz spoke a Salishan dialect.

For millennia, the Chehalis River Basin, including the project location, has been a place of travel and exchange. The Cowlitz Trail extended north-south through the Cowlitz and Chehalis River Valleys, linking Puget Sound and the Columbia River. The Chehalis and Black Rivers enabled travel between Grays Harbor and southern Puget Sound. Willapa Bay was accessible via the upper Chehalis River and the Willapa Hills, and passes across the Cascade Range were present in the upper Newaukum River Valley. Native peoples journeyed through these corridors. They harvested resources from a range of environments and formalized social and economic relationships with neighboring groups. Relationships were established and strengthened via intermarriage, gifting, and trade, especially of localized resources such as shellfish from southern Puget Sound, sea mammal pelts from the coast, and (beginning in the eighteenth century) horses from the Columbia Plateau. The Chehalis River Basin was also an important highway connecting people with regional gathering, festivity, and trading centers such as Celilo Falls (Hajda 1990:508; James and Chubby 2015:106; Miller 2012).

During the nineteenth century, and for centuries prior, the lifeways of Cowlitz peoples and their neighbors featured seasonal movements to different settlements and resource gathering locations. During the spring, summer, and fall, families travelled across the landscape, primarily via canoe, to seasonal camps situated in a variety of environmental zones. From these camps, they built fish weirs to catch salmon, trout, and small fish; hunted birds and terrestrial mammals such as elk and deer; and collected berries, roots and other plants (Hajda 1990:507). Many important plant and animals would have been present along the Chehalis, Newaukum, and Cowlitz Rivers and their tributaries. The inland prairies in Upper Chehalis and Cowlitz lands also supported large quantities of camas, which were harvested for

consumption and exchange. The prairies were actively managed, with periodic burns conducted to enhance the productivity of camas and other plants and provide forage for animals (Leopold and Boyd 1999). Camas, fish, and other harvested resources were roasted, dried, and stored for consumption during the leaner winter months or processed for manufacture of clothing, medicines, baskets, and tools.

As fall turned to winter, families relocated to large gable-roofed, cedar plank houses in villages situated along waterways. Plank houses measured up to several hundred feet in length and were fashioned from split cedar planks and carved house posts, with mats used for insulation. They contained multiple interior hearths, sleeping platforms, and extensive storage facilities, and could house more than one family. Winter was a time for ceremonial activities and strengthening relations within and between village communities (Haeberlin and Gunther 1930). Kinkade (1997) compiled a list of Cowlitz place names and identified several villages along the Cowlitz River. The closest listed village is *łəkwəl*, located approximately 13.88 miles southeast of the project near the present-day town of Toledo.

The project location is part of a storied landscape. The names given to rivers, mountains, food gathering areas, and other geographic markers encapsulate the creation and ordering of the world, stories for proper behavior toward human and nonhuman relations, and Native peoples' millennia-old and ongoing histories. During the early twentieth century, ethnographers recorded hundreds of named places around western Washington. This collection is far from complete—the lands and waters of western Washington have been known by many thousands of names through time—and many of the translations offered by ethnographers do not capture the full significance of these places to local Native peoples (Thrush 2017:209-214). Even so, recorded place names speak to the connections between Native peoples and their ancestral homelands as well as the nature of cultural resources that may be encountered during this assessment.

Kinkade (1997) also recorded several place names along the Cowlitz River and its tributaries:

- o *q'ápn'ł* meaning “blueberry plant,” for the area near the present-day town of Winlock, located approximately 8.72 miles west of the project.
- o *kulu'ln* for Jackson Prairie, located approximately 13.53 miles northeast of the project.
- o *nixk'wá×nəxt'ən* meaning “stretching a hide,” or *łəkəmas*, for Lacamas Prairie, which has lots of camas, located approximately 13.55 miles west of the project.
- o *lapa'ləm* for a creek near Newaukum Prairie, located approximately 13.6 miles northeast of the project.

- o Náwaqwm meaning “big prairie,” for Newaukum Prairie, located approximately 14.38 miles northeast of the project.
- o Now-ok for Cowlitz Prairie, located approximately 15.02 miles west of the project.
- o mǝḵkan’l̥ for Lacamas Creek, located approximately 19.35 miles west of the project.

Knowledge about gathering areas, place names, and other lifeways continues to be passed down among contemporary Native peoples. Today, descendants of the those that lived, utilized, and travelled through the Chehalis River Basin are members of the Confederated Tribes of the Chehalis Reservation, Cowlitz Indian Tribe, Squaxin Island Tribe, Confederated Tribes and Bands of the Yakama Nation, Quinault Indian Nation, Nisqually Indian Tribe, and other Tribes. To learn more about the Chehalis and Cowlitz Tribes, visit the Tribal websites (e.g., Confederated Tribes of Chehalis Reservation 2025; Cowlitz Indian Tribe 2025).

2.6 Recent History

2.6.1 Colonization of Oregon Country

During the late eighteenth and early nineteenth centuries, Oregon Country, which encompassed the present-day Pacific Northwest, emerged as an epicenter of British and U.S. imperial activities. In May 1792, the Vancouver Expedition, led by George Vancouver, entered Puget Sound. The expedition was tasked with exploring whether the Strait of Juan de Fuca represented the western extent of the fabled Northwest Passage, which would facilitate water transport across North America. After dropping anchor between Bainbridge and Blake Islands, Vancouver dispatched a small crew led by Lieutenant Peter Puget to survey the southern sound. The expedition named several geographical features—including Mount Rainier, Hood Canal, and Whidbey Island—after crew members and British naval officers (Crowley 2003; Morgan 2018:3-23).

In 1833, Britain’s Hudson’s Bay Company (HBC) established Puget Sound’s first Euro-American trading post, Fort Nisqually. The fort was situated halfway between HBC’s Fort Vancouver to the south and Fort Langley to the north, and the local prairie was seen as a promising fur-gathering and agricultural area (Bagley 1915; Carpenter 1986:24-25, 36). In addition to economic aims, the fort was intended to strengthen British claims to the region and discourage U.S. settlement. The fort became home to a diverse population of HBC employees who established trading relationships with local Native groups. As the number of furbearing animals dwindled, the fort’s economic emphasis shifted to agriculture and husbandry. The Puget Sound Agricultural Company (PSAC) was established in 1838 as an HBC subsidiary to oversee cattle ranching at the fort and raise wheat, barley, oat, potato, and peas at the 4,000-acre Cowlitz Farm near present-day Toledo (Morgan 2018:50-53; Wilma 2005).

In May 1841, the United States Exploring Expedition entered Puget Sound. Led by Charles Wilkes, the expedition spent four years producing detailed surveys of the Antarctic coast, islands in the south and central Pacific, and the Pacific Northwest. The expedition's naturalists also collected zoological, botanical, and geological specimens and material culture from numerous Indigenous peoples. In the Pacific Northwest, these scientific aims were pursued alongside a larger geopolitical goal: assess the region's economic potential in the hopes of tilting imperial control toward the United States (Walker 2020). After meeting with HBC personnel at Fort Nisqually, the expedition set out to map the islands, harbor, and inlets of Puget Sound. In order to emphasize U.S. connection to the region, Wilkes named dozens of Puget Sound inlets, islands, and other areas after expedition officers and crewmembers. Many of these names, such as Elliott Bay, remain in use today (Crowley 2003).

The Oregon Treaty of 1846 resolved the United Kingdom and United States' competing imperial claims in the Pacific Northwest. The treaty ceded land south of the 49th parallel to the United States. Oregon Territory (which included present-day Washington State) soon attracted interest as a site of economic potential, religious proselytization, and territorial expansion. In 1850, the federal government passed the Donation Land Act, which attracted settlers to the region with the promise of free land. The act allowed individuals to claim 320 acres and married couples to claim 640 acres provided they arrived before December 1850 and occupied the land for four consecutive years. The act was later extended so that settlers who arrived as late as 1855 could claim 160 acres (Boswell 2017:33). The act passed despite the fact that, in the absence of ratified treaties, the federal government did not hold title to the land it offered. The Donation Land Act transformed Oregon Territory into a settler colony, a form of territorial control that relies on the appropriation of Native land and the removal of Native peoples (Veracini 2011). As the Euro-American population grew, settlers came to see the continued presence of Native peoples as antithetical to the region's future.

During the first half of the nineteenth century, Native peoples across western Washington grappled with the impacts of foreign diseases, introduced plants and animals, land seizure, and other outcomes of Euro-American colonization. From the late 1820s to 1850s, disease devastated Native communities in the Pacific Northwest. Cowlitz groups lost over 80 percent of their people due to diseases that had not been encountered before settlers (Dupres 2014:16). It was against this backdrop that Washington territorial governor and ex officio superintendent of Indian affairs Isaac Stevens negotiated treaties with Native groups. In February 1855, Stevens met with leaders representing Chinook, Chehalis, Cowlitz, Quinault and other groups on the Chehalis River near Grays Harbor. Native leaders resisted Stevens' push to consolidate all southwestern Washington Native groups onto a single reservation. Negotiations broke down, and Stevens left the treaty council. In July, leaders representing Quinault, Queets, Hoh, and Quileute groups signed the Quinault River Treaty

(later known as the Treaty of Olympia), which established the Quinault Reservation in exchange for title to 1.2 million acres of the western Olympic Peninsula.

In subsequent decades, many Native people in southwestern Washington were compelled to relocate to the Quinault Reservation, Chehalis Reservation, and Shoalwater Bay Reservation, the latter two of which were created via executive orders in 1864 and 1866. Many others remained in their ancestral homelands, living and working in urban and rural settings (Fisher and Jetté 2013; Harmon 1998; Marino 1990; Ott 2008, 2010; Wilma 2006). They also maintained (and continue to maintain) ties to gathering, hunting, and fishing locations and other significant places across their ancestral homelands. The Cowlitz Indian Tribe secured federal recognition in 2000.

