

ADDENDUM #1
FORMAL BID #2022-104

KITSAP COUNTY PUBLIC WORKS WASTEWATER DIVISION
BANGOR-KEYPORT FORCE MAIN REPLACEMENT

March 11th, 2022

TO: All Respondents
FROM: Glen McNeill, Buyer
CLOSING DATE: **March 30, 2022 at 3:00 PM (CHANGED PER ITEMS 2 AND 3)**
REF NO.: Bangor-Keypport Force Main Replacement
DATE: March 11th, 2022

The purpose of this addendum is to modify the Contract Documents for the referenced project. This addendum shall become a part of these Contract Documents. Bidder shall acknowledge receipt of this 237 page addendum (including attachments) on the Bid Form.

VOLUME 1 OF 2 OF THE CONTRACT DOCUMENTS IS MODIFIED AS FOLLOWS:

TABLE OF CONTENTS

Item 1. ADD the following Sections to the Table of Contents:

Appendix G – Bangor-Keypport Force Main Additional Geotechnical Services Report

Appendix H – Inadvertent Discovery Plan

Appendix I – Pre-Bid Meeting Sign-In Form

Appendix J – Kitsap County HDPE Inventory

Appendix K – Construction Stormwater Pollution Prevention Plan

Appendix L – WSDOT Roadside Tree Schedule Plans

INVITATION TO BID

Item 2. REVISE the Bid Submission Date & Time to Wednesday March 30, 2022 @ 3:00 PM.

Item 3. REVISE the Bid Opening Date and Time to Wednesday March 30, 2022 @3:15 PM.

BID PROPOSAL

Item 4. REPLACE pages 5 through 13 with the attached pages 5 through 13.

WSDOT DIVISION 1 – SPECIAL PROVISIONS

Item 5. REVISE the second paragraph in Section 1-02.1(2) to read as follows:

For purposes of meeting this criterion, the Contracting Agency has determined that “similar size and scope” means municipal public works projects that include HDPE sewer force main pipe installations with a minimum inside diameter of 18-inches and a minimum length of 15,000 LF. All of the following shall be included: cleaning/prepping and coating a wet well; and cured-in-place pipe rehabilitation ~~and odor control fan installation~~. Separate projects may be used to demonstrate compliance with these installation requirements. Each project shall also have a construction cost in excess of \$15,000,000.

TECHNICAL SPECIFICATIONS

Item 6. REPLACE page 40 94 24 – 2 with the attached page 40 94 24 – 2.

APPENDICES

- Item 7. ADD attached Hydraulic Project Approval to Appendix B - Permits.
- Item 8. ADD attached Baker & Moon-Deering Property TCE agreements to Appendix E – Temporary Construction Easements.
- Item 9. ADD attached Appendix G – Bangor-Keyport Force Main Additional Geotechnical Services Report.
- Item 10. ADD attached Appendix H – Inadvertent Discovery Plan.
- Item 11. ADD attached Appendix I – Pre-Bid Meeting Sign-In Form.
- Item 12. ADD attached Appendix J – Kitsap County HDPE Inventory.
- Item 13. ADD attached Appendix K – Construction Stormwater Pollution Prevention Plan.
- Item 14. ADD attached Appendix L – WSDOT Roadside Tree Schedule Plans

VOLUME 2 OF 2 OF THE CONTRACT DOCUMENTS IS MODIFIED AS FOLLOWS:

- Item 15. Cover Sheet: REMOVE COVER SHEET and REPLACE with attached COVER SHEET.
- Item 16. SS-9: REMOVE sheet SS-9 and REPLACE with attached sheet SS-9.
- Item 17. SS-10: REMOVE sheet SS-10 and REPLACE with attached sheet SS-10.

- Item 18. SS-11: REMOVE sheet SS-11 and REPLACE with attached sheet SS-11.
- Item 19. SS-29: REMOVE sheet SS-29 and REPLACE with attached sheet SS-29.
- Item 20. SS-34: REMOVE sheet SS-34 and REPLACE with attached sheet SS-34.
- Item 21. SS-42: REMOVE sheet SS-42 and REPLACE with attached sheet SS-42.
- Item 22. SS-43: REMOVE sheet SS-43 and REPLACE with attached sheet SS-43.
- Item 23. SS-44: REMOVE sheet SS-44 and REPLACE with attached sheet SS-44.
- Item 24. SS-46: REMOVE sheet SS-46 and REPLACE with attached sheet SS-46.
- Item 25. R-1: REMOVE sheet R-1 and REPLACE with attached sheet R-1.
- Item 26. R-13: REMOVE sheet R-13 and REPLACE with attached sheet R-13.
- Item 27. R-15: REMOVE sheet R-15 and REPLACE with attached sheet R-15.
- Item 28. R-16: REMOVE sheet R-16 and REPLACE with attached sheet R-16.
- Item 29. R-17: REMOVE sheet R-17 and REPLACE with attached sheet R-17.
- Item 30. R-19: REMOVE sheet R-19 and REPLACE with attached sheet R-19.
- Item 31. R-20: REMOVE sheet R-20 and REPLACE with attached sheet R-20.

Attachments For:

- Item 4. Bid Proposal (Pages 5 – 13)
- Item 6. PRESSURE SENSOR RINGS (Page 40 94 24 – 2)
- Item 7. Hydraulic Project Approval
- Item 8. Baker & Moon-Deering Property Temporary Construction Easements
- Item 9. Appendix G – Bangor-Keyport Force Main Additional Geotechnical Services Report.
- Item 10. Appendix H – Inadvertent Discovery Plan.
- Item 11. Appendix I – Pre-Bid Meeting Sign-In Form.
- Item 12. Appendix J – Kitsap County HDPE Inventory.
- Item 13. Appendix K – Construction Stormwater Pollution Prevention Plan.
- Item 14. Appendix L – WSDOT Roadside Tree Schedule Plans
- Item 15. Revised Cover Sheet

- Item 16. Revised Drawing SS-9
- Item 17. Revised Drawing SS-10
- Item 18. Revised Drawing SS-11
- Item 19. Revised Drawing SS-29
- Item 20. Revised Drawing SS-34
- Item 21. Revised Drawing SS-42
- Item 22. Revised Drawing SS-43
- Item 23. Revised Drawing SS-44
- Item 24. Revised Drawing SS-46
- Item 25. Revised Drawing R-1
- Item 26. Revised Drawing R-13
- Item 27. Revised Drawing R-15
- Item 28. Revised Drawing R-16
- Item 29. Revised Drawing R-17
- Item 30. Revised Drawing R-19
- Item 31. Revised Drawing R-20

End Addendum #1

Bid Schedule A – Pump Station 17 & Intersection of NE Tagholm Road/Brownsville Highway

Item No.	Ref. Section	Est. Quantity	Unit Price (in words)	Unit Price (in Numbers)	Extended Amount (Qty x Unit Price) (in numbers)
1A	Preconstruction Work Phase	1-04	1 LS		
2A	Final Cleanup and Restoration	1-04	1 LS		
3A	Surveying	1-05	1 LS		
4A	Project Record Drawings ¹	1-05	1 LS		
5A	Type B Schedules	1-08	14 MO	One Thousand Dollars and No Cents	\$1,000.00
6A	Minor Change (Allowance)	1-09	1 FA	Five Hundred Twenty-Five Thousand Dollars and No Cents	\$525,000.00
7A	Mobilization and Demobilization	1-09	1 LS		
8A	Dewatering (Allowance)	Div. 31	1 FA	One Hundred Seventy Five Thousand Dollars and No Cents	\$175,000.00
9A	Excavation Support Systems	Div. 31	1 LS		
10A	Temporary Erosion and Sediment Control	Div. 31	4 FA 1 LS		
11A	Project Temporary Traffic Control	1-10	1 LS		
12A	Existing Infrastructure/Utility Conflicts (Allowance)	1-09	1 FA	One Hundred Fifty Thousand Dollars and No Cents	\$150,000.00

¹ The lump sum for this bid item shall be at least 0.5% of the total bid amount

Bid Schedule A – Pump Station 17 & Intersection of NE Tagholm Road/Brownsville Highway

Item No.	Ref. Section	Est. Quantity	Unit Price (in words)	Unit Price (in Numbers)	Extended Amount (Qty x Unit Price) (in numbers)
13A 24-inch Diameter HDPE DR 11 Sewer Force Main	Div. 22	3,400 LF	_____	\$ _____	\$ _____
14A Horizontal Directional Drilled 24-inch Diameter, HDPE DR 11 Force Main	Div. 33	1 LS	_____	\$ _____	\$ _____
15A 26-inch Diameter HDPE DR 11 Sewer Force Main	Div. 22	17,000 LF	_____	\$ _____	\$ _____
16A 60-inch Diameter Manhole (BPA Easement) and Bioswale	Div. 22	1 EA	_____	\$ _____	\$ _____
17A 20-inch Diameter CIPP Sewer Force Main	Div. 22	830 LF	_____	\$ _____	\$ _____
18A 2-inch Combination Air Vacuum Valve Assembly	Div. 40	6 EA	_____	\$ _____	\$ _____
19A 3-inch Combination Air Vacuum Valve Assembly	Div. 40	5 EA	_____	\$ _____	\$ _____
20A 4-inch Blowoff Valve Assembly	Div. 40	8 EA	_____	\$ _____	\$ _____
21A IPS Sewer Lateral from ROW to Main	Div. 22	5 EA 6 EA	_____	\$ _____	\$ _____
22A 26-inch Diameter HDPE DR 11 11.25 Degree Bend	Div. 22	4 EA	_____	\$ _____	\$ _____
23A 26-inch HDPE DR 11 22.5 Degree Bend	Div. 22	3 EA	_____	\$ _____	\$ _____
24A 24-inch HDPE DR 11 45 Degree Bend	Div. 22	8 EA	_____	\$ _____	\$ _____

Bid Schedule A – Pump Station 17 & Intersection of NE Tagholm Road/Brownsville Highway

Item No.	Ref. Section	Est. Quantity	Unit Price (in words)	Unit Price (in Numbers)	Extended Amount (Qty x Unit Price) (in numbers)
25A 26-inch Diameter HDPE DR 11 45 Degree Bend	Div. 22	8 EA	_____	\$ _____	\$ _____
26A 26-inch Diameter HDPE DR 11 Non-Standard Degree Bend	Div. 22	1 EA	_____	\$ _____	\$ _____
27A 24-inch Diameter HDPE DR 11 Flange Adapter	Div. 22	17 EA	_____	\$ _____	\$ _____
28A 26-inch Diameter HDPE DR 11 Flange Adapter	Div. 22	14 EA	_____	\$ _____	\$ _____
29A Abandon Existing Force Main	Div. 33	20,500 LF	_____	\$ _____	\$ _____
30A Pump Station 17 Improvements, Bypass, and Final Connections	1-09	1 LS	_____	\$ _____	\$ _____
31A Brownsville Highway Connection	1-09	1 LS	_____	\$ _____	\$ _____
32A CIPP Bypass	1-09	1 LS	_____	\$ _____	\$ _____
33A Connect to Existing Pump Station 64	1-09	1 LS	_____	\$ _____	\$ _____
34A CIPP Connection to New Saddle Manhole	Div. 33	1 LS	_____	\$ _____	\$ _____
35A CIPP Connection to New 26- inch HDPE DR 11 Pipe	Div. 33	1 LS	_____	\$ _____	\$ _____
36A Asphalt Removal	Div. 32	18,900 SY	_____	\$ _____	\$ _____

Bid Schedule A – Pump Station 17 & Intersection of NE Tagholm Road/Brownsville Highway