2.6.2 History of Lewis County

The federal government's appropriation of Native land through treaties, combined with legislation such as the Donation Land Act of 1850, Land Act of 1820, and Homestead Act of 1862, paved the way for Euro-American settlement. Early Euro-American settlement activity, like that of Native communities, focused on easily accessed and resource rich areas such as shorelines and river valleys. There had already been a long history of the movement of people and goods through the area, as the Cowlitz Trail ran north-to-south through the county, connecting the Columbia River and Puget Sound. The first Euro-American settler in the county was Simon Plamandon, a French-Canadian farmer who claimed 640 acres along the Cowlitz River in 1927 and later operated the PSAC's Cowlitz Farm near present-day Toledo. Cowlitz Farm became a stop along the Cowlitz Trail, which the PSAC used to travel between Fort Vancouver and Fort Nisqually. The first settler in the Chehalis (then Saundersville) area was John Jackson, who settled at Jackson Prairie near present-day Mary's Corner in 1845 (Wilma 2005).

Lewis County was created on December 21, 1845, by the Provisional Legislature of Oregon, in honor of Meriwether Lewis. However, this Lewis County was far larger than today, spanning the entirety of western Washington and north into British Columbia. There was no official county seat, but the county commissioners first met at John Jackson's cabin in 1847. When Congress separated Washington Territory from Oregon in 1853, smaller counties were created in southwestern Washington, including Lewis County, which was cemented in its present-day shape by 1854 (Wilma 2005).

More settlers continued to arrive in the area, including the Saunder family who claimed land at the confluence of the Chehalis and Newaukum Rivers in 1851, John Cutting who filed the first claim in the Napavine area soon after, and Christopher Pagget and John Samuel Nealy who claimed land in the Winlock area in the following years. However, limited transportation routes stymied early development. People and goods could be shipped north up the Chehalis

and Cowlitz Rivers, but transport to Olympia and Puget Sound required overland journeys on muddy trails. In 1873, the Northern Pacific Railroad began offering service from Kalama to Puget Sound via Chehalis. The rail connection created new opportunities for the town. The railroad, combined with the dredging of the Chehalis River in the 1880s, led to a boom in the timber industry, as it opened a new connection to the towns on Washington's coast and a faster way to ship people and goods. By the early twentieth century, lumber, dairying, and other farms dominated the local economy (Cipalla 2021; Crowell 2007; Ott 2008; Wilma 2005). Starting in the late 1880s and continuing through the start of World War I, German-speaking families from Bukovina (modern Romania and Ukraine) immigrated to southwest Lewis County, in particular to the Boistfort and Lost valleys, establishing small family farms and finding work in the hops fields, mining, railroad and timber industries (Windler et al. 2021).

However, development in the early years of the twentieth century was relatively slow, and the county focused internally, building roads and improving infrastructure. The 1920s saw a drop in the timber industry, which was furthered by the Great Depression. In Winlock, egg and poultry production surpassed lumber during this time. During World War II, the demand for agricultural products and wood increased, revitalizing the community. Boeing operated a manufacturing plant in Chehalis that focused building on B-17 and B-29 bombers for the war effort. I-5 opened in 1955, further linking the area with Puget Sound and the Willamette Valley. In recent decades, a number of distribution facilities have been built in Chehalis and Centralia, taking advantage of the area's position midway between the Seattle and Portland metropolitan areas, but much of Lewis County remains rather rural and focused on farming and ranching. Today, over 85,000 call Lewis County home, 2,000 of which live in Napavine (Cipalla 2021; Crowell 2007; Ott 2008; Wilma 2005).

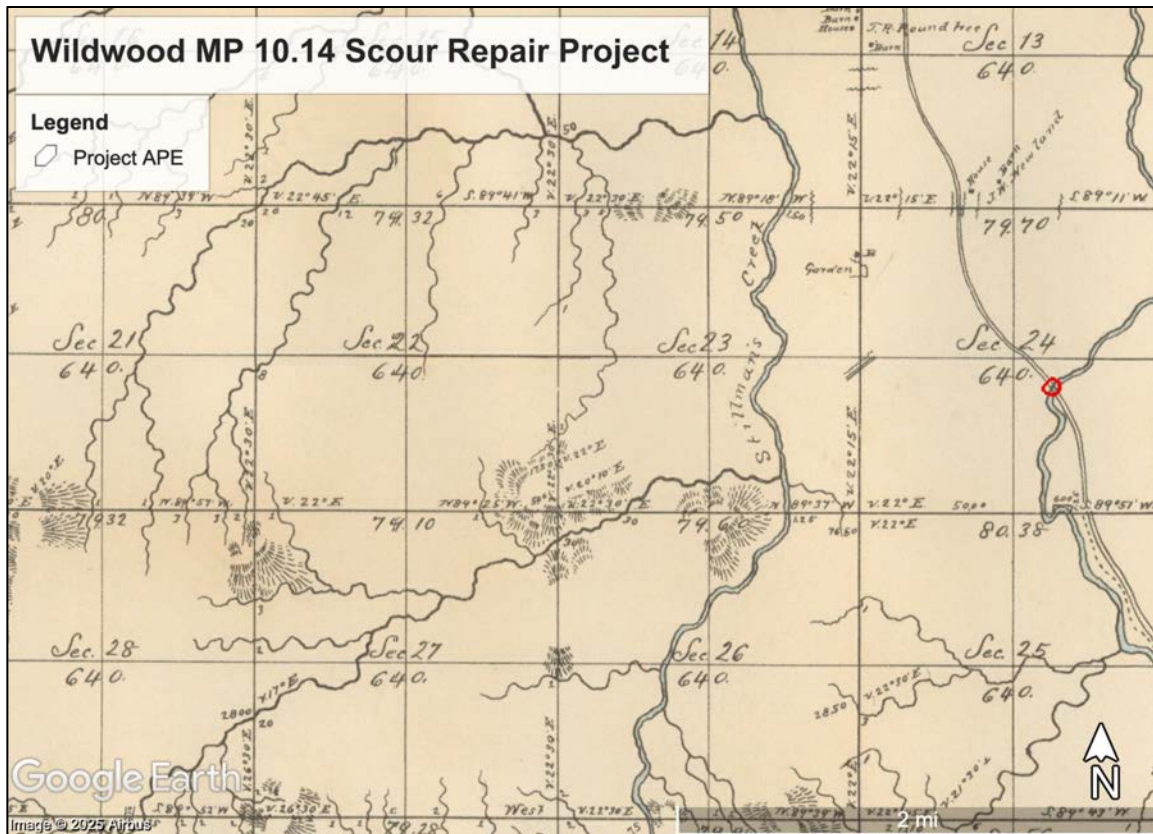
2.7 Historical Records Search

Information about landscape change, land use, and property ownership at the project location during the nineteenth and twentieth centuries is preserved in historical county atlases, topographic maps, census records, and aerial photographs. The United States General Land Office (GLO) conducted early cadastral surveys to define or re-establish the boundaries and subdivisions of federal lands so that land patents could be issued to settlers. The GLO produced maps of the project vicinity in 1874 (Figure 3) (United States Bureau of Land Management [BLM] 2025; United States Surveyor General [USSG] 1874). The project is located in a broad alluvial plain with the South Fork Chehalis River flowing north-to-south through the project. The map depicts an unnamed road that followed the approximate route of Wildwood Road. Stillman's Creek was recorded 0.92 miles to the west flowing from north-to-south. Local homesteads included the "J. W. New Land" barn and house (2.18 miles to the northeast), three barns and one house labelled "J.R. Round Tree" (2.65 miles to the northwest), and one barn labelled "W.M. Marey" (3.15 miles to the north). One garden

was located 1.7 miles west of the project location. Homesteads include that of Patrick Roundtree, granted in 1884; Zimri Rhodes, also granted in 1884; and Alfred Morris granted in 1891 (BLM 2025; USSG 1887). The Northern Pacific Railroad Company was granted numerous claims in the surrounding area in 1894 (BLM 2025). Records indicate that the project rests on land that was first patented by the heirs of Lewis Vliet under the Homestead Act of 1862 (12 Stat. 392) (BLM 2025). The patents, H.C. Detering Road, and Boistfort L.F. Road are featured in an 1890s right-of-way map (Figure 4) (Lewis County Assessor 2025).

Historical records indicate that the project vicinity has been the site of moderate development, farming, and ranching since at least the early twentieth century, though some of the farms were replaced by Chehalis and Boistfort Telephone Company facilities during the late twentieth century (Lewis County Assessor 2025). By 1941, the South Fork Chehalis River followed its current course, and the precursor to Wildwood Vader Road was present (Figure 5) (USACE 1941). Several roads were present in the vicinity of the project; Ocean Beach Highway was present 6.42 miles northwest of the project. The North Pacific Railroad was present 0.85 miles west of the project. The city of Boistfort lies 2.12 miles north. By 1953, little had changed, though a few new structures were present in the vicinity of the project (Figure 6) (USGS 1953).

Aerial imagery, available from Nationwide Environmental Title Research (NETR) starting in 1951, indicates that at that time, the project vicinity was almost entirely composed of farmlands. The South Fork Chehalis River was in its present-day location (NETR 2025). The land was owned by an A. C. Fairley, and most of the farms were owned by individuals or families (Metsker Map Company 1960). No major changes in land use or development occurred throughout most of the late twentieth century (Figures 7 – 8) (Google Inc. 2025; NETR 2025; USGS 1992). The area lost some of its rural character, but it has consisted primarily of farmlands into the present day, with few changes having occurred since 2009.



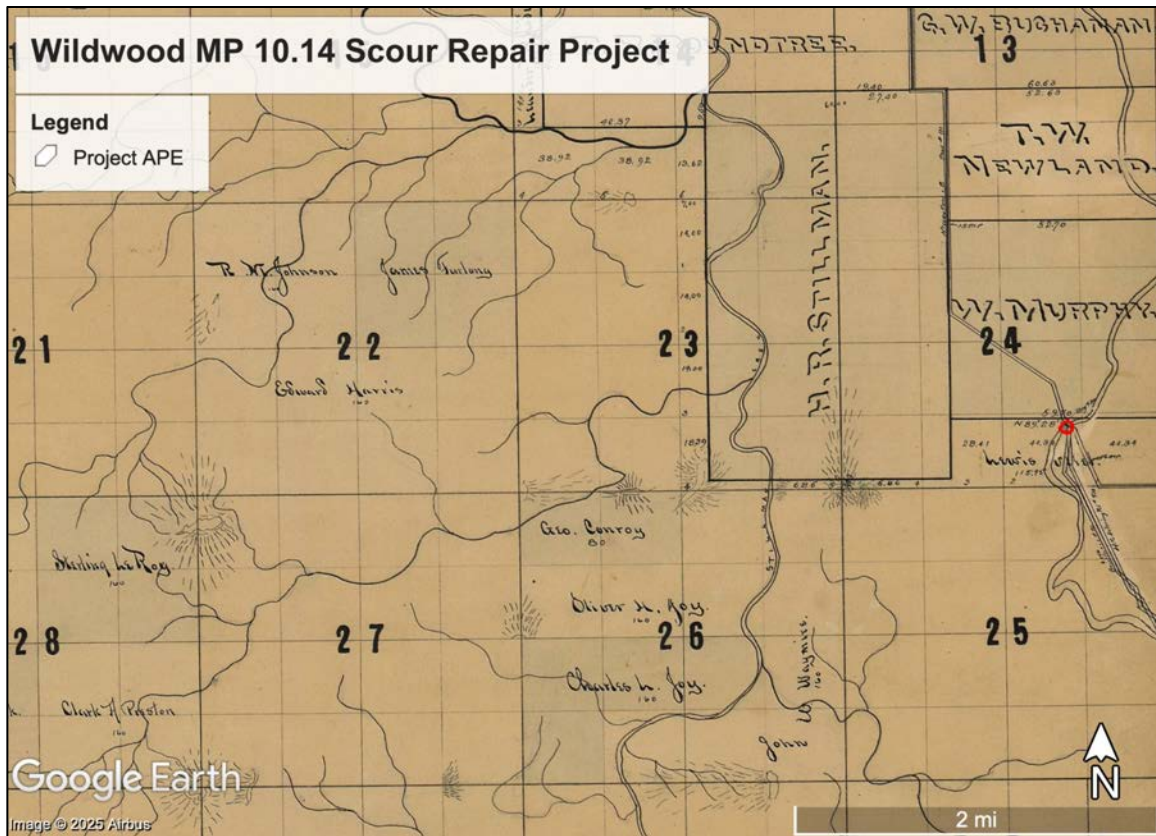


Figure 4. 1890s Lewis County GIS Historic ROW Map of the project vicinity (Lewis County Assessor 2025).

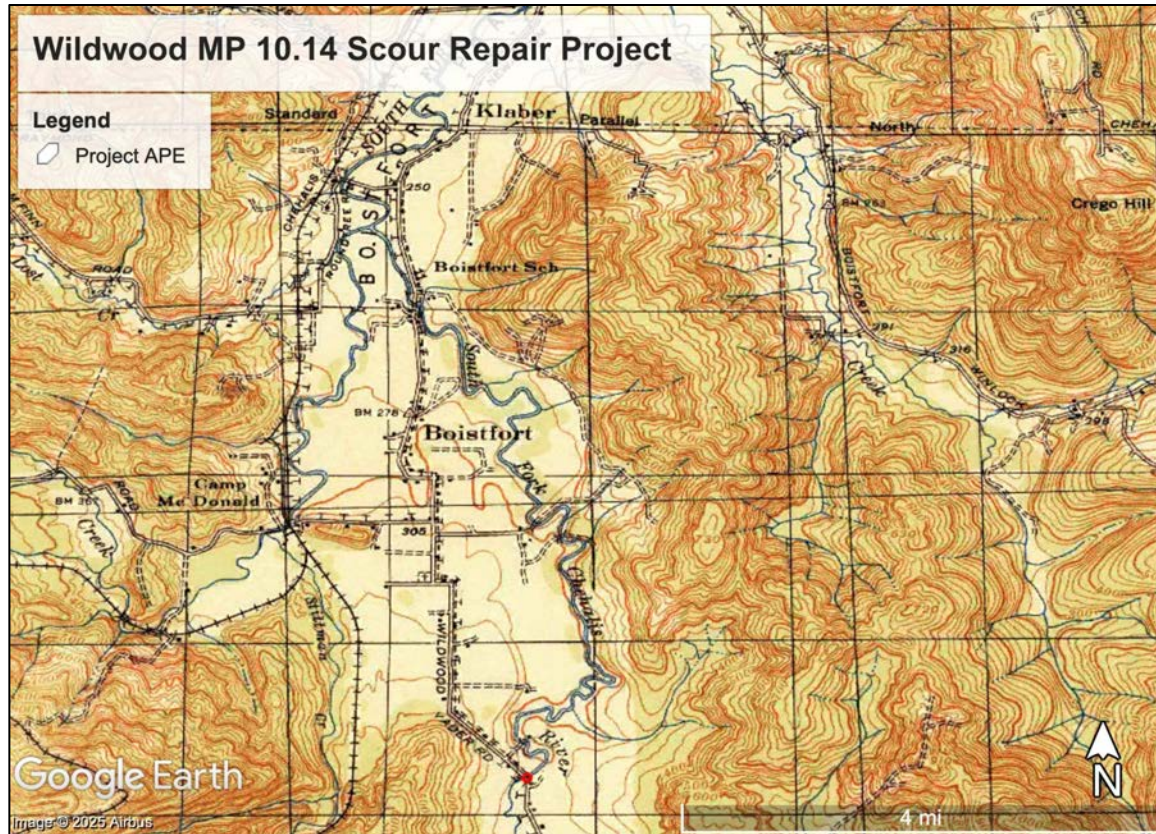


Figure 5. 1941 Meskill topographic map of the project vicinity (USACE 1941).

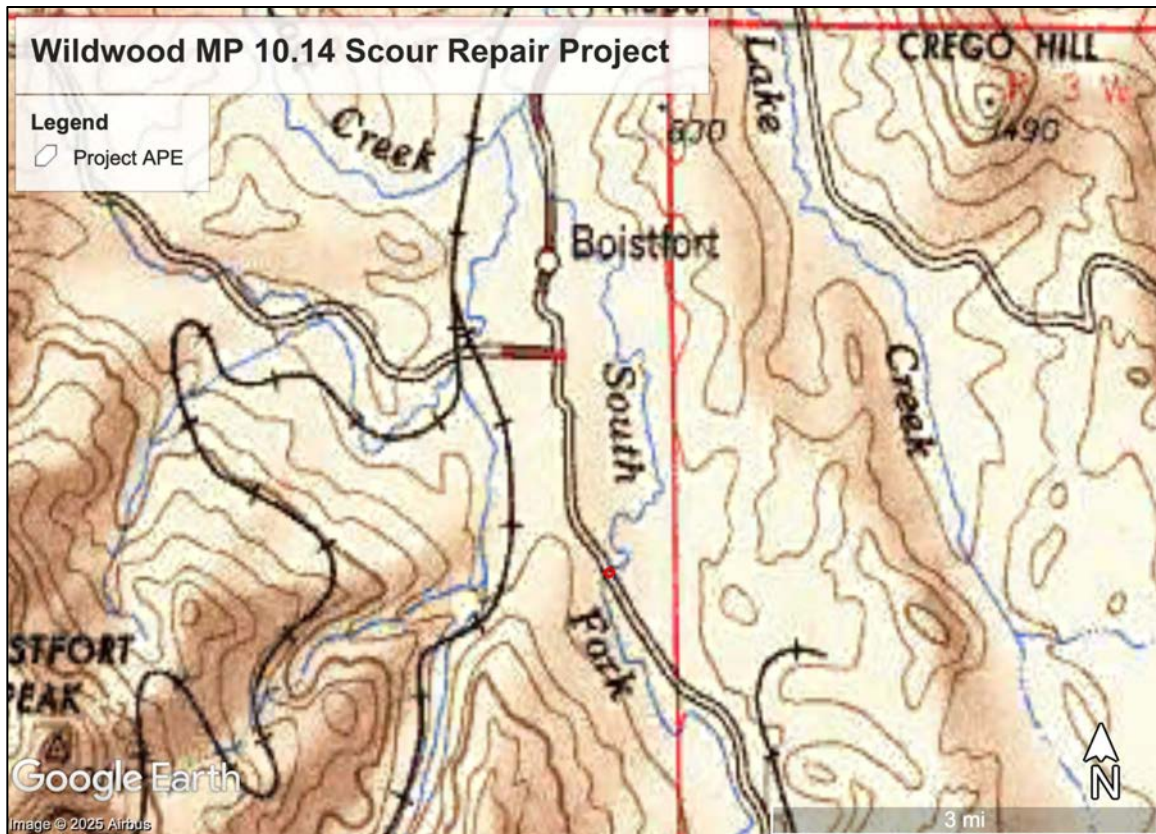


Figure 6. 1953 topographic map of the project vicinity (USGS 1953).



Figure 7. 1990 aerial imagery of the project vicinity (Google, Inc. 2025).