Item No.	Ref. Section	Est. Quantity	Unit Price (in words)	Unit Price (in Numbers)	Extended Amount (Qty x Unit Price) (in numbers)
37A Removal of Unsuitable Foundation Material (Allowance)*	1-09	350 CY	_____	\$ _____	\$ _____
38A Import Trench Foundation Material (Allowance)*	1-09	600 TN	_____	\$ _____	\$ _____
39A Trench Backfill	Div. 31	27,200 TN	_____	\$ _____	\$ _____
40A Controlled Density Fill (CDF) Encasement	Div 31	400 TN	_____	\$ _____	\$ _____
41A Crushed Surfacing Base Course (CSBC)	Div. 31	4,300 TN	_____	\$ _____	\$ _____
42A Crushed Surfacing Top Course (CSTC)	Div 31	1,100 TN	_____	\$ _____	\$ _____
43A HMA Cl. ½-inch PG 58-22 for Trench Patch	Div. 32	3,400 TN	_____	\$ _____	\$ _____
44A HMA Cl. ½-inch PG 58-22 Extended	Div. 32	1,000 TN	_____	\$ _____	\$ _____
45A General Restoration	Div. 32	25,700 SF	_____	\$ _____	\$ _____
46A ROW Restoration at NW Katy Place and NE Tagholm Rd	Div. 32	1 LS	_____	\$ _____	\$ _____
47A Grass Pavers	Div 32	800 SY	_____	\$ _____	\$ _____
48A Replace Survey Monument (Allowance)	1-09	1 EA	_____	\$ _____	\$ _____

Bid Schedule A – Pump Station 17 & Intersection of NE Tagholm Road/Brownsville Highway

Item No.	Ref. Section	Est. Quantity	Unit Price (in words)	Unit Price (in Numbers)	Extended Amount (Qty x Unit Price) (in numbers)
Subtotal of Schedule A Bid Items				\$ _____	
Sales Tax @ 9% 9.2%				\$ _____	
Total for Schedule A				\$ _____	

Bid Schedule B – Intersection of NE Tagholm Road/Brownsville Highway to Station 277+90

Item No.	Ref. Section	Est. Quantity	Unit Price (in words)	Unit Price (in Numbers)	Extended Amount (Qty x Unit Price) (in numbers)
1B	Preconstruction Work Phase	1-04	1 LS		
2B	Final Cleanup and Restoration	1-04	1 LS		
3B	Surveying	1-05	1 LS		
4B	Project Record Drawings ²	1-05	1 LS		
5B	Type B Schedules	1-08	5 MO	One Thousand Dollars and No Cents	\$1,000.00 \$5,000.00
6B	Minor Change (Allowance)	1-09	1 FA	Two Hundred Twenty Five Thousand Dollars and No Cents	\$225,000.00 \$225,000.00
7B	Mobilization and Demobilization	1-09	1 LS		
8B	Dewatering (Allowance)	Div. 31	1 FA	Fifty-Five Thousand Dollars and No Cents	\$55,000.00 \$55,000.00
9B	Excavation Support Systems	Div. 31	1 LS		
10B	Temporary Erosion and Sediment Control	Div. 31	4 FA 1 LS		
11B	Project Temporary Traffic Control	1-10	1 LS		

²The lump sum for this bid item shall be at least 0.5% of the total bid amount

Bid Schedule B – Intersection of NE Tagholm Road/Brownsville Highway to Station 277+90

Item No.	Ref. Section	Est. Quantity	Unit Price (in words)	Unit Price (in Numbers)	Extended Amount (Qty x Unit Price) (in numbers)
12B Existing Infrastructure/Utility Conflicts (Allowance)	1-09	1 FA	<u>Sixty Thousand Dollars and No Cents</u>	<u>\$60,000.00</u>	<u>\$60,000.00</u>
13B 30-inch Diameter HDPE DR 11 Sewer Force Main	Div.22	5,800 LF	<u>_____</u>	<u>\$ _____</u>	<u>\$ _____</u>
14B 2-inch Combination Air Vacuum Valve Assembly	Div. 40	2 EA	<u>_____</u>	<u>\$ _____</u>	<u>\$ _____</u>
15B 3-inch Combination Air Vacuum Valve Assembly	Div. 40	1 EA	<u>_____</u>	<u>\$ _____</u>	<u>\$ _____</u>
16B 4-inch Blowoff Valve Assembly	Div. 40	2 EA	<u>_____</u>	<u>\$ _____</u>	<u>\$ _____</u>
17B IPS Sewer Lateral from ROW to Main	Div. 22	1 EA	<u>_____</u>	<u>\$ _____</u>	<u>\$ _____</u>
18B 26-inch Diameter HDPE DR 11 45 Degree Bend	Div. 22	1 EA	<u>_____</u>	<u>\$ _____</u>	<u>\$ _____</u>
19B 30-inch Diameter HDPE DR 11 45 Degree Bend	Div. 22	3 EA	<u>_____</u>	<u>\$ _____</u>	<u>\$ _____</u>
20B 26-inch Diameter HDPE DR 11 Flange Adapter	Div. 22	4 EA	<u>_____</u>	<u>\$ _____</u>	<u>\$ _____</u>
21B 30-inch Diameter HDPE DR 11 Flange Adapter	Div. 22	5 EA	<u>_____</u>	<u>\$ _____</u>	<u>\$ _____</u>
22B Abandon Existing Force Main	Div. 33	6,000 LF	<u>_____</u>	<u>\$ _____</u>	<u>\$ _____</u>
23B Pump Station 24 Improvements, Bypass, and Final Connections	1-09	1 LS	<u>_____</u>	<u>\$ _____</u>	<u>\$ _____</u>

Bid Schedule B – Intersection of NE Tagholm Road/Brownsville Highway to Station 277+90

Item No.	Ref. Section	Est. Quantity	Unit Price (in words)	Unit Price (in Numbers)	Extended Amount (Qty x Unit Price) (in numbers)
24B Brownsville Hwy Connection	1-09	1 LS	_____	\$ _____	\$ _____
25B Connect to Existing 30-inch Diameter HDPE DR 11 Force Main	1-09	1 LS	_____	\$ _____	\$ _____
26B Asphalt Removal	Div. 32	9,000 SY	_____	\$ _____	\$ _____
27B Removal of Unsuitable Foundation Material (Allowance)	1-09	150 CY	_____	\$ _____	\$ _____
28B Import Trench Foundation Material (Allowance)	1-09	300 TN	_____	\$ _____	\$ _____
29B Trench Backfill	Div. 31	6,300 TN	_____	\$ _____	\$ _____
30B Crushed Surfacing Base Course (CSBC)	Div. 31	1,400 TN	_____	\$ _____	\$ _____
31B Crushed Surfacing Top Course (CSTC)	Div. 31	400 TN	_____	\$ _____	\$ _____
32B HMA Cl. ½-inch PG 58-22 for Trench Patch	Div. 32	1,200 TN	_____	\$ _____	\$ _____
33B HMA Cl. ½-inch PG 58-22 Extended	Div. 32	200 TN	_____	\$ _____	\$ _____
34B General Restoration	Div. 32	7,600 SF	_____	\$ _____	\$ _____
35B Replace Survey Monument (Allowance)	1-09	2 EA	_____	\$ _____	\$ _____

Bid Schedule B – Intersection of NE Tagholm Road/Brownsville Highway to Station 277+90

Item No.	Ref. Section	Est. Quantity	Unit Price (in words)	Unit Price (in Numbers)	Extended Amount (Qty x Unit Price) (in numbers)
Subtotal of Schedule B – Station 219+40 to Station 278+00 Subtotal				\$ _____	
Sales Tax @ 9% 9.2%				\$ _____	
Total for Schedule B – Station 219+40 to Station 278+00 Total				\$ _____	

TOTAL FOR SCHEDULES A AND B WITH SALES TAX

\$ _____

2. Submit product literature that includes information on the performance and operation of the sensor, materials of construction, dimensions and weights, elastomer characteristics, and pressure ratings.
- C. Manufacturer's installation instructions, including mounting requirements.
- D. Operation and maintenance information.
- E. Warranty information.

PART 2 : PRODUCTS

2.01 MANUFACTURERS

All sensors shall be of the series 40 as manufactured by the Red Valve Co., Inc. of Carnegie, PA 15106 or approved equal.

2.02 GENERAL

- A. Pressure Sensors are to be of the full flange design, to be retained between standard ANSI B16.1 Class 125/6.5 Class 150 pipeline flanges. Flange bolts shall pass through sensor body and flanges. The outside diameter of the sensor shall match the outside diameter of the mating flange. Face-to-face of the entire sensor shall be no longer than specifications MSS-SP67.
- B. Sensor shall be flow through design with flexible elastomer sensing ring around the full circumference. The elastomer sensing ring shall be rigidly clamped between metal end cover flanges, and no part of the elastomeric sensing ring shall be exposed to the external face of the sensor. There shall be no dead ends or crevices and flow passage shall make the sensor self-cleaning.
- C. The pressure sensing ring shall measure pressure for 360° around the full inside circumference of the pipeline. Flexible sensing ring shall have a cavity behind the ring filled with fluid to transfer pressure to the gauge. Sensor shall be manufactured in the USA.

2.03 FUNCTION

- A. Line pressure pushes against an elastomer ring inside the sensor. The deflection of the ring displaces a fluid fill inside the body of the sensor, forcing the fluid into a pressure-measuring device.

2.04 ELECTRICAL REQUIREMENTS

- A. Input current: 20 mA max (loop Power)
- B. Signal Output: 4-20mA, 0-5 VDC, 0-2.5VDC Analog signal. Signal shall change in direct linear proportional to changes in measured value.
- C. Insulation resistance: 100 Mega Ω @ 500 VDC Capable of withstanding a 600 Volt spike in accordance with ENV 50142 without damage.
- D. Circuit protection: polarity, surge/shorted output.



HYDRAULIC PROJECT APPROVAL

Washington Department of
Fish & Wildlife
PO Box 43234
Olympia, WA 98504-3234
(360) 902-2200

Issued Date: February 11, 2022
Project End Date: February 09, 2027

Permit Number: 2022-6-77+01
FPA/Public Notice Number: N/A
Application ID: 20398

PERMITTEE	AUTHORIZED AGENT OR CONTRACTOR
Kitsap County Department of Public Works, Sewer Utility ATTENTION: Barbara Zaroff 614 Division Street, MS-26 Port Orchard, WA 98366	Landau Associates ATTENTION: Steven Quarterman 130 2nd Ave S Edmonds, WA 98020-3512

Project Name: Bangor-Keyport Forcemain Replacement Project

Project Description: The Kitsap County Sewer Utility Division is proposing to replace the sewer main that services North Kitsap County (County; i.e., Bangor-Keyport force main). The extent of the sewer main to be replaced is largely collocated in existing road right-of-way between Pump Station 17, located southwest of the intersection of NW Skiff Lane and Clear Creek Road NW, to approximately 4,800 feet south of Pump Station 24 on Brownsville Highway. Replacement of the sewer main will include the replacement of approximately 5 miles of 18- to 24-inch diameter ductile iron pipe with 24 to 30 inch high-density polyethylene standard dimensional (SDR) 11 sewer pipe, connections to existing individual pump stations and pump stations, and connections to existing air-vacuum structures. There will be 16 water crossings associated with the project, 3 of which will be installed below existing culverts with the rest being installed above existing culverts.

PROVISIONS

TIMING - PLANS - INVASIVE SPECIES CONTROL

1. TIMING LIMITATION: You may work below the ordinary high water line (OHL) between July 16 to October 15 of any year during the life of this permit, or whenever the watercourse is naturally dry.
2. APPROVED PLANS: You must accomplish the work per plans and specifications submitted with the application and approved by the Washington Department of Fish and Wildlife, entitled "BANGOR-KEYPORT FORCE MAIN REPLACEMENT: Part1_.pdf.pdf, Part2_.pdf, Part3_.pdf, Part4_.pdf, Part5_.pdf ", dated December 2021, except as modified by this Hydraulic Project Approval. You must have a copy of these plans available on site during all phases of the project construction.
3. INVASIVE SPECIES CONTROL: Follow Method 1 for low risk locations (i.e. clean/drain/dry). Thoroughly remove visible dirt and debris from all equipment and gear (including drive mechanisms, wheels, tires, tracks, buckets, and undercarriage) before arriving and leaving the job site to prevent the transport and introduction of invasive species. For contaminated or high risk sites please refer to the Method 2 Decontamination protocol. Properly dispose of any water and chemicals used to clean gear and equipment. You can find this and additional information in the Washington Department of Fish and Wildlife's "Invasive Species Management Protocols", available online at <https://wdfw.wa.gov/species-habitats/invasive/prevention>.