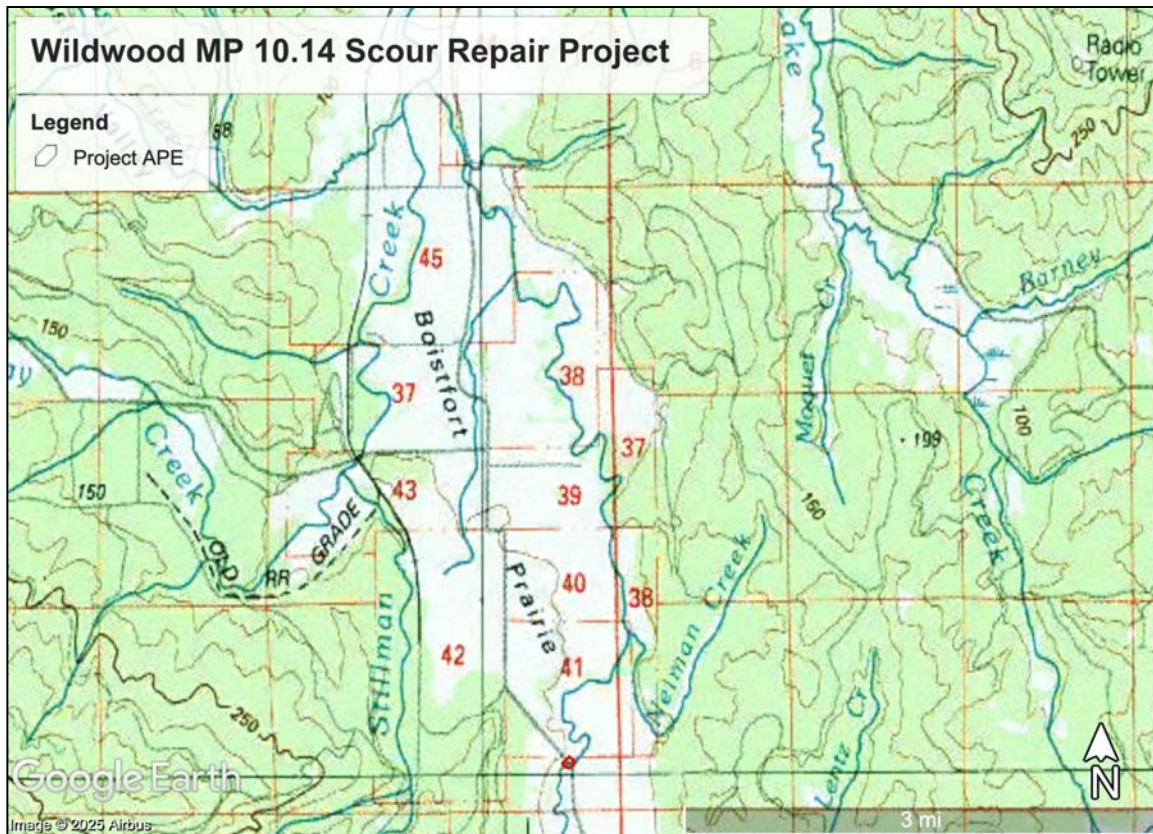


Figure 8. 1992 topographic map of the project vicinity (USGS 1992).

2.8 Cultural Resources Database Review

A review of the WISAARD database identified cultural resource investigations, precontact and postcontact archaeological sites, register-listed historic properties, and historic built environment resources in the vicinity of the project. This review provides information about the nature and likelihood of cultural resources at the project location (DAHP 2025).

2.8.1 Cultural Resources Investigations

Eight cultural resources investigations listed on WISAARD have been completed within two miles of the project (Table 1). Of these, two cultural resources assessments have been completed within one mile of the project.

Freed (2013) conducted a surface pedestrian survey and excavated five shovel test probes ahead of proposed water system improvements along the western side of Wildwood Road. Surface pedestrian survey was conducted along both sides of Wildwood Road, including at the current project APE. No shovel probes were excavated at the current project APE. Near the bridge, the road prism stood about 15 feet above the surrounding pastureland. No archaeological sites or other cultural resources were identified.

Another cultural resources investigation is located approximately 0.22 miles south-southwest of the current project APE. Lancaster and Amara (2024) conducted a surface pedestrian survey and excavated 22 shovel test probes. The pedestrian survey was carried out along the riparian forest of the South Fork Chehalis River. This investigation was undertaken in support of the Lewis Conservation District (LCD), in collaboration with Mallonee Farms, on privately owned land in preparation for planned riparian conservation activities. No archaeological sites or other cultural resources were identified during the investigation.

Table 1. Cultural resources investigations completed within two miles of the project.

Reference (NADB)	Report Title	Field Methodology	Distance from Project	Results
Freed 2013 (1683555)	Archaeological Investigation for the Wildwood Road Water Main Replacement Project (Phase 3) in the Boistfort Valley	Surface survey, 5 shovel test probes	Overlaps with project APE	No cultural resources recorded
Lancaster and Amara 2024 (1699246)	Cultural Resources Inventory for the Mallonee Farms Riparian Planting Project, Lewis County, Washington	Surface survey, 22 shovel test probes	0.22 miles southwest	No cultural resources recorded
Randolph 2010 (1353778)	Cultural Resources Inventory and Test Excavations of the Mallonee, Heifer Farm 2009 EQIP Project, Lewis County, Washington (DAHP Log. No. 082509- 05-NRCS)	Surface survey, 8 shovel test probes	1.80 miles northwest	No cultural resources recorded
Fuld and Ozburn 2015 (1687312)	Cultural Resource Survey for the Pe Ell McDonald Road (MP 8.68) Bridge Scour Project Renton, King County, Washington	Surface survey, 10 shovel test probes	1.90 miles northwest	Recorded 45LE907, Camp McDonald, Historic Railroad Bridge Abutments, Structural Debris Scatter

2.8.2 Archaeological Sites

Three previously recorded archaeological sites are located within one mile of the project location (Table 2). 45LE95 is located 0.78 miles to the southeast. The site was identified in 1969 and is poorly documented. It contained stone tools and flakes, projectile points and scrapers, and fossilized shell (DAHP 1969). It has not received an eligibility determination for listing on the NRHP.

45LE1011 is located 0.5 miles southeast. The site was identified in 2020 and contains two clusters of lithic material (Gardner 2020a). The first layer consisted of five lithic fragments and one volcanic flake from 10 to 30 cm below surface. The second layer of lithic material consisted of two CCS flakes from 110 to 140 cm below surface. It has not received an eligibility determination for listing on the NRHP.

45LE1012 is located 0.47 miles southeast. The site contains two lithic fragments or CCS shatter from 10 to 30 cm below surface (Gardner 2020b). It has not received an eligibility determination for listing on the NRHP.

Table 2. Recorded archaeological sites located within one mile of the project location.

Site	Site Type	Depth (below surface)	Site Age	Distance from Project	NRHP Status
45LE95	Precontact site	Surface	Likely precontact	0.78 miles southeast	No eligibility determined
45LE1011	Precontact lithic material	10-140 cm	Likely precontact	0.5 miles southeast	No eligibility determined
45LE1012	Precontact lithic material	10-30 cm	Likely precontact	0.47 miles southeast	No eligibility determined

2.8.3 Historic Properties

No properties listed on the NRHP or the Washington Heritage Register (WHR) are located within one mile of the project. The historic property listed on the National Register and Washington Heritage Register closest to the project is Boistfort High School (45LE535), located 3.02 miles to the north-northwest. The high school is a two-story frame structure built in 1918. To the north of the high school is a brick elementary school which was constructed in the 1930s. The gymnasium was added to the high school in the 1960s. The original fir flooring, paneled doors, and simple door and window surrounds have been retained throughout the building.

2.8.4 Historic Built Environment Resources

The closest historic built environment resource to the project is the 2104 Wildwood Road building (DAHP Property # 607240), located 937 feet to the southeast. The 1.5-story building has an unknown roof clad in asphalt composition shingles. The walls of the building are clad principally in wood. The building sits on a concrete block foundation. A Historic Property Inventory (HPI) form for the building was created as part of DAHP's 2011 HPI Upload Project, which involved the addition of available information from county assessor building records to WISAARD (ACI et al. 2011). This data was not field verified at the time, nor were eligibility assessments conducted.

2.8.5 Cemeteries

No cemeteries are located within one mile of the project location. Closest to the project is the Boistfort Cemetery (45LE631) and Old Boistfort Cemetery (45LE632) 1.25 miles to the northwest along Wildwood Road.

2.8.6 Traditional Cultural Properties

No Traditional Cultural Properties (TCPs) listed on WISAARD are located within one mile of the project.

3. DAHP Statewide Predictive Model

The DAHP statewide predictive model uses environmental data associated with documented archaeological sites to identify areas at which unknown sites may be found (Kauhi and Markert 2009). Environmental categories included in the model are elevation, slope, aspect, distance to water, geology, soils, and landforms. The model contains five probability ranks: (1) very high risk, (2) high risk, (3) moderate risk, (4) moderately low risk, and (5) low risk. The model ranks the project location as high to very high risk for archaeological sites.

4. Archaeological Expectations

This assessment combines the above background research, cultural resources database review, and predictive modeling results to evaluate the possibility that archaeological deposits will be encountered at the project location. The Wildwood MP 10.14 Scour Repair Project encompasses approximately 2.23 acres of Wildwood Road right-of-way, the South Fork Chehalis River channel, and a floodplain terrace between them. The project landscape was formed by fluvial processes, leaving alluvial deposits in the project vicinity from river flooding and channel migration. The landscape surrounding the project has been shaped by natural processes for millennia. The soil unit mapped across the majority of the project, Chehalis silty clay, formed out of alluvium. Additionally, the project location has been used for agriculture and ranching and may have been disturbed by plowing, harvesting, and other associated landscape modifications.

The project location has also been shaped by human activity. For millennia, Lewis has supported settlements, resource management and gathering, and travel by the Newaukum and Cowlitz peoples and their neighbors. These long-term connections are reflected in the presence of recorded place names, village locations, and archaeological sites in the project's vicinity. Physical evidence of historic Native lifeways may exist at the project in the form of archaeological sites. Given the geomorphological setting of the project, archaeological sites created between the terminal Pleistocene and twentieth century, if present, may be situated near the surface or deeply buried within alluvial deposits. Fine-grained sediments may preserve organic and cultural materials deep below the surface due to the low-energy depositional setting along the South Fork Chehalis River. Archaeological sites associated with Native peoples' long-term history on and around the project may include but are not limited to lithic tools, fire-modified rock, hearth features, bone tools or implements, processed faunal remains, or structural elements.

The arrival of Euro-American settlers in the middle decades of the nineteenth century led to major changes in the landscape of the project vicinity. Landscape modification and occupation during the nineteenth and twentieth centuries may have also resulted in the creation of new archaeological sites. These more recent sites may include debris from road and bridge construction, and possibly various residential debris such as brick, concrete, and milled lumber, and domestic and agricultural objects such as glass vessels and metal implements, among others. Nineteenth- and twentieth-century archaeological sites, if present, will be encountered near the surface in fill deposits and/or near-surface horizons of intact alluvial derived soils. Isolated finds associated with recent sites and concentrations of temporally nondiagnostic materials generally do not satisfy eligibility criteria for the NRHP. Exceptions may include intact floors or structural elements or objects associated with particular individuals or events.

5. Field Investigation

5.1 Survey Data

Total area examined: areas where livestock were not present (2.06 acres).

Areas not examined: areas where livestock were present (0.17 acres).

Date of survey: May 22, 2025.

Fieldwork conducted by: Emily Boutain and Lane Larson. Field notes are on file with CRC.

Weather and surface visibility: Weather conditions ranged from clear and sunny to overcast and raining with temperatures between 60 and 72 degrees Fahrenheit. Surface visibility was less than five percent in the northeastern half of the project due to dense vegetation ground

cover. The western and southern half of the project contained some cleared areas and dense vegetation; surface visibility was about 10 percent.

5.2 Survey Methodology

Field investigation consisted of surface and subsurface survey. Surface survey was conducted via pedestrian transects spaced 20 meters (66 feet) apart. Subsurface survey was achieved via excavation of six cylindrical shovel test probes. Probes were excavated at 20- to 30-meter (66- to 99-foot) intervals. They measured 50 cm (1.6 feet) in diameter and were excavated with a shovel and a 10-cm (4-inch) diameter bucket auger to a target depth of 150 cm (4.9 feet) below surface. Excavated sediments were passed through 1/8-inch mesh to screen for artifacts. If identified, artifacts would be documented in the field, placed in a bag with a detectable metal tag, and reburied in the probe in which they were found. Probe locations were recorded using a handheld GPS unit (WGS84 Zone 10 UTM coordinates, ± 3 meters [9.8 feet]).

5.3 Survey Results

5.3.1 Surface Survey

Surface survey was conducted to assess project conditions, document archaeological materials, and identify areas suitable for subsurface testing. The project location consists of the Wildwood Road roadway and Wildwood Bridge, the area east of Wildwood Road, and the area west of Wildwood Road (Figures 9 – 14). The South Fork Chehalis River flows under Wildwood Bridge and through the areas both east and west of the bridge. The southwestern portion of the project was not accessible due to livestock occupying the area but primarily consisted of farmland to the west and the heavily vegetated South Fork Chehalis River channel to the west. Fences separated the eastern and western properties from the road.

The majority of the project to the northwest and east of Wildwood Road was surveyed. These areas consist primarily of undeveloped, moderately vegetated land surrounding the South Fork Chehalis River channel (Figure 15). The riverbed is significantly lower than the surrounding land, with steep slopes descending into the channel. Wildwood Bridge sits approximately 40 feet above the riverbed. Many wetland plants surround the river, while more upland vegetation exists above the river, such as western sword fern (*Polystichum munitum*), Oregon grape (*Mahonia aquifolium*), Himalayan blackberry (*Rubus armeniacus*), western redcedar (*Thuja plicata*), and Douglas fir (*Pseudotsuga menziesii*), among others. The riverbed itself is covered with cobbles, and the water was between 0.5 and 3 feet deep at the time of the survey.

The portion of Wildwood Road within the project consists of a two-lane paved road with wide gravel shoulders to the east and west of Wildwood Bridge but with very narrow shoulders with guard rails on the bridge itself. Constructed in 1955, the structure is a 124-foot-long, three-span bridge supported by concrete piles (Figure 16). As the bridge was constructed after 1945 and is of a simple girder and slab design, it meets the Advisory Council on Historic Preservation's Program Comment on Common Post-1945 Concrete and Steel Bridges (ACHP 2012:Section V) and is therefore exempt from Section 106 review (FHWA 2025).

Small amounts of modern trash were observed scattered throughout the project location during surface survey, primarily consisting of plastic wrappers and bottles, and aluminum cans. No cultural resources were observed during the surface survey.



Figure 9. Locations of pedestrian survey transects and shovel test probes excavated at the project location.



Figure 10. Overview of Wildwood Road and Wildwood Bridge.
View to the south.

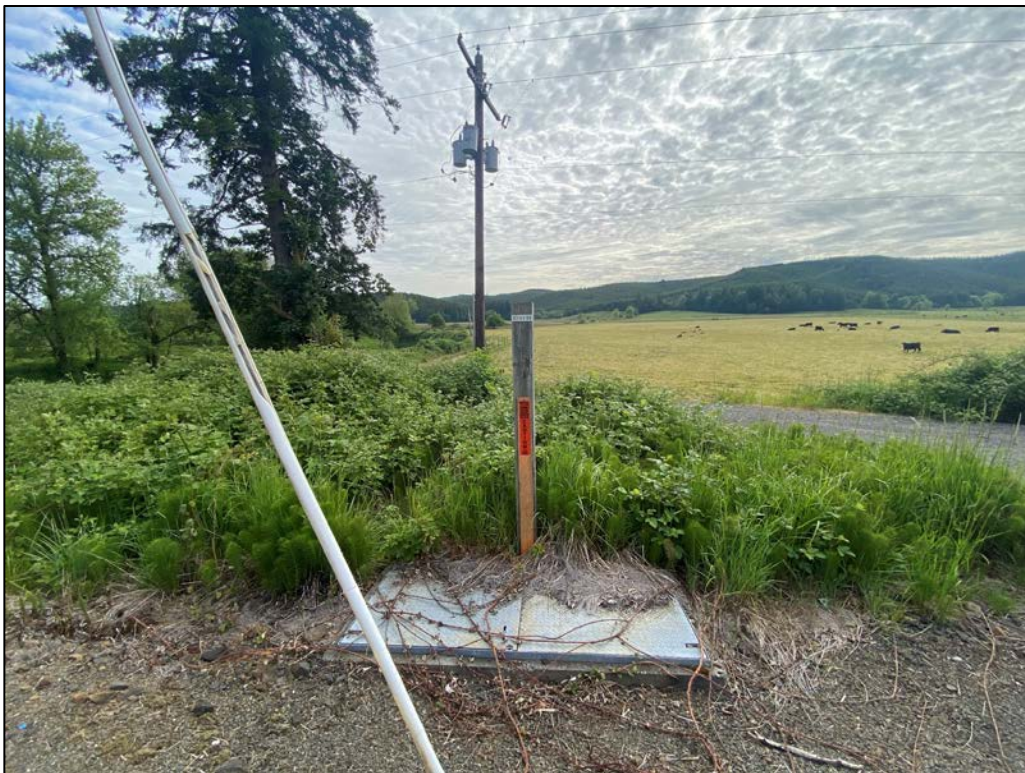


Figure 11. Overview of the southeastern half of the project west of probe #6. View to the east.



Figure 12. Overview of the southwestern portion of the project in the vicinity of probes #3, 4, and 5. View to the west.



Figure 13. Overview of the northwestern part of the project in the vicinity of probe #1 and the South Fork Chehalis River. View to the north.



Figure 14. Overview of the northwestern part of the project in the vicinity of probe #2 and the South Fork Chehalis River. View to the north



Figure 15. Overview of the South Fork Chehalis River and bridge in the vicinity of probe #5. View to the northeast.



Figure 16. Overview of the Wildwood Bridge in the vicinity of probe #2.
View to the southeast.

5.3.2 *Subsurface Survey*

Subsurface survey was achieved via excavation of six shovel test probes (Figure 9, Appendix C). Probes were excavated at 20- to 30-meter (66 to 99-foot) intervals. They reached an average depth of 116 cm (3.8 feet). The location of probe 6 was shifted slightly southwest from its original location to avoid a fallen tree and probes 3 to 5 were shifted slightly north to avoid livestock. The most common reason for probe termination was encounter of dense clay deposits unamenable to hand excavation. Probe 4 was terminated in the B horizon due to encountering a subsurface ant colony. Probe 6 terminated in fill due to rock obstructions.

In the northwestern portion of the project location, probes 1 and 2 encountered well-developed soil horizons (Figure 18). Soil horizons, textures, and colors were generally consistent with the locally mapped soil unit, Chehalis silty clay loam. The A horizon was thinner than the mapped soil unit and consisted of pale brown silty clay and extended to a depth of 21 cm (0.6 feet). The B horizon consisted of pale brown to yellowish brown sandy silty clay and extended to a depth of 125 cm (4.1 feet). The C horizon consisted of moderately to highly compact, very pale brown to pale gray sandy clay. Across much of the project's southern half, which appeared largely undisturbed, the C horizon was observed about 125 cm (4.1 feet) below surface and extended to the base of the probes.

Probes 3, 4, and 5, located in the southwestern portion of the project area, encountered markedly different sediments compared to probes 1 and 2 in the northwestern portion. This variation in stratigraphy is likely attributable to differences in topography and hydrological influence. The southwestern portion of the project area exhibits a gentler slope and lies closer to the South Fork Chehalis River, suggesting a greater susceptibility to periodic flooding and sediment reworking. Shovel test probes in this area revealed two distinct stratigraphic layers, both composed primarily of sand. The A horizon consisted of light yellowish brown fine sand extending to a depth of 41 cm (1.3 feet), underlain by alluvium of darker yellowish brown fine sand, which extended to at least 160 cm (5.2 feet). The absence of well-developed soil horizons in this area may stem from fluvial processes or ground disturbance, possibly related to grading or construction activities. These overlying horizons may have been stripped and redeposited elsewhere, such as in the berm located to the east.

Small quantities of modern or temporally non-diagnostic refuse were observed in select probes. No archaeological sites were identified during subsurface survey.



Figure 17. Representative images of subsurface deposits identified at the project location. Clockwise from upper left, images are of intact soil horizons (probes #1 and #2) and intact soil horizons overlying sandy alluvium (probes #3 and #5).

6. Findings and Recommendations

The Wildwood MP 10.14 Scour Repair Project proposes to excavate and fill along the banks of the South Fork Chehalis River to provide scour protection and bank stability. Background research conducted by CRC did not result in the identification of any previously recorded archaeological sites, historic properties, or other cultural resources at the project location. Lewis County Bridge No. 03 is a three-span reinforced concrete T-beam girder bridge constructed in 1955 to carry Wildwood Road over the South Fork Chehalis River. While the bridge is over 50 years old, the bridge is of a ubiquitous design common to twentieth century bridge construction (Parsons Brinckerhoff and Engineering and Industrial Heritage 2005:3-88). In 2012, these bridges were included in an exception to Section 106 requirements for inventory and evaluation for listing on the NRHP under the Program Comment for Common Post-1945 Concrete and Steel Bridges (ACHP 2012; FHWA 2025). As such, the bridge is excluded from evaluation.