NOTIFICATION REQUIREMENTS

4. NOTIFICATION: You, your agent, or contractor must contact the Washington Department of Fish and Wildlife by e-mail at HPAapplications@dfw.wa.gov; mail to Post Office Box 43234, Olympia, Washington 98504-3234; or fax to (360) 902-2946 at least three business days before starting work. The notification must include the permittee's name, project location, starting date, and the Hydraulic Project Approval permit number.



HYDRAULIC PROJECT APPROVAL

Washington Department of
Fish & Wildlife
PO Box 43234
Olympia, WA 98504-3234
(360) 902-2200

Issued Date: February 11, 2022

Permit Number: 2022-6-77+01

Project End Date: February 09, 2027

FPA/Public Notice Number: N/A

Application ID: 20398

5. PRE- AND POST-CONSTRUCTION NOTIFICATION: You, your agent, or contractor must contact the Washington Department of Fish and Wildlife by e-mail at HPAapplications@dfw.wa.gov; mail to Post Office Box 43234, Olympia, Washington 98504-3234; or fax to (360) 902-2946 at least three business days before starting work, and again within seven days after completing the work. The notification must include the permittee's name, project location, starting date for work or date the work was completed, and the permit number. The Washington Department of Fish and Wildlife may conduct inspections during and after construction; however, the Washington Department of Fish and Wildlife will notify you or your agent before conducting the inspection.

6. FISH KILL/ WATER QUALITY PROBLEM NOTIFICATION: If a fish kill occurs or fish are observed in distress at the job site, immediately stop all activities causing harm. Immediately notify the Washington Department of Fish and Wildlife of the problem. If the likely cause of the fish kill or fish distress is related to water quality, also notify the Washington Military Department Emergency Management Division at 1-800-258-5990. Activities related to the fish kill or fish distress must not resume until the Washington Department of Fish and Wildlife gives approval. The Washington Department of Fish and Wildlife may require additional measures to mitigate impacts.

STAGING, JOB SITE ACCESS, AND EQUIPMENT

7. Establish staging areas (used for equipment storage, vehicle storage, fueling, servicing, and hazardous material storage) in a location and manner that will prevent contaminants such as petroleum products, hydraulic fluid, fresh concrete, sediments, sediment-laden water, chemicals, or any other toxic or harmful materials from entering waters of the state.

8. Use existing roadways or travel paths.

9. Limit the removal of native bankline vegetation to the minimum amount needed to construct the project.

10. Station and operate equipment used for this project landward of the ordinary high water line.

11. Equipment used for this project may operate waterward of the ordinary high water line, provided the drive mechanisms (wheels, tracks, tires, etc.) do not enter or operate waterward of the ordinary high water line.

12. If wet or muddy conditions exist, in or near a riparian zone or wetland area, use equipment that reduces ground pressure.

13. Check equipment daily for leaks and complete any required repairs in an upland location before using the equipment in or near the water.

14. Use environmentally acceptable lubricants composed of biodegradable base oils such as vegetable oils, synthetic esters, and polyalkylene glycols in equipment operated in or near the water.

15. This Hydraulic Project Approval does not authorize equipment crossings of the stream.

CONSTRUCTION-RELATED SEDIMENT, EROSION AND POLLUTION CONTAINMENT

16. Work in the dry watercourse (when no natural flow is occurring in the channel, or when flow is diverted around the job site).

17. Protect all disturbed areas from erosion. Maintain erosion and sediment control until all work and cleanup of the job site is complete.

18. All erosion control materials that will remain onsite must be composed of 100% biodegradable materials.

19. Straw used for erosion and sediment control, must be certified free of noxious weeds and their seeds.

20. Stop all hydraulic project activities except those needed to control erosion and siltation, if flow conditions arise that will result in erosion or siltation of waters of the state.

21. Prevent project contaminants, such as petroleum products, hydraulic fluid, fresh concrete, sediments, sediment-laden water, chemicals, or any other toxic or harmful materials, from entering or leaching into waters of the state.

22. Route construction water (wastewater) from the project to an upland area above the limits of anticipated floodwater.



HYDRAULIC PROJECT APPROVAL

Washington Department of
Fish & Wildlife
PO Box 43234
Olympia, WA 98504-3234
(360) 902-2200

Issued Date: February 11, 2022
Project End Date: February 09, 2027

Permit Number: 2022-6-77+01
FPA/Public Notice Number: N/A
Application ID: 20398

Remove fine sediment and other contaminants before discharging the construction water to waters of the state.

CONSTRUCTION MATERIALS

23. Store all construction and deconstruction material in a location and manner that will prevent contaminants such as petroleum products, hydraulic fluid, fresh cement, sediments, sediment-laden water, chemicals, or any other toxic or harmful materials from entering waters of the state.
24. Do not stockpile construction material waterward of the ordinary high water line.
25. Use only clean, suitable material as fill material. Any imported fill must be round washed material matching the size and composition of the native streambed sediment.

IN-WATER WORK AREA ISOLATION USING A TEMPORARY BYPASS

26. Isolate fish from the work area by using either a total or partial bypass to reroute the stream through a temporary channel or pipe.
27. Sequence the work to minimize the duration of dewatering.
28. Use the least-impacting feasible method to temporarily bypass water from the work area. Consider the physical characteristics of the site and the anticipated volume of water flowing through the work area.
29. The hydraulic capacity of the stream bypass must be equal to or greater than the 100-year peak flow event expected when the bypass will be operated.
30. Design the temporary bypass to minimize the length of the dewatered stream channel.
31. During all phases of bypass installation and decommissioning, maintain flows downstream of the project site to ensure survival of all downstream fish.
32. Install a cofferdam or similar device at the upstream and downstream end of the bypass to prevent backwater from entering the work area.
33. Return diverted water to the channel immediately downstream of the work area. Dissipate flow energy from the diversion to prevent scour or erosion of the channel and bank.
34. If the diversion inlet is a gravity diversion that provides fish passage, place the diversion outlet where it facilitates gradual and safe reentry of fish into the stream channel.
35. If the bypass is a pumped diversion, once started it must run continuously until it is no longer necessary to bypass flows. This requires back-up pumps on-site and twenty-four-hour monitoring for overnight operation.
36. If the diversion inlet is a pump diversion in a fish-bearing stream, the pump intake structure must have a fish screen installed, operated, and maintained in accordance with RCW 77.57.010 and 77.57.070. Screen the pump intake with one of the following:
 - a) Perforated plate: 0.094 inch (maximum opening diameter);
 - b) Profile bar: 0.069 inch (maximum width opening); or
 - c) Woven wire: 0.087 inch (maximum opening in the narrow direction).The minimum open area for all types of fish screens is twenty-seven percent. The screened intake facility must have enough surface area to ensure that the velocity through the screen is less than 0.4 feet per second. Maintain fish screens to prevent injury or entrapment of fish.
37. The fish screen must remain in place whenever water is withdrawn from the stream through the pump intake.
38. Remove fish screens on dewatering pumps in the isolated work area only after all fish are safe and excluded from the work area.
39. Isolate pump hose intakes with block nets so that fish cannot get near the intake.

FISH LIFE REMOVAL

40. All persons participating in capture and removal must have training, knowledge, and skills in the safe handling of



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Washington Department of
Fish & Wildlife
PO Box 43234
Olympia, WA 98504-3234
(360) 902-2200

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fish life.

41. If electrofishing is conducted, a person with electrofishing training must be on-site to conduct or direct all electrofishing activities.
42. If personnel are available, the Washington Department of Fish and Wildlife and affected tribes may help capture and move fish life from the job site.
43. Place block nets upstream and downstream of the in-water work area before capturing and removing fish life.
44. Capture and safely move fish life from the work area to the nearest suitable free-flowing water.

UTILITY CROSSING

45. Below culvert and stream utility crossings must be installed with adequate depth below streambed and potential scour elevation to avoid inhibiting future fish passible culvert replacements and stream restoration, or they must be replaced at adequate depth at the time of culvert replacement.
46. Align the conduit as perpendicular as possible to the watercourse.
47. Avoid crossing at meander bends, braided streams, alluvial fans, active flood plains, or any other area that is inherently unstable and may lead to eroding and scouring the stream bed.
48. Avoid areas of groundwater upwelling or locations within one hundred feet upstream of documented fish spawning areas.
49. Install the conduit well below scour depth of the watercourse to prevent natural scouring of the stream bed from exposing the pipeline or cable.
50. If construction involves boring or jacking:
 - a. Isolate pits from surface water flow to prevent bore hole collapse; and
 - b. Before discharging wastewater to state waters, route wastewater from project activities and dewatering to an area outside the watercourse to allow removal of fine sediment and other contaminants.
51. If construction involves trench excavation:
 - a. Trench widths should be as narrow as feasible to accommodate the pipe/line and achieve the depth specified in the approved plan;
 - b. Excavate trenches in the dry or isolate them from the flowing watercourse by installing a cofferdam, culvert, flume, or other approved method;
 - c. Plowing, placement, and covering must occur in a single pass of the equipment;
 - d. Limit disturbance of the bed and banks to the amount needed to complete the project. Before returning flow, backfill trenches with approved materials and return the bed to preproject condition;
 - e. Dispose of excess spoils upland or on a barge so they will not reenter waters of the state; and
 - f. Isolate the conduit approach trench from the watercourse until the conduit is laid across the watercourse.
 - g. Backfill the trench with native streambed sediment or imported round washed material of the appropriate size, and return the streambed to preproject condition.
52. If construction involves directional drilling:
 - a. Design the drill path to an appropriate depth below the watercourse to minimize the risk of frac-out and to a depth to prevent exposure of the line from natural scouring of the stream bed; and
 - b. Locate the drill entry and exit points away from the banks of the watercourse to minimize impact on these areas.
 - c. Do not disturb the streambed. If the streambed collapses and flow enters the drilling area, work activities must cease and the Habitat Biologist listed below must be contacted immediately.
53. If construction involves an aerial conduit crossing:
 - a. Locate and armor support structures for aerial conduit crossings to prevent scour or undermining.

DEMOBILIZATION AND CLEANUP

54. Do not relocate removed or replaced structures within waters of the state. Remove and dispose of these structures



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in an upland area above the limits of anticipated floodwater.

- 55. Upon completion of the project, restore the disturbed bed, banks, and riparian zone to preproject condition to the extent possible.
- 56. Completely remove any temporary fill before the end of the in-water timing window if the fill material could erode and deliver sediment-laden water into waters of the state.
- 57. To prevent fish from stranding, backfill trenches, depressions, and holes in the bed that may entrain fish during high water or wave action.
- 58. To minimize sediment delivery to the stream or stream channel, do not return in-stream flows to the work area until all in-channel work is completed and the bed and banks are stabilized.
- 59. Stabilize the bed with clean material sized to match undisturbed sediments.
- 60. Replace native riparian zone and aquatic vegetation, and wetland vascular plants (except noxious weeds) damaged or destroyed by construction using a proven methodology.
- 61. Upon completion of the project, remove all materials or equipment from the site and dispose of all excess spoils and waste materials in an upland area above the limits of anticipated floodwater.
- 62. Return water flow slowly to the in-water work area to prevent the downstream release of sediment laden water. If necessary, install silt fencing above the bypass outlet to capture sediment during re-watering of the channel.
- 63. Remove temporary erosion and sediment control methods after job site is stabilized or within three months of project completion, whichever is sooner.