The DAHP Statewide Predictive Model ranks the project location as high to very high risk for archaeological sites. For millennia, the Chehalis River and its tributaries have supported

habitation, travel, and resource gathering by Cowlitz-speakers such as the Cowlitz and Newaukum groups and their neighbors. This long-term history is reflected in the presence of recorded villages, place names, and archaeological sites in the greater project vicinity. Beginning in the mid-nineteenth century, Native peoples and Euro-American settlers and other newcomers established logging activities, transportation networks, residences, and agricultural operations around the Boistfort and Chehalis areas.

During field investigation, no archaeological sites or other cultural resources were identified. Six shovel test probes were excavated across the APE to an average depth of 116 cm (3.8 feet). None of the probes contained archaeological material. The northwestern side of the river valley consists of intact soil horizons consistent with mapped Chehalis silty clay. In contrast, the southwestern (downslope) side of the river, which is graded pastureland and situated closer to the active channel, is composed of yellowish brown, loose sand extending to at least 160 cm (5.25 feet) below surface. This stratigraphy is consistent with recent floodplain or overbank deposition, potentially influenced by channel migration and modern land modification. This stratigraphic variability reflects the complex depositional history of the valley, where alluvial processes have shaped multiple landforms within the project boundary. Most ground disturbance is anticipated to be within 3 to 5 ft below surface, comparable to the depths reached by the shovel probes, and the maximum depth of ground disturbance will be up to 8 feet below surface. No additional cultural resources investigation is recommended at this time. CRC recommends a finding of “no historic properties affected.” If project activities result in the discovery of archaeological materials or human skeletal remains, CRC recommends project staff follow the inadvertent discovery protocol outlined in Appendix D. Work should be stopped until further investigation and appropriate consultation have concluded. If human skeletal remains are inadvertently revealed, project staff should immediately stop work, cover, and secure the remains against further disturbance, and contact law enforcement personnel, consistent with the provisions set forth in RCW 27.44.055 and RCW 68.60.055.

7. Limitations of this Assessment

No cultural resources study can assess with complete certainty whether archaeological sites, historic properties, or traditional cultural properties exist at a project location. The information presented in this report is based on professional opinions derived from CRC’s analysis and interpretation of available documents, records, literature, and information identified in this report and on field investigation and observations. The conclusions and recommendations presented apply to current and reasonably foreseeable project conditions. The data, conclusions, and interpretations in this report should not be construed as a warranty of subsurface conditions. They do not apply to site changes of which CRC is not aware and has not had the opportunity to evaluate.

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Appendix A. Correspondence



Cultural Resource Consultants

Confederated Tribes of the Chehalis Reservation
Dan Penn, Tribal Historic Preservation Officer
PO Box 536
Oakville, WA 98568

April 14, 2025

Re: Cultural Resources Assessment for the Wildwood MP 10.14 Scour Repair Project, Lewis County, Washington

Dear Dan:

I am writing to inform you of a cultural resources assessment for the above referenced project and to seek additional information about the project area the Tribe may be willing to share that is not readily available in other sources. This letter is sent on a technical staff-to-technical staff basis to inquire about project-related cultural information or concerns. It is not intended as formal government-to-government consultation to be initiated by the appropriate regulatory agency.

The project APE totals 2.23 acres. It encompasses the right-of-way of Wildwood Road over the South Fork Chehalis River and portions of adjacent parcels in the SE¼ of Section 24 in Township 12 North, Range 04 West, Willamette Meridian. The bridge is classified as scour critical due to abutment/interior pile tip elevations within 10 feet of the stream's thalweg. The project proposes to conduct scour analysis and develop three mitigation alternatives. Ground disturbance will likely include excavation along the channel and banks of the South Fork Chehalis River and tracking from movement of machinery.

We are currently conducting background research for this project. Background research will include a review of site forms maintained by the Washington State Department of Archaeology and Historic Preservation, previously completed cultural resource reports, and relevant environmental, historical, and cultural publications. Field investigation will consist of pedestrian survey, excavation of shovel test probes, and built environment survey. Results will be presented in a technical memo.

We are aware that not all information is contained in published sources. Should the Tribe have additional information you would be willing to share to support our assessment, we would very much like to include it in our study. Please contact me at ian@crcwa.com or 360.431.3433 should you wish to provide any comments. I appreciate your assistance and look forward to hearing from you.

Sincerely,

Ian Kretzler
Projects Manager

CULTURAL RESOURCE CONSULTANTS, LLC. PO Box 4159, SEATTLE, WA 98194
PHONE 206.855.9020 - ian@crcwa.com



Cultural Resource Consultants

Cowlitz Indian Tribe
Irene Dunbar, Cultural Resources
PO Box 2547
Longview, WA 98632

April 14, 2025

Re: Cultural Resources Assessment for the Wildwood MP 10.14 Scour Repair Project, Lewis County, Washington

Dear Irene:

I am writing to inform you of a cultural resources assessment for the above referenced project and to seek additional information about the project area the Tribe may be willing to share that is not readily available in other sources. This letter is sent on a technical staff-to-technical staff basis to inquire about project-related cultural information or concerns. It is not intended as formal government-to-government consultation to be initiated by the appropriate regulatory agency.

The project APE totals 2.23 acres. It encompasses the right-of-way of Wildwood Road over the South Fork Chehalis River and portions of adjacent parcels in the SE¼ of Section 24 in Township 12 North, Range 04 West, Willamette Meridian. The bridge is classified as scour critical due to abutment/interior pile tip elevations within 10 feet of the stream's thalweg. The project proposes to conduct scour analysis and develop three mitigation alternatives. Ground disturbance will likely include excavation along the channel and banks of the South Fork Chehalis River and tracking from movement of machinery.

We are currently conducting background research for this project. Background research will include a review of site forms maintained by the Washington State Department of Archaeology and Historic Preservation, previously completed cultural resource reports, and relevant environmental, historical, and cultural publications. Field investigation will consist of pedestrian survey, excavation of shovel test probes, and built environment survey. Results will be presented in a technical memo.

We are aware that not all information is contained in published sources. Should the Tribe have additional information you would be willing to share to support our assessment, we would very much like to include it in our study. Please contact me at ian@crcwa.com or 360.431.3433 should you wish to provide any comments. I appreciate your assistance and look forward to hearing from you.

Sincerely,

Ian Kretzler
Projects Manager

CULTURAL RESOURCE CONSULTANTS, LLC. PO Box 4159, SEATTLE, WA 98194
PHONE 206.855.9020 - ian@crcwa.com



Cultural Resource Consultants

Nisqually Indian Tribe
Brad Beach, Tribal Historic Preservation Officer
4820 She-Nah-Num Drive SE
Olympia, WA 98513

April 14, 2025

Re: Cultural Resources Assessment for the Wildwood MP 10.14 Scour Repair Project, Lewis County, Washington

Dear Brad:

I am writing to inform you of a cultural resources assessment for the above referenced project and to seek additional information about the project area the Tribe may be willing to share that is not readily available in other sources. This letter is sent on a technical staff-to-technical staff basis to inquire about project-related cultural information or concerns. It is not intended as formal government-to-government consultation to be initiated by the appropriate regulatory agency.

The project APE totals 2.23 acres. It encompasses the right-of-way of Wildwood Road over the South Fork Chehalis River and portions of adjacent parcels in the SE¼ of Section 24 in Township 12 North, Range 04 West, Willamette Meridian. The bridge is classified as scour critical due to abutment/interior pile tip elevations within 10 feet of the stream's thalweg. The project proposes to conduct scour analysis and develop three mitigation alternatives. Ground disturbance will likely include excavation along the channel and banks of the South Fork Chehalis River and tracking from movement of machinery.

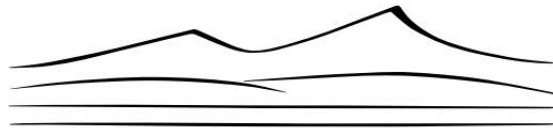
We are currently conducting background research for this project. Background research will include a review of site forms maintained by the Washington State Department of Archaeology and Historic Preservation, previously completed cultural resource reports, and relevant environmental, historical, and cultural publications. Field investigation will consist of pedestrian survey, excavation of shovel test probes, and built environment survey. Results will be presented in a technical memo.

We are aware that not all information is contained in published sources. Should the Tribe have additional information you would be willing to share to support our assessment, we would very much like to include it in our study. Please contact me at ian@crcwa.com or 360.431.3433 should you wish to provide any comments. I appreciate your assistance and look forward to hearing from you.

Sincerely,

Ian Kretzler
Projects Manager

CULTURAL RESOURCE CONSULTANTS, LLC. PO BOX 4159, SEATTLE, WA 98194
PHONE 206.855.9020 - ian@crcwa.com



Cultural Resource Consultants

Quinault Indian Nation
Lia Frenchman, Tribal Historic Preservation Officer
PO Box 189
Taholah, WA 98587

April 14, 2025

Re: Cultural Resources Assessment for the Wildwood MP 10.14 Scour Repair Project, Lewis County, Washington

Dear Lia:

I am writing to inform you of a cultural resources assessment for the above referenced project and to seek additional information about the project area the Tribe may be willing to share that is not readily available in other sources. This letter is sent on a technical staff-to-technical staff basis to inquire about project-related cultural information or concerns. It is not intended as formal government-to-government consultation to be initiated by the appropriate regulatory agency.

The project APE totals 2.23 acres. It encompasses the right-of-way of Wildwood Road over the South Fork Chehalis River and portions of adjacent parcels in the SE¼ of Section 24 in Township 12 North, Range 04 West, Willamette Meridian. The bridge is classified as scour critical due to abutment/interior pile tip elevations within 10 feet of the stream's thalweg. The project proposes to conduct scour analysis and develop three mitigation alternatives. Ground disturbance will likely include excavation along the channel and banks of the South Fork Chehalis River and tracking from movement of machinery.

We are currently conducting background research for this project. Background research will include a review of site forms maintained by the Washington State Department of Archaeology and Historic Preservation, previously completed cultural resource reports, and relevant environmental, historical, and cultural publications. Field investigation will consist of pedestrian survey, excavation of shovel test probes, and built environment survey. Results will be presented in a technical memo.

We are aware that not all information is contained in published sources. Should the Tribe have additional information you would be willing to share to support our assessment, we would very much like to include it in our study. Please contact me at ian@crcwa.com or 360.431.3433 should you wish to provide any comments. I appreciate your assistance and look forward to hearing from you.

Sincerely,

Ian Kretzler
Projects Manager

CULTURAL RESOURCE CONSULTANTS, LLC. PO Box 4159, SEATTLE, WA 98194
PHONE 206.855.9020 - ian@crcwa.com

Appendix B.APE Consultation

April 2, 2025

WSDOT Local Programs
Northwest Region
Attn: Trent de Boer
P.O. Box 47390
310 Maple Park Avenue
Olympia, WA 98504-7390

Re: Area of Potential Effects, Wildwood MP 10.14 Scour Repair Project, Lewis County,
Washington

Dear Mr. de Boer:

Lewis County seeks to initiate Section 106 consultation for the Wildwood MP 10.14 Scour Repair Project in accordance with Chapter 24.6 of WSDOT Local Agency Guidelines. The project will make use of federal funds awarded by the Federal Highway Administration (FHWA) and will require involvement by the United States Army Corps of Engineers (USACE). It therefore qualifies as a federal undertaking subject to Section 106 of the National Historic Preservation Act (NHPA). A description of the project's direct Area of Potential Effects (APE) is included below.

Project Location & Description

The Wildwood MP 10.14 Bridge (Lewis County Bridge No. 03) carries Wildwood Road over the South Fork Chehalis River in unincorporated Lewis County 7.9 miles west of City of Winlock and 10.9 miles southwest of City of Napavine. The project is located in the SE¼ of Section 24 in Township 12 North, Range 04 West, Willamette Meridian (Figure 1).

Built in 1955, the 124-foot-long, three-span bridge is supported by concrete piles. The bridge is classified as scour critical due to abutment/interior pile tip elevations within 10 feet of the stream's thalweg. Lewis County proposes to conduct scour analysis, including geomorphic, geotechnical, hydrologic, and hydraulic analyses, and develop three mitigation alternatives. Ground disturbance at the project APE will likely include excavation in the channel and along the banks of the South Fork Chehalis River and tracking from movement of machinery. Staging areas will be located within the boundaries of the project APE.

Direct Area of Potential Effects (APE)

The APE totals approximately 2.23 acres. It encompasses the right-of-way of Wildwood Road and portions of Lewis County parcel numbers 016274002007, 016273001000, and 016274002009. Based on the scope and scale of proposed project activities, effects to historic properties outside of this APE are not anticipated.

Known Cultural Resources

According to the Washington Information System for Architectural and Archaeological Records Data (WISAARD) maintained by the Washington State Department of Archaeology and Historic

Preservation (DAHP), no previously recorded archaeological sites, register-listed historic properties, or inventoried historic built environment resources are located at the project APE.

One previous cultural resources investigation overlaps with the project APE. Freed (2013, NADB 1683555) conducted surface pedestrian survey and excavated five shovel test probes ahead of proposed water system improvements along the western side of Wildwood Road. Surface pedestrian survey was conducted along both sides of Wildwood Road, including at the current project APE. No shovel probes were excavated at the current project APE. Near the bridge, the road prism stood about 15 feet above the surrounding pastureland. No archaeological sites or other cultural resources were identified.

The archaeological site recorded closest to the project APE is 45LE95, which is located 0.78 miles to the southeast. The site was identified in 1969 and is poorly documented. It contained stone tools and flakes, including projectile points and scrapers, and fossilized shell. It has not received an eligibility determination for listing on the National Register of Historic Places (NRHP).

The register-listed historic property closest to the project APE is Boistfort High School (45LE535) 3.02 miles to the north-northwest. The cemeteries closest to the project APE are the Boistfort Cemetery (45LE631) and Old Boistfort Cemetery (45LE632) 1.25 miles to the northwest along Wildwood Road. No inventoried historic built environment resources are located in the immediate project vicinity.

The DAHP Statewide Predictive Model ranks the project APE as high to very high risk for archaeological sites.

Field Investigation

Cultural Resource Consultants, LLC (CRC) will complete a cultural resources survey at the project APE in order to evaluate potential effects of the project on historic properties. Identification efforts will include background research, surface pedestrian survey, excavation of shovel test probes, and historic structure inventory (Figure 2). Field investigation will be conducted within the Wildwood Road right-of-way and Lewis County parcel numbers 016274002007, 016273001000, and 016274002009.

Surface pedestrian survey will be conducted via transects spaced 10 to 20 meters (33 to 66 feet) apart. Up to six cylindrical shovel test probes will be excavated at 30-meter (98-foot) intervals along the banks of the South Fork Chehalis River on both sides of Wildwood Road. Probes will measure 50 centimeters (cm) (1.6 feet) in diameter and will extend to a minimum depth of 50 cm (1.6 feet). Excavated sediments will be screened through 1/8-inch hardware mesh. Artifacts, if identified, will be documented in the field, placed in a bag with a detectable metal tag, and reburied in the probe in which they were found. Archaeological sites will be recorded on Archaeological Site Inventory Forms. Because the existing Wildwood Bridge is more than 50 years old, it may be eligible for listing on the NRHP. CRC will complete a Historic Property Inventory (HPI) Form for the bridge and evaluate it for listing on the NRHP.

CRC will present the results of background research and field investigation in a cultural resources assessment, which will support project permitting and design. The assessment will include an inadvertent discovery protocol (IDP) to be used during ground disturbance. We welcome any information you are able to provide that may assist with these identification efforts.

Should you have any questions or comments regarding the proposed project or APE, you may contact me by phone at 206-855-9020 or by email at margaret@crcwa.com.

Sincerely,

A handwritten signature in black ink, appearing to be 'M Berger', written in a cursive style.

Margaret Berger, Principal Investigator
Cultural Resource Consultants

Enclosures: APE Figures

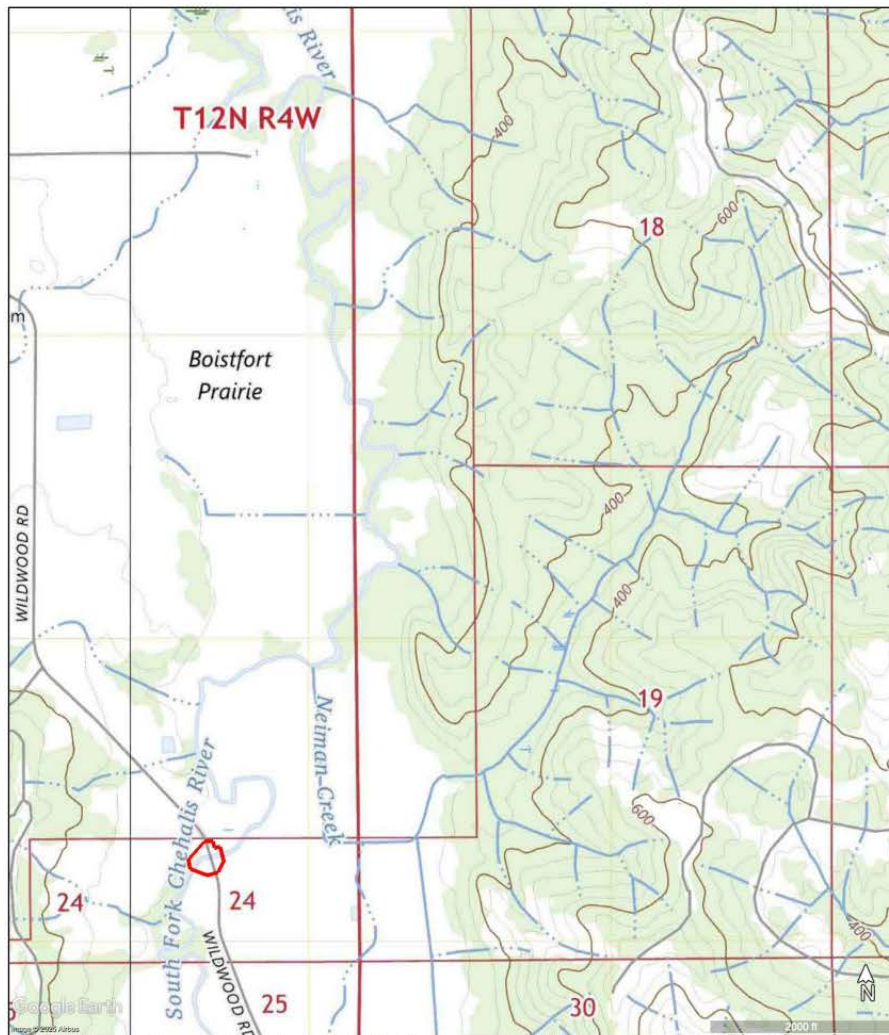


Figure 1. Project APE on the 2023 Curtis, Washington, USGS 7.5-minute topographic quadrangle.



Figure 2. Satellite imagery of the project APE and locations of proposed shovel test probes.



Allyson Brooks Ph.D., Director
State Historic Preservation Officer

April 8, 2025

Mr. Trent de Boer
Archaeologist
WA State Dept. of Transportation
PO Box 47390
Olympia, WA. 98504-7390

In future correspondence please refer to:
Project Tracking Code: 2025-04-02249
Property: Wildwood MP 10.14 Scour Repair
Re: APE Concur

Dear Mr. de Boer:

Thank you for contacting the State Historic Preservation Officer (SHPO) and Department of Archaeology and Historic Preservation (DAHPP) regarding the above referenced project. In response, we have reviewed your description and map of the area of potential effect (APE).