LOCATION #1:		Site Name: Bangor-Keyport Forcemain , , WA				
WORK START:		April 1, 2022		WORK END:		December 31, 2023
<u>WRIA</u>		<u>Waterbody:</u>			<u>Tributary to:</u>	
15 - Kitsap		Various			Various	
<u>1/4 SEC:</u>	<u>Section:</u>	<u>Township:</u>	<u>Range:</u>	<u>Latitude:</u>	<u>Longitude:</u>	<u>County:</u>
	10	25 N	01 E	47.700492	-122.684736	Kitsap
<u>Location #1 Driving Directions</u>						



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From Port Orchard:
Follow SR 16 West to SR 3 North.
Project crosses south of SR 3 and SR 308 interchange.

The project area includes the existing right-of-way associated with (west to east):

- Clear Creek Road NW
- NW Mountain View Road
- Sewer easement within Bonneville Power Administration right-of-way (parallel to and west of State Route (SR) 3)
- SR 3
- SR 308 (NW Luoto Road), with connections through:
 - o NW Luoto Court
 - o Silverdale Way NW
 - o NW Katy Place
 - o NE Tagholm Road
- Brownsville Highway.

APPLY TO ALL HYDRAULIC PROJECT APPROVALS

This Hydraulic Project Approval pertains only to those requirements of the Washington State Hydraulic Code, specifically Chapter 77.55 RCW. Additional authorization from other public agencies may be necessary for this project. The person(s) to whom this Hydraulic Project Approval is issued is responsible for applying for and obtaining any additional authorization from other public agencies (local, state and/or federal) that may be necessary for this project.

This Hydraulic Project Approval shall be available on the job site at all times and all its provisions followed by the person(s) to whom this Hydraulic Project Approval is issued and operator(s) performing the work.

This Hydraulic Project Approval does not authorize trespass.

The person(s) to whom this Hydraulic Project Approval is issued and operator(s) performing the work may be held liable for any loss or damage to fish life or fish habitat that results from failure to comply with the provisions of this Hydraulic Project Approval.

Failure to comply with the provisions of this Hydraulic Project Approval could result in civil action against you, including, but not limited to, a stop work order or notice to comply, and/or a gross misdemeanor criminal charge, possibly punishable by fine and/or imprisonment.

All Hydraulic Project Approvals issued under RCW 77.55.021 are subject to additional restrictions, conditions, or revocation if the Department of Fish and Wildlife determines that changed conditions require such action. The person(s) to whom this Hydraulic Project Approval is issued has the right to appeal those decisions. Procedures for filing appeals are listed below.



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MINOR MODIFICATIONS TO THIS HPA: You may request approval of minor modifications to the required work timing or to the plans and specifications approved in this HPA unless this is a General HPA. If this is a General HPA you must use the Major Modification process described below. Any approved minor modification will require issuance of a letter documenting the approval. A minor modification to the required work timing means any change to the work start or end dates of the current work season to enable project or work phase completion. Minor modifications will be approved only if spawning or incubating fish are not present within the vicinity of the project. You may request subsequent minor modifications to the required work timing. A minor modification of the plans and specifications means any changes in the materials, characteristics or construction of your project that does not alter the project's impact to fish life or habitat and does not require a change in the provisions of the HPA to mitigate the impacts of the modification. If you originally applied for your HPA through the online Aquatic Protection Permitting System (APPS), you may request a minor modification through APPS. A link to APPS is at <http://wdfw.wa.gov/licensing/hpa/>. If you did not use APPS you must submit a written request that clearly indicates you are seeking a minor modification to an existing HPA. Written requests must include the name of the applicant, the name of the authorized agent if one is acting for the applicant, the APP ID number of the HPA, the date issued, the permitting biologist, the requested changes to the HPA, the reason for the requested change, the date of the request, and the requestor's signature. Send by mail to: Washington Department of Fish and Wildlife, PO Box 43234, Olympia, Washington 98504-3234, or by email to HPAapplications@dfw.wa.gov. You should allow up to 45 days for the department to process your request.

MAJOR MODIFICATIONS TO THIS HPA: You may request approval of major modifications to any aspect of your HPA. Any approved change other than a minor modification to your HPA will require issuance of a new HPA. If you originally applied for your HPA through the online Aquatic Protection Permitting System (APPS), you may request a major modification through APPS. A link to APPS is at <http://wdfw.wa.gov/licensing/hpa/>. If you did not use APPS you must submit a written request that clearly indicates you are requesting a major modification to an existing HPA. Written requests must include the name of the applicant, the name of the authorized agent if one is acting for the applicant, the APP ID number of the HPA, the date issued, the permitting biologist, the requested changes to the HPA, the reason for the requested change, the date of the request, and the requestor's signature. Send your written request by mail to: Washington Department of Fish and Wildlife, PO Box 43234, Olympia, Washington 98504-3234. You may email your request for a major modification to HPAapplications@dfw.wa.gov. You should allow up to 45 days for the department to process your request.

APPEALS INFORMATION

If you wish to appeal the issuance, denial, conditioning, or modification of a Hydraulic Project Approval (HPA), Washington Department of Fish and Wildlife (WDFW) recommends that you first contact the department employee who issued or denied the HPA to discuss your concerns. Such a discussion may resolve your concerns without the need for further appeal action. If you proceed with an appeal, you may request an informal or formal appeal. WDFW encourages you to take advantage of the informal appeal process before initiating a formal appeal. The informal appeal process includes a review by department management of the HPA or denial and often resolves issues faster and with less legal complexity than the formal appeal process. If the informal appeal process does not resolve your concerns, you may advance your appeal to the formal process. You may contact the HPA Appeals Coordinator at (360) 902-2534 for more information.

A. INFORMAL APPEALS: WAC 220-660-460 is the rule describing how to request an informal appeal of WDFW actions taken under Chapter 77.55 RCW. Please refer to that rule for complete informal appeal procedures. The following information summarizes that rule.



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A person who is aggrieved by the issuance, denial, conditioning, or modification of an HPA may request an informal appeal of that action. You must send your request to WDFW by mail to the HPA Appeals Coordinator, Department of Fish and Wildlife, Habitat Program, PO Box 43234, Olympia, Washington 98504-3234; e-mail to HPAapplications@dfw.wa.gov; fax to (360) 902-2946; or hand-delivery to the Natural Resources Building, 1111 Washington St SE, Habitat Program, Fifth floor. WDFW must receive your request within 30 days from the date you receive notice of the decision. If you agree, and you applied for the HPA, resolution of the appeal may be facilitated through an informal conference with the WDFW employee responsible for the decision and a supervisor. If a resolution is not reached through the informal conference, or you are not the person who applied for the HPA, the HPA Appeals Coordinator or designee may conduct an informal hearing or review and recommend a decision to the Director or designee. If you are not satisfied with the results of the informal appeal, you may file a request for a formal appeal.

B. FORMAL APPEALS: WAC 220-660-470 is the rule describing how to request a formal appeal of WDFW actions taken under Chapter 77.55 RCW. Please refer to that rule for complete formal appeal procedures. The following information summarizes that rule.

A person who is aggrieved by the issuance, denial, conditioning, or modification of an HPA may request a formal appeal of that action. You must send your request for a formal appeal to the clerk of the Pollution Control Hearings Boards and serve a copy on WDFW within 30 days from the date you receive notice of the decision. You may serve WDFW by mail to the HPA Appeals Coordinator, Department of Fish and Wildlife, Habitat Program, PO Box 43234, Olympia, Washington 98504-3234; e-mail to HPAapplications@dfw.wa.gov; fax to (360) 902-2946; or hand-delivery to the Natural Resources Building, 1111 Washington St SE, Habitat Program, Fifth floor. The time period for requesting a formal appeal is suspended during consideration of a timely informal appeal. If there has been an informal appeal, you may request a formal appeal within 30 days from the date you receive the Director's or designee's written decision in response to the informal appeal.

C. FAILURE TO APPEAL WITHIN THE REQUIRED TIME PERIODS: If there is no timely request for an appeal, the WDFW action shall be final and unappealable.

Habitat Biologist Nam.Siu@dfw.wa.gov
Nam Siu 360-522-6035

for Director
WDFW

Hope & Jeffrey Baker

TEMPORARY CONSTRUCTION EASEMENT

The undersigned property owner, (hereafter known as the "Grantor"), in consideration of **Mutual Benefits**, does hereby grant and convey unto Kitsap County, A Political Subdivision of the State of Washington, (hereinafter known as "Grantee"), a **Temporary Construction Easement** over, under and across the following described lands for the purpose of constructing sanitary sewer improvements associated with the Bangor–Keyport Forcemain Replacement Project, situated in that portion of Government Lot 7, Section 35, Township 26 North, Range 1 East, W.M., Kitsap County, State of Washington.

Property known as Kitsap County Assessor Number: 352601-4-018-2006

It Is Hereby Agreed As Follows:

1. Kitsap County and/or its assigns shall be constructing the Bangor–Keyport Forcemain Replacement Project. The work requires staff and/or assigns to temporarily enter private property in order to perform work in accordance with the above-referenced project, remove and/or relocate private improvements reconstruct existing driveway approaches, and inspect and connect to the existing side sewer.
2. The Grantee (Kitsap County) also agrees to indemnify and save harmless the Grantor (property owner) from any liability arising from the activities contemplated herein.
3. In the event that private improvements (excluding native vegetation) on the above-described private property which have not been addressed in the project construction plans are disturbed or destroyed, they will be replaced in as good as, or better condition as they were immediately before the property was entered upon by Kitsap County and/or assigns.
4. This Temporary Construction Easement shall be in effect from the start of construction on your property for a period six months or until the restoration or project is completed, whichever is sooner. The property owner assumes no obligation under this agreement other than granting access for completion of these tasks.

Dated this 10 day of FEBRUARY, 2022.

JEFF BAKER John Hope Baker
Grantor (s)

Contact Person: JEFF BAKER

Phone: 425 405 0115 425-405-0115

Other Information: See enclosed letter.

Hope & Jeff Baker
1499 NE Tagholm Rd
Poulsbo, WA 98370

February 10, 2022

Robert McGinley
Kitsap County Department of Public Works
614 Division Street MS-26
Port Orchard, WA 98366

Robert,

We are returning the construction easement regarding replacement of the sewer forcemain notice signed. We don't have any problems with the proposed work if Kitsap County truly aims to rebuild impacted features afterwards. We do want to let you know of our concerns with the process itself.

Kitsap County workers have been on our property well before any communications letting us know what was happening was presented. These visits involved surveys and markers being staked in our lawn. Our neighbors were notified months before us, expressed concerns, and have been communicating with you and us.

Until this notice to us, dated January 14, 2022, all information has come from our neighbors who had received communications in May of last year.

While we don't think the impact to our property is as significant as others, the timeframe between notification and work isn't sufficient. If the impact to our property was something we had issue with, we wouldn't have time to communicate before work was started. That's simply not acceptable. We believe the Kitsap County processes need to be more accommodating of the residents it's serving. Please keep in mind this is an inconvenience for us and not just a needed repair for the County.

Please take this into consideration in the future.

Sincerely,

Hope Baker  

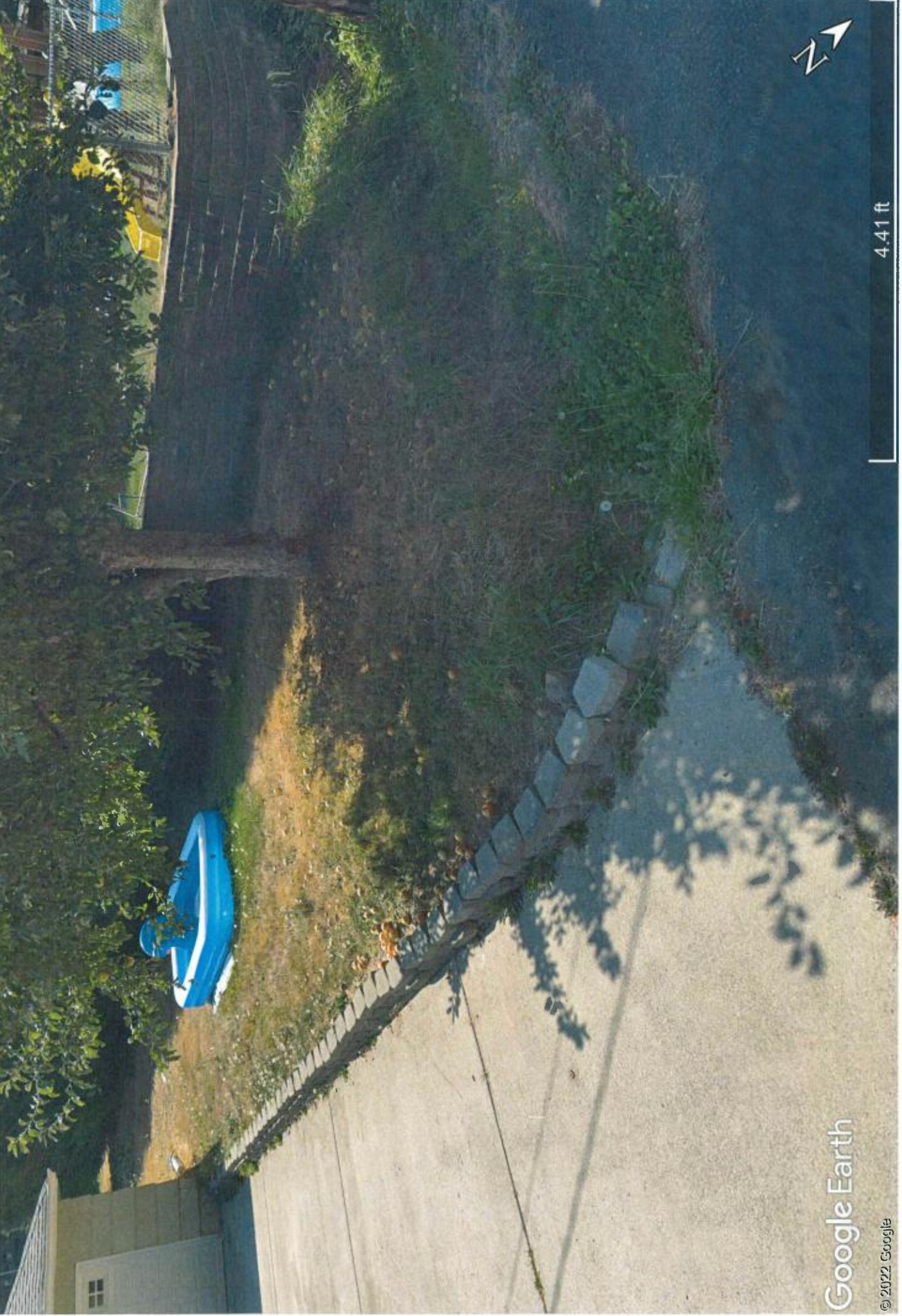
Hope & Jeff Baker
1499 NE Tagholm Rd

425-405-0115

Untitled Map

Write a description for your map.

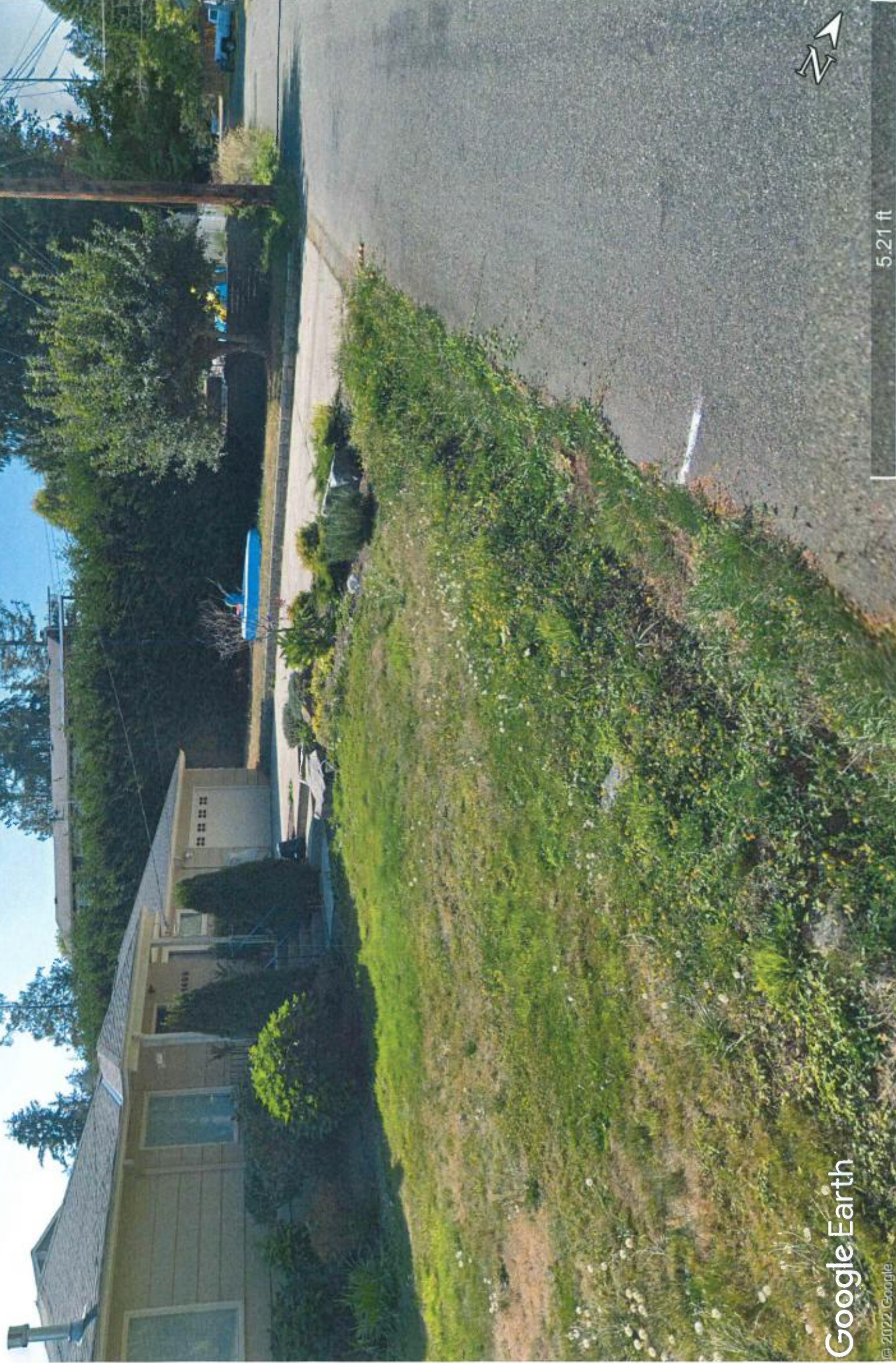
Legend



Untitled Map

Write a description for your map.

Legend



5.21 ft

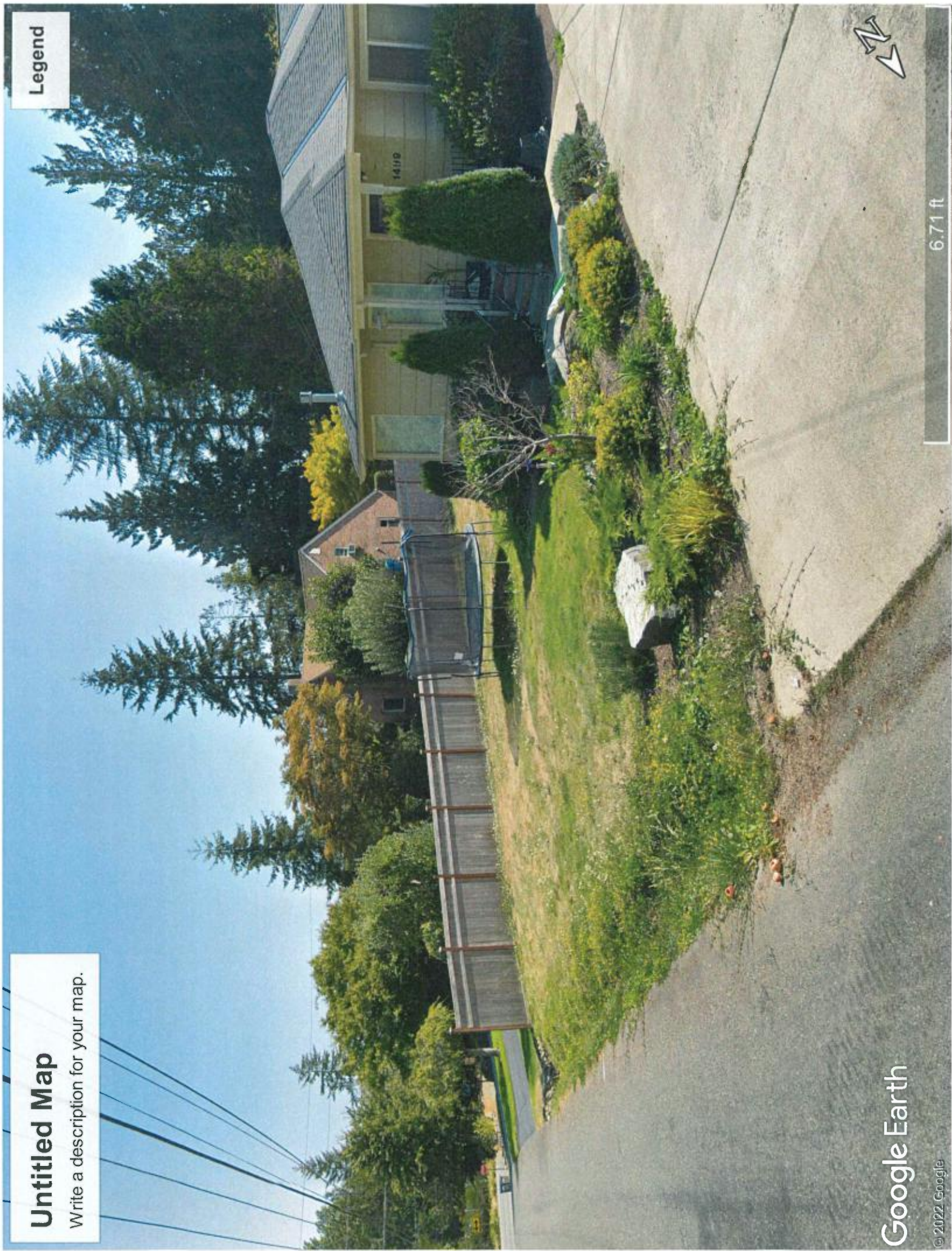
Google Earth

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Untitled Map

Write a description for your map.

Legend



6.71 ft

Google Earth

© 2022 Google





Joseph Moon & Edith Deering

TEMPORARY CONSTRUCTION EASEMENT

The undersigned property owner, (hereafter known as the "Grantor"), in consideration of **Mutual Benefits**, does hereby grant and convey unto Kitsap County, A Political Subdivision of the State of Washington, (hereinafter known as "Grantee"), a **Temporary Construction Easement** over, under and across the following described lands for the purpose of constructing sanitary sewer improvements associated with the Bangor–Keyport Forcemain Replacement Project, situated in that portion of Government Lot 7, Section 35, Township 26 North, Range 1 East, W.M., Kitsap County, State of Washington.

Property known as Kitsap County Assessor Number: 5060-000-034-0006

It Is Hereby Agreed As Follows:

1. Kitsap County and/or its assigns shall be constructing the Bangor–Keyport Forcemain Replacement Project. The work requires staff and/or assigns to temporarily enter private property in order to perform work in accordance with the above-referenced project, remove and/or relocate private improvements reconstruct existing driveway approaches, and inspect and connect to the existing side sewer.
2. The Grantee (Kitsap County) also agrees to indemnify and save harmless the Grantor (property owner) from any liability arising from the activities contemplated herein.
3. In the event that private improvements (excluding native vegetation) on the above-described private property which have not been addressed in the project construction plans are disturbed or destroyed, they will be replaced in as good as, or better condition as they were immediately before the property was entered upon by Kitsap County and/or assigns.
4. This Temporary Construction Easement shall be in effect from the start of construction on your property for a period six months or until the restoration or project is completed, whichever is sooner. The property owner assumes no obligation under this agreement other than granting access for completion of these tasks.

Dated this 22 day of February, 2022.

Joseph Moon Edith Deering
Grantor (s)

Contact Person: EDITH DEERING

Phone: 714-312-9048

Other Information: _____



APPENDIX G

**BANGOR KEYPORT FORCE MAIN ADDITIONAL
GEOTECHNICAL SERVICES REPORT**

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February 8, 2022

Murraysmith
600 University St, Ste 300
Seattle, WA 98101

Attn: Ms. Erika Schuyler, PE, PMP, and Miaomiao Zhang, PE

Transmitted via email to: *Erika.Schuyler@murraysmith.us* and *Miaomiao.Zhang@murraysmith.us*

**Re: Additional Geotechnical Engineering Services
Bangor-Keyport Force Main Replacement
Kitsap County, Washington
Murraysmith Project No. 20-2815.00
Landau Associates Project No. 1490005.010.019**

Dear Ms. Schuyler:

In May 2020, Landau Associates, Inc. (Landau) completed an initial geotechnical field investigation in support of the Bangor-Keyport Force Main Replacement project in Kitsap County, Washington. Findings were summarized in a geotechnical engineering report, dated September 3, 2020.

Since the report was submitted, Kitsap County Public Works Sewer Utility Division (County; project owner) has identified a new horizontal directional drilling (HDD) crossing. This letter summarizes the results of additional geotechnical services completed in support of the HDD crossing. The conclusions and recommendations herein are intended to supplement Landau's September 2020 report.

Project Understanding

Landau's project understanding is based on information provided by Murraysmith (project civil engineer). The County proposes to replace approximately 5 miles of force main in North Kitsap County (site; Figure 1) to mitigate corrosion at several locations along the sewer alignment. The County has identified a new HDD crossing beneath an existing culvert at Clear Creek Road Northwest (NW), near Station 14+20.

Scope of Services

Additional geotechnical services were provided in accordance with the scope outlined in Landau's December 7, 2021 email proposal. The services were performed in accordance with the terms presented in Task Order under Agreement for Services on Continuing Basis, dated April 29, 2020.

Geotechnical Field Investigation and Laboratory Testing

The following sections include descriptions of the geotechnical field investigation and laboratory testing completed in support of the proposed HDD crossing.

Geotechnical Borings

In December 2021, Landau explored subsurface conditions in the vicinity of the proposed HDD crossing by completing two supplemental Rotosonic™ borings (B-HDD1 and B-HDD2). Borings B-HDD1 and B-HDD2 were advanced 31.51 and 41.51 feet (ft) below ground surface (bgs), respectively. Boring B-HDD1 was completed with a 2-inch-diameter standpipe piezometer monitoring well.

The approximate locations of the explorations are shown on Figures 2A and 2B. Figure 2A shows the locations of the supplemental borings relative to the project alignment; Figure 2B includes a focused view of the HDD crossing at Clear Creek Road NW.

Landau and Murraysmith personnel monitored the supplemental explorations. Landau's field representative maintained a detailed record of the subsurface soil and groundwater conditions observed and collected representative soil samples for geotechnical laboratory testing. Subsurface conditions were described using the soil classification system shown on Figure 3, in general accordance with ASTM International (ASTM) standard D2488, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*. Summary logs of the explorations are presented on Figures 4 and 5. Photographs of the Rotosonic and standard penetration test (SPT) samples are provided in Attachment 1.

Geotechnical Laboratory Testing

Samples obtained from the supplemental explorations were transported to Landau's geotechnical laboratory for further examination and testing. Laboratory testing was performed in general accordance with the ASTM standard test methods described below. Field log descriptions were checked against the samples and updated, where appropriate, in accordance with ASTM standard D2487, *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)*.

Natural moisture content determinations were performed in accordance with ASTM standard test method D2216-19, *Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass*. The natural moisture content is shown as "W = xx" (i.e., percent of dry weight) in the "Test Data" column on Figures 4 and 5.

Grain size analyses were performed in accordance with ASTM standard test method D6913, *Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis*. Samples selected for grain size analysis are designated with a "GS" in the "Test Data" column on Figures 4 and 5. The results of the grain size analyses are presented on Figures 6 and 7.

To assess the fines content, select samples were washed over a U.S. Standard No. 200 sieve in accordance with ASTM standard test method D1140-17, *Standard Test Methods for Determining the Amount of Material Finer than 75- μ m (No. 200) Sieve in Soils by Washing*. The fines content, or

percent weight passing the No. 200 sieve, is designated with a “-200 = xx” in the “Test Data” column on Figures 4 and 5.

Atterberg limits determinations were performed in accordance with ASTM standard test method D4318, *Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils*. Samples selected for Atterberg limits determinations are designated with an “AL” in the “Test Data” column on Figures 4 and 5. The results of the Atterberg limits determinations are presented on Figure 8.

Site Conditions

The following sections describe the geologic setting of the site and the surface and subsurface conditions observed during Landau’s field investigation. Interpretations of site conditions are based on the results of Landau’s 2020 and 2021 geotechnical investigations and laboratory testing programs.

Surface Conditions

Clear Creek Road NW is a two-lane, asphalt-paved road with an emergency shoulder in each direction. The surrounding area includes highways, grassy fields, and residential and commercial development. Site grades along the HDD alignment are relatively flat and increase at approximately 4 percent from north to south. The HDD crossing is located at a local low point relative to surrounding topography.

Asphalt pavement measured between 6 and 7.5 inches thick at the locations explored. The pavement is underlain by 18 to 24 inches of structural fill.

Geologic Setting

Geologic information for the site and the surrounding area was obtained from the *Geologic Map of the Seabeck and Poulsbo 7.5-minute Quadrangles, Kitsap and Jefferson Counties, Washington* (Polenz et. al 2013). Surficial deposits in the immediate vicinity of the HDD crossing are mapped as ice-contact deposits (Qgic), a unit that consists of poorly to well-sorted cobbles and pebble gravel, sand, lacustrine mud, and isolated boulders. Ice-contact deposits may also include ablation or flow till.

The subsurface conditions observed in Landau’s December 2021 explorations were generally consistent with the mapped geology for the site.

Soil Conditions

The soils observed below the pavement section were categorized into two general units:

- **Fill:** Fill was observed in borings B-HDD1 and B-HDD2 and consisted of medium dense to dense sand with gravel and cobbles or of gravel with variable sand, cobble, and organic content in a medium dense, moist to wet condition. The fill extended between 2.5 and 4.7 ft bgs.
- **Ice-contact deposits:** Ice-contact deposits were observed beneath the fill in borings B-HDD1 and B-HDD2. The ice-contact deposits consisted of sand with variable silt, gravel, cobble, and organic content; of silty gravel with sand; of clayey silt with sand; or of silt with variable sand

content. The deposits ranged from moist to wet and loose to very dense or stiff to very stiff. Both borings were terminated in this unit.

Scattered cobbles, approximately 3 to 4 inches in diameter, were observed in samples collected from borings B-HDD1 and B-HDD2. Intermittent cobbles and fractured rock were observed in both borings from 3 to 21.5 ft bgs. Cobbles and boulders are often found in glacially derived soils and may be present along the proposed HDD alignment.

Groundwater Conditions

At time of drilling, groundwater was observed at 5 ft bgs in boring B-HDD1 and at 4.8 ft bgs in boring B-HDD2. A 2-inch-diameter standpipe piezometer was installed in boring B-HDD1 to monitor groundwater levels in the immediate vicinity of the proposed HDD crossing. A groundwater measurement of 8.5 ft bgs (elevation 247.4 ft North American Vertical Datum of 1988 [NAVD 88]) was recorded in boring B-HDD1 on December 22, 2021 (24 hours after well development).

During Landau's May 2020 field investigation, soil heave was noted in borings B-1 and B-2. During the December 2021 investigation, the Rotasonic drill seized at approximately 30 to 35 ft bgs in borings B-HDD1 and B-HDD2. The driller added approximately 100 gallons of water to the borings to release the inner core barrel. Just below this depth, field SPT blow counts dropped significantly, and the driller was unable to recover a soil sample with the split-spoon sampler. Based on field observations and discussion with the driller, Landau speculates that soil heave caused the inner core barrel to lock in place. Flushing of the borehole to release the barrel likely disturbed soil at the base of the borehole; this is reflected in the lower SPT blow counts observed at the base of the boring.

Soil heave may be indicative of a pressurized groundwater condition. Following flushing of boring B-HDD2, Landau monitored groundwater levels within the borehole prior to backfilling. Over a 30-minute period, groundwater levels dropped from approximately 5 to 10 ft bgs. Groundwater typically rises in pressurized conditions.

The groundwater conditions reported herein are for the specific dates and locations indicated and may not be representative of other locations and/or times. Groundwater elevations will vary depending on weather conditions, local subsurface conditions, and other factors. Maximum groundwater levels typically occur during late winter and early spring.

Horizontal Directional Drilling

Soil conditions along the proposed HDD path are expected to consist of loose to dense, silty sand or very stiff, clayey silt with variable sand, gravel, and cobble content. The borehole path should include adequate cover to prevent frac-out (inadvertent release of drilling fluid at ground surface) and ground heave around the existing culvert/storm drainpipe.

Occasional cobbles, up to 4 inches in diameter, were observed in Landau's explorations. Boulders were not observed in the explorations but may be present along the HDD path. If large cobbles or boulders are encountered, the path may need to be realigned to avoid obstructions. The contractor should coordinate realignment with the project civil engineer.

No indication of artesian groundwater conditions was observed at the locations explored; however, soil heave, which may be indicative of pressurized aquifers, was observed in all four borings advanced in Clear Creek Rd NW. The HDD design team and/or a specialty trenchless contractor should assess site soil and groundwater risks and confirm the feasibility of using HDD to install pipe beneath the existing culvert.

Engineering Soil Properties

Based on Landau's field observations, subsurface soils at the site can be grouped into four engineering soil units (ESUs): existing fill (ESU-1) and ice-contact deposits (ESU-2A through ESU-2C). The ice-contact deposits have variable gradation and density and were split into three subunits. The ESUs in Table 1 can be used to support HDD design.

Table 1. Recommended Engineering Soil Properties

Soil Unit	Soil Description	ESU	Moist Unit Weight (pcf)	Drained Angle of Friction (degrees)	Drained Cohesion (C; psf)	Shear Modulus (G; kips/ft ²)
Fill	Dense to medium dense sand	ESU-1	120–130	34	0	220–430
Ice-contact Deposits	Loose to medium dense sand	ESU-2A	120–125	34	0	500–700
	Very stiff, clayey silt	ESU-2B	115–120	32	300–500	240–340
	Dense to very dense sand and gravel	ESU-2C	125–135	36	0	1,200–1,400

C = cohesion

ESU = engineering soil unit

ft² = square foot

G = shear modulus

pcf = pounds per cubic foot

psf = pounds per square foot

Construction Dewatering

On December 22, 2021, groundwater was observed within the ice-contact deposits in boring B-HDD1; groundwater was measured at a depth of 8.5 ft (elevation 247.4 ft NAVD 88). Based on a review of project drawings, Landau anticipates that excavations for installation and tie-in of the HDD pipe may extend below the groundwater table.

The quantity of groundwater seepage will depend on the soils encountered within the tie-in excavations. Minor seepage may be encountered where the excavations are terminated in clayey silt soil (ESU-2B); conventional sumps and pumps should be sufficient to limit the amount of groundwater that enters the excavations. If the excavations extend through the clayey silt into the underlying sand, conventional sumps and pumps may not be adequate to provide a dry, stable work area; the use of multiple trash pumps, well points, or cutoff walls may be required.

The launch/receptor shaft excavations are not expected to require significant dewatering (e.g., use of well points or deep wells), provided they do not extend more than 4 to 5 ft bgs. Recommendations for construction dewatering along the force main alignment are provided in Landau's 2020 report.

Completing construction during the summer and early fall will reduce dewatering needs. The contractor should be responsible for the design, permitting, installation, monitoring, and maintenance of the dewatering system(s).

Construction Considerations

The following key points should be reviewed when developing project plans and specifications:

- **Temporary slopes:** Temporary excavations should be no steeper than 1½ horizontal to 1 vertical, in accordance with regulations for safe excavation practice in the State of Washington (Chapter 296-155 of the Washington Administrative Code). If groundwater seepage is present, flatter slopes, temporary shoring, and/or dewatering may be required.
- **Temporary shoring:** The temporary shoring system should be designed by a civil or structural engineer licensed in the State of Washington. The shoring system should be designed to support lateral loads exerted by the retained soil mass and hydrostatic pressure, as shown in Table 2. The shoring design should also account for surcharge loads from construction equipment and soil stockpiles. Surcharge loading can be computed as $q_s * K_a$, where q_s is the surcharge load. Landau recommends a rectangular pressure distribution for surcharge loading. Prior to implementation, the design should be submitted for the County's approval.

Table 2. Recommended Soil Parameters for Design of Temporary Shoring

Soil Unit	Moist Unit Weight (pcf)	Internal Angle of Friction (degrees)	Active Earth Pressure Coefficient, K_a	Active Earth Pressure EFD (pcf)	Passive Earth Pressure Coefficient, $K_p^{(a)}$	Passive Earth Pressure EFD (pcf) ^(a)	Submerged Passive Earth Pressure EFD (pcf) ^(a,b)
Fill	130	34	0.28	37	3.54	300	160
Ice-contact Deposits	125	32	0.31	38	3.25	270	135

(a) = Passive earth pressure values include a factory of safety of 1.5.

(b) = Submerged passive earth pressures should be used for excavations extending below the groundwater table.

EFD = equivalent fluid density

pcf = pounds per cubic foot

psf = pounds per square foot

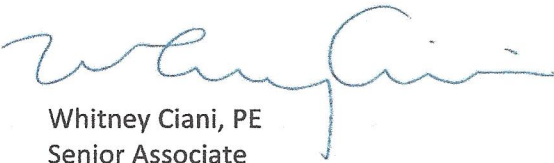
Closing

We trust that this memorandum provides you with sufficient information to proceed with the project. If you have questions or comments, please contact Whitney Ciani at 208.996.0946 or at wciani@landauinc.com.

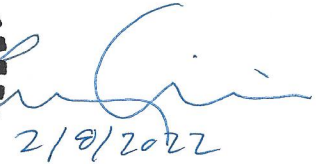
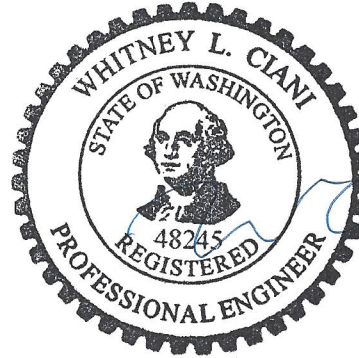
LANDAU ASSOCIATES, INC.



Barsha Pradhan
Senior Staff EIT



Whitney Ciani, PE
Senior Associate



2/8/2022

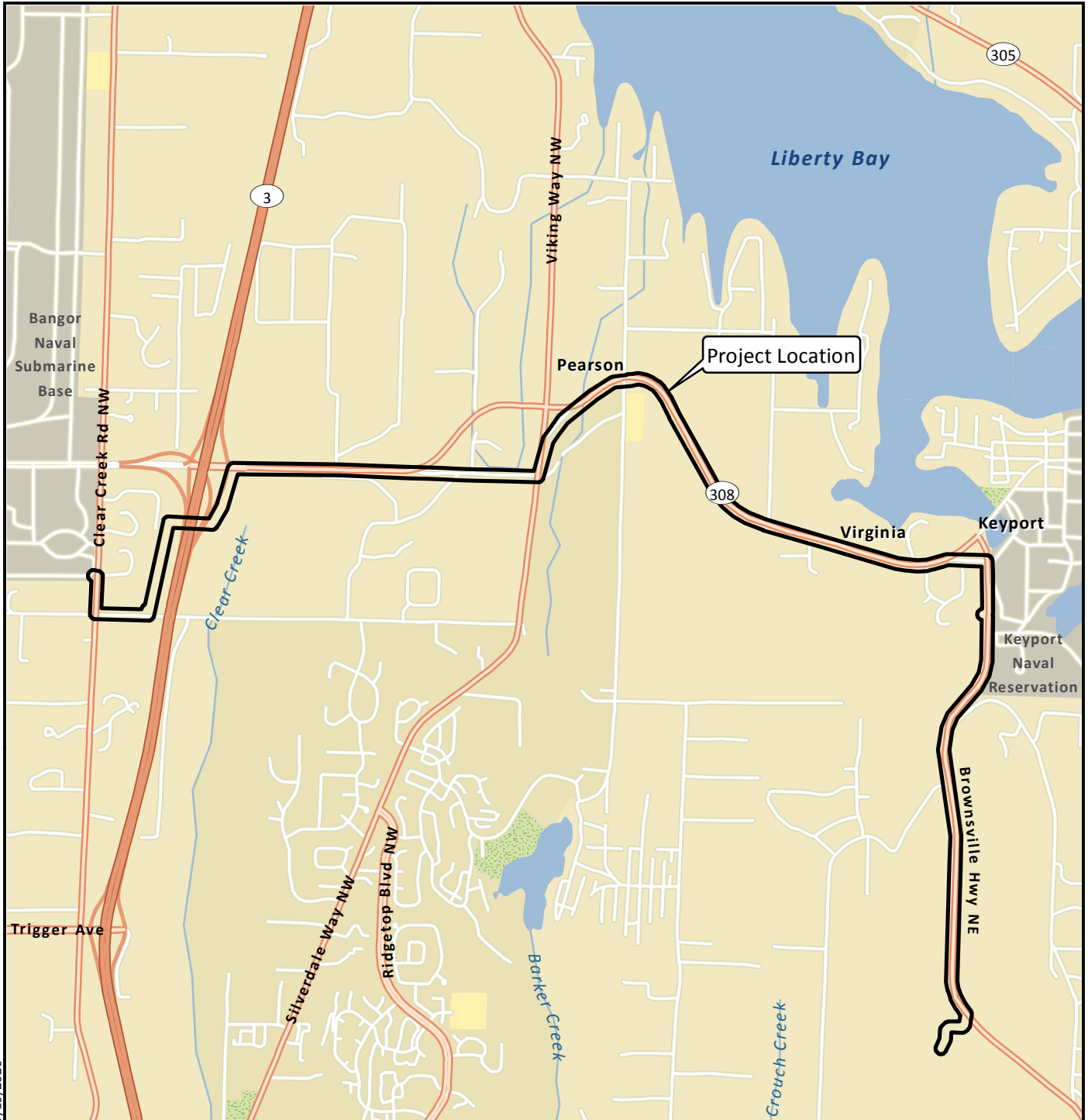
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[Y:\1490\005.010\R\SUP GEOTECH REPORT_CLEAR CREEK HDD\BANGOR-KEYPORT ADDITIONAL GEOTECHNICAL SERVICES LETTER 2.8.2022.DOCX]

Attachments: Figure 1. Vicinity Map
Figure 2A. Summary Site and Exploration Plan
Figure 2B. Site and Exploration Plan B and Geologic Cross Section
Figure 3. Soil Classification System and Key
Figures 4 and 5. Logs of Borings B-HDD1 and B-HDD2
Figures 6 and 7. Grain Size Distribution
Figure 8. Plasticity Chart
Attachment 1. Sample Photograph Log

References

- Landau. 2020. Geotechnical Engineering Report: Bangor-Keyport Force Main Replacement, Kitsap County, Washington. Landau Associates, Inc. September 3.
- Polenz, M., G.T. Petro, T.A. Contreras, K.A. Stone, G.L. Paulin, and R. Cakir. 2013. *Geologic Map of the Seabeck and Poulsbo 7.5-minute Quadrangles, Kitsap and Jefferson Counties, Washington*. Map Series 2013-02. Washington Division of Geology and Earth Resources.



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Data Source: Esri 2012



Bangor-Keyport
Force Main Replacement
Kitsap County, Washington

Vicinity Map

Figure
1

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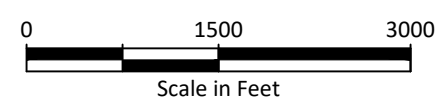


Legend

- B-1 ● Approximate Boring Location and Designation
- B-6 ⊕ Approximate Monitoring Well Location and Designation
- HA-11 ● Approximate Hand Auger Location and Designation
- PS-1 ▲ Pump Station Location

Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



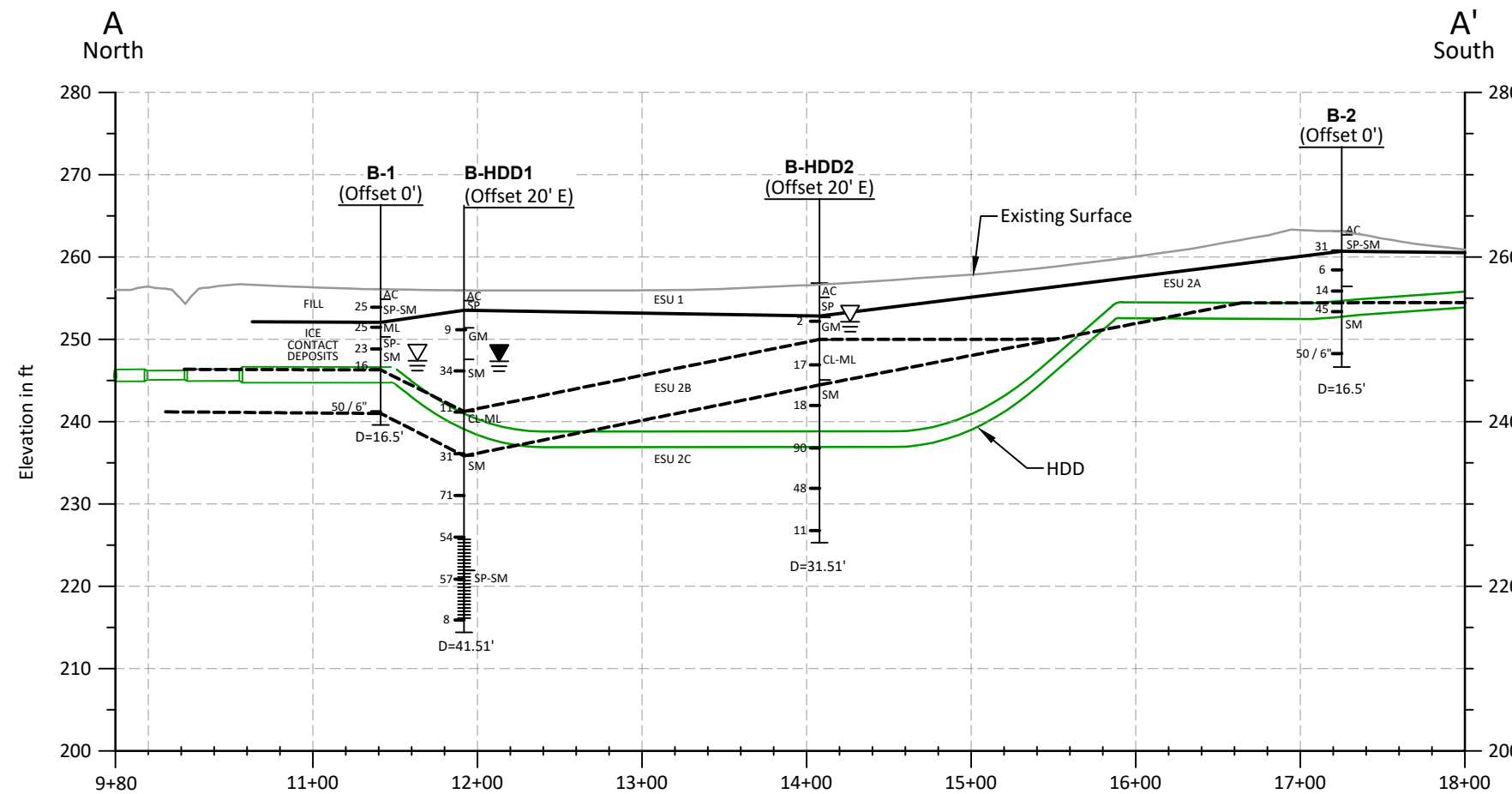
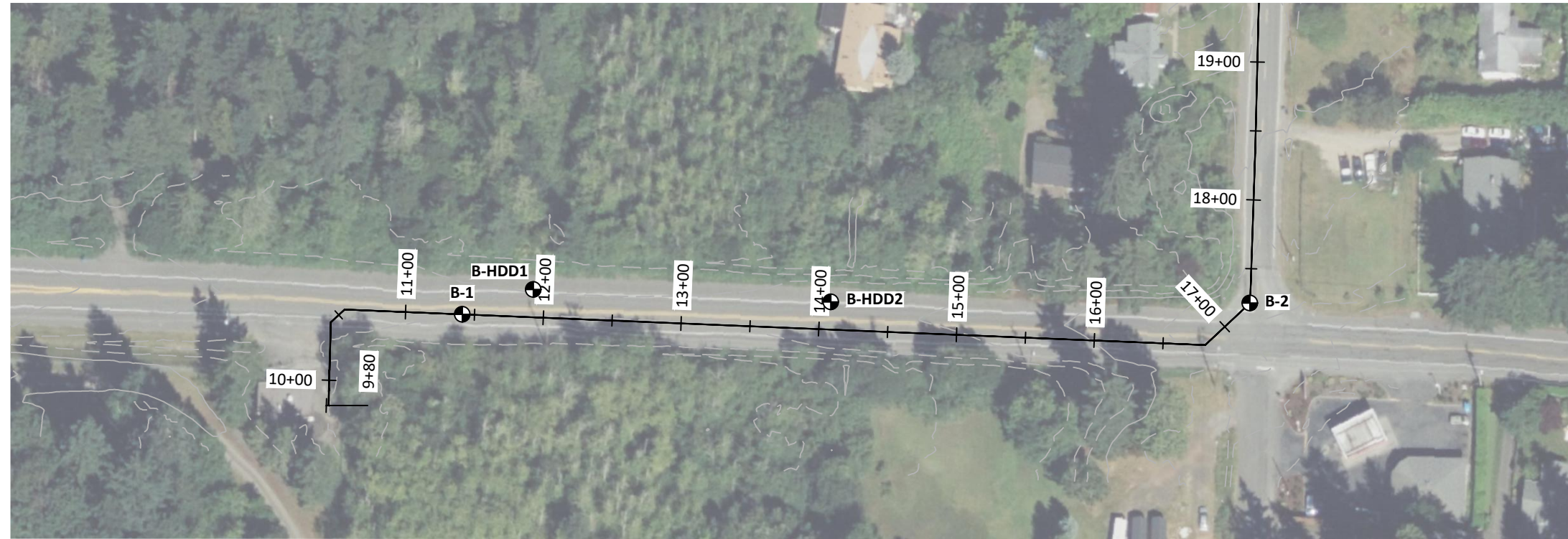
Source: Bing Aerial Imagery 2022; Murraysmith 2021



Bangor-Keyport
Force Main Replacement
Kitsap County, Washington

Summary Site and Exploration Plan

Figure
2A



- Legend**
- B-1 Approximate Boring Location and Designation
 - B-HDD2 Project Exploration Designation (Offset 20' E)
 - Top of Exploration
 - Groundwater Measured in Piezometer
 - Groundwater Level at Time of Drilling
 - Unified Soils Classification Symbol
 - Standard Penetration Test Sample Blow Count
 - Inferred Geologic Contact
 - Well Screen Interval
 - Bottom of Exploration
 - Depth of Exploration

Note

- Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

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Geologic Profile A-A'
 Horizontal Scale in Feet: 1"=100'
 Vertical Scale in Feet: 1"=20'
 5x Vertical Exaggeration

Source: Bing Aerial Imagery 2022; Murraysmith 2021



Soil Classification System

	MAJOR DIVISIONS	CLEAN GRAVEL (Little or no fines)	GRAPHIC SYMBOL	LETTER SYMBOL ⁽¹⁾	TYPICAL DESCRIPTIONS ⁽²⁾⁽³⁾
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)		GW	Well-graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		GP	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		GM	Silty gravel; gravel/sand/silt mixture(s)
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)		SW	Well-graded sand; gravelly sand; little or no fines
		CLEAN SAND (Little or no fines)		SP	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)		SM	Silty sand; sand/silt mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)	SILT AND CLAY (Liquid limit less than 50)		ML	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity
		SILT AND CLAY (Liquid limit less than 50)		CL	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay
		SILT AND CLAY (Liquid limit less than 50)		OL	Organic silt; organic, silty clay of low plasticity
	SILT AND CLAY (Liquid limit greater than 50)	SILT AND CLAY (Liquid limit greater than 50)		MH	Inorganic silt; micaceous or diatomaceous fine sand
		SILT AND CLAY (Liquid limit greater than 50)		CH	Inorganic clay of high plasticity; fat clay
		SILT AND CLAY (Liquid limit greater than 50)		OH	Organic clay of medium to high plasticity; organic silt
	HIGHLY ORGANIC SOIL		PT	Peat; humus; swamp soil with high organic content	

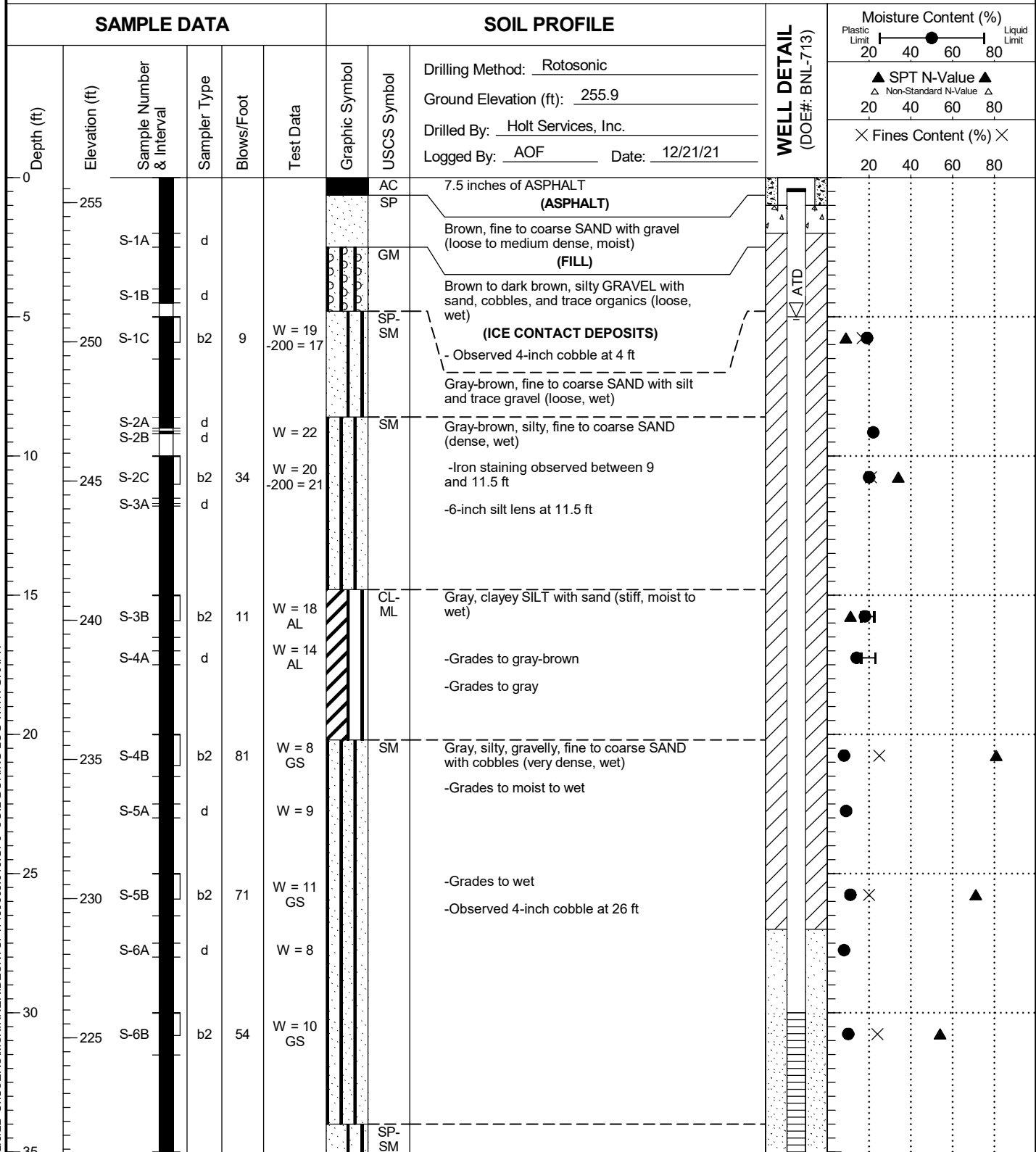
OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT		AC or PC	Asphalt concrete pavement or Portland cement pavement
ROCK		RK	Rock (See Rock Classification)
WOOD		WD	Wood, lumber, wood chips
DEBRIS		DB	Construction debris, garbage

- Notes:
- USCS letter symbols correspond to symbols used by the Unified Soil Classification System and ASTM classification methods. Dual letter symbols (e.g., SP-SM for sand or gravel) indicate soil with an estimated 5-15% fines. Multiple letter symbols (e.g., ML/CL) indicate borderline or multiple soil classifications.
 - Soil descriptions are based on the general approach presented in the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the Standard Test Method for Classification of Soils for Engineering Purposes, as outlined in ASTM D 2487.
 - Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:
 - Primary Constituent: > 50% - "GRAVEL," "SAND," "SILT," "CLAY," etc.
 - Secondary Constituents: > 30% and < 50% - "very gravelly," "very sandy," "very silty," etc.
 - > 15% and < 30% - "gravelly," "sandy," "silty," etc.
 - Additional Constituents: > 5% and < 15% - "with gravel," "with sand," "with silt," etc.
 - < 5% - "with trace gravel," "with trace sand," "with trace silt," etc., or not noted.
 - Soil density or consistency descriptions are based on judgement using a combination of sampler penetration blow counts, drilling or excavating conditions, field tests, and laboratory tests, as appropriate.

Drilling and Sampling Key		Field and Lab Test Data																																																				
SAMPLER TYPE	SAMPLE NUMBER & INTERVAL																																																					
<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Code</th> <th style="text-align: left;">Description</th> </tr> <tr><td>a</td><td>3.25-inch O.D., 2.42-inch I.D. Split Spoon</td></tr> <tr><td>b</td><td>2.00-inch O.D., 1.50-inch I.D. Split Spoon</td></tr> <tr><td>c</td><td>Shelby Tube</td></tr> <tr><td>d</td><td>Grab Sample</td></tr> <tr><td>e</td><td>Single-Tube Core Barrel</td></tr> <tr><td>f</td><td>Double-Tube Core Barrel</td></tr> <tr><td>g</td><td>2.50-inch O.D., 2.00-inch I.D. WSDOT</td></tr> <tr><td>h</td><td>3.00-inch O.D., 2.375-inch I.D. Mod. California</td></tr> <tr><td>i</td><td>Other - See text if applicable</td></tr> <tr><td>1</td><td>300-lb Hammer, 30-inch Drop</td></tr> <tr><td>2</td><td>140-lb Hammer, 