We concur with your definition of the APE. Along with the results of the inventory we will need to review your consultation with the concerned tribes, and other interested/affected parties. Please provide any correspondence or comments from concerned tribes and/or other parties that you receive as you consult under the requirements of 36 CFR 800.4(a)(4).

These comments are based on the information available at the time of this review and on behalf of the SHPO in conformance with Section 106 of the National Historic Preservation Act and its implementing regulations 36 CFR 800. Should additional information about the project become available, our assessment may be revised.

Thank you for the opportunity to review and comment. If you have any questions, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink, appearing to read 'D. Wardlaw', is placed above the typed name.

Dennis Wardlaw
Transportation Archaeologist
(360) 485-5014
dennis.wardlaw@dahp.wa.gov

State of Washington • Department of Archaeology & Historic Preservation
P.O. Box 48343 • Olympia, Washington 98504-8343 • (360) 586-3065
www.dahp.wa.gov



Appendix C. Subsurface Survey Results

Probe #	Probe Location (UTMs)	Stratigraphic Description (depths are centimeters below surface [cmbs])	Cultural Materials (cmbs)
1	490616 m E 5150268 m N	0-21: pale brown sandy silty clay; <5% very small pebbles, subrounded to rounded; firm; gradual lower boundary; 5% roots and rootlets; 5% roots/rootlets; grass on surface (A horizon) 21-44: slightly yellowish brown fine sandy silty clay; <5% very small pebbles, subrounded to rounded; firm; gradual lower boundary (B horizon) 44-61: brown fine sandy clay; firm; gradual lower boundary (B horizon) 61-125: Mottled orangish brown and gray clay; compact; gradual lower boundary; became more orange color with depth; augured at 90 cm due to density/compaction (B horizon) 125-140: very orangish brown slightly sandy clay; compact; became slightly sandier with depth (C horizon) Terminated due to clay density	None

Probe #	Probe Location (UTMs)	Stratigraphic Description (depths are centimeters below surface [cmbs])	Cultural Materials (cmbs)
2	490635 m E 5150290 m N	0-21: pale brown sandy silty clay; firm; gradual lower boundary; (topsoil) 21-38: brown fine sandy silty clay; firm; gradual lower boundary (B horizon) 38-74: brown fine sandy silty clay; compact; gradual lower boundary; very dense, augured at 70 cm due to density/compaction (B horizon) 74-125: mottled orangish brown and gray clay; compact; gradual; became more gray and more orange mottling with depth (B horizon) 125-150: mottled orange and gray slightly sandy clay; compact; became more orange and less gray with depth; became sandier with depth (C horizon) Terminated due to clay density	None
3	490635 m E 5150235 m N	0-31: pale brown fine sand; weak; gradual lower boundary; 5% roots and rootlets (A horizon) 31-160: brown fine sand; friable (alluvium) Terminated at reach of hand tools	None
4	490652 m E 5150247 m N	0-18: pale brown fine sand; weak; gradual lower boundary (A horizon) 18-67: brown fine sand; friable; few roots/rootlets; some woody debris at the bottom (alluvium) Terminated due to ant colony	None

Probe #	Probe Location (UTMs)	Stratigraphic Description (depths are centimeters below surface [cmbs])	Cultural Materials (cmbs)
5	490672 m E 5150256 m N	0-47: light yellowish brown fine sand; <5% very small pebbles, subrounded to rounded; friable; gradual lower boundary; 10% roots and rootlets; field horsetail and Himalayan blackberry bushes on surface (A horizon) 47-158: darker yellowish-brown sand; <5% very small pebbles, subrounded to rounded; friable; trace charcoal fragments; slightly oxidized (alluvium) Terminated at reach of hand tools	0-20: 2 fragments of colorless bottle glass 20-30: 1 fragment of colorless bottle glass
6	490702 m E 5150260 m N	0-25: pale brown fine to medium to gravelly silty sand; >50% small pebbles to small cobbles, subangular to rounded; friable; near gravel road (fill) Terminated due to rock obstruction	None

Appendix D. Inadvertent Discovery Protocol

In accordance with RCW 27.44 Indian Graves and Records Act, RCW 27.53 Archaeological Sites and Resources, RCW 68.50 Human Remains, and RCW 68.60 Abandoned and Historic Cemeteries and Historic Graves, the below procedures will be followed in the event that archaeological materials or human remains are discovered during ground disturbance.

D.1 Procedures for Discovery of Potential or Actual Cultural Resources

Upon discovery of a potential or actual archaeological site or cultural resources as defined by RCW 27.44 Indian Graves and Records Act and RCW 27.53 Archaeological Sites and Resources, the project proponent, its employees, contractors, and sub-contractors shall take the following steps.

- a) Immediately halt ground disturbing, construction, or other activities around the area of the discovery and secure the area with a perimeter of not less than 30 feet until all procedures are completed and the parties agree that activities can resume. If such a perimeter would materially impact agency functions mandated by law related to health, safety, or environmental concerns, then the secured area shall be of a size and extent practicable to provide maximum protection to the resource under the circumstances. Project activities may continue outside the secured perimeter. No one shall excavate the discovery, which will be left in place, undisturbed and without analysis, until consultation with DAHP and affected Tribes regarding a final disposition of the discovery has been completed. In accordance with RCW 27.53.060, no one shall knowingly remove or collect any archaeological objects without obtaining a permit.
- b) Notify WSDOT Local Programs, who will notify the State Archaeologist at DAHP and affected Tribes of the discovery as soon as possible and no later than 24 hours of the discovery. If human remains are found, the project proponent shall follow the notification procedures specified below.
- c) Arrange for the parties to conduct a joint viewing of the discovery within 48 hours of the notification or at the earliest possible time thereafter. After the joint viewing, WSDOT, DAHP, Tribes, and the project proponent shall discuss the significance, if any, of the discovery. If the discovery is deemed eligible or potentially eligible for listing on historic registers, additional investigation or mitigation may be necessary before ground disturbing activities may resume.
- d) Consult with WSDOT, Tribes, and DAHP on the transfer and final disposition of artifacts.

D.2 Procedures for Discovery of Human Skeletal Remains

Upon discovery of human skeletal remains on non-federal and non-tribal land and in accordance with RCWs 68.50.645, 27.44.055, and 68.60.055, the project proponent, its employees, contractors, and sub-contractors shall:

(a) If ground-disturbing activities encounter human skeletal remains during the course of construction, then all activity must cease that may cause further disturbance to those remains and the area of the find must be secured and protected from further disturbance. In addition, the finding of human skeletal remains must be reported to the Lewis County Coroner and Lewis County Sheriff's Office in the most expeditious manner possible. The remains should not be touched, moved, or further disturbed.

(b) The Lewis County Coroner will assume jurisdiction over the human skeletal remains and make a determination of whether those remains are forensic or non-forensic. If the county medical examiner determines the remains are non-forensic, then they will report that finding to DAHP who will then take jurisdiction over the remains and report them to the appropriate cemeteries and affected Tribes. The State Physical Anthropologist will make a determination of whether the remains are Indian or Non-Indian and report that finding to any appropriate cemeteries and the affected Tribes. DAHP will then handle all consultation with the affected parties as to the future preservation, excavation, and disposition of the remains.

(c) DAHP will handle all consultation with the affected parties as to the future preservation, excavation, and disposition of the remains if no federal agency is involved.

Confidentiality of Information

The project proponent and their authorized representative recognizes that archaeological sites are sensitive cultural resources that can become targets of vandalism and illegal removal activities. The project proponent or their authorized representative shall keep and maintain as confidential all information regarding any discovered cultural resources, particularly the location of known or suspected archaeological property, and exempt all such information from public disclosure consistent with RCW 42.17.300.

Contact Information

The lead representatives and primary contacts of each party under this plan are as identified below. The parties may identify other specific personnel before the commencement of any particular project element as the contacts.

Confederated Tribes of the Chehalis Reservation

P.O. Box 536, Howanut Road, Oakville, WA 98568

Primary Contact: Dan Penn, Acting Tribal Historic Preservation Officer, 360-709-1747,
dpenn@chehalis-tribe.org

Cowlitz Indian Tribe

P.O. Box 2547, Longview, WA 98632

Primary Contact: James Gordon, Tribal Historic Preservation Officer, 360-957-3004,
jgordon@cowlitz.org

Nisqually Indian Tribe

4820 She-Nah-Num Drive SE, Olympia, WA 98513-9105

Primary Contact: Brad Beach, Tribal Historic Preservation Officer, 360-456-5221 ex. 1277,
cell: 360-528-0680, beach.brad@nisqually-nsn.gov

Secondary Contact: Annette Bullchild, Director, 360-456-5221 ex. 1106,
Bullchild.annette@nisqually-nsn.gov

Quinalt Indian Nation

P.O. Box 189, Taholah, WA 98587-0189

Primary Contact: Lia Frenchman, Tribal Historic Preservation Officer, 360-276 8215 x7308,
cell: 360-590 0322, LFrenchman@quinault.org

Secondary Contact: Justine James, Cultural Resources, 360-276-8215 ext. 520,
jjames@quinault.org

Washington State Department of Transportation (WSDOT)

Acting as lead agency on behalf of the Federal Highway Administration (FHWA)

Local Programs

11018 NE 51st Cr, Vancouver, WA 98682-6686

Primary Contact: Trent DeBoer, Archaeologist – Statewide, 360-705-7879,
trent.deboer@wsdot.wa.gov

Washington Department of Archaeology and Historic Preservation (DAHHP)

P.O. Box 48343, Olympia, WA 98504-8343

Primary Contact: Rob Whitlam, State Archaeologist, 360-586-3080,
Rob.Whitlam@dahp.wa.gov

Primary Contact for Human Remains: Guy Tasa, State Physical Anthropologist, 360-586-
3534 or 360-790-1633, Guy.Tasa@dahp.wa.gov

Lewis County Sheriff's Office

345 W Main Street, Chehalis, WA 98532

Primary Contact: Robert Snaza, Sheriff, 360-748-9286

Lewis County Coroner's Office

585 NW Center Street, Chehalis, WA 98532

Primary Contact: Warren McLeod, Coroner, 360-748-9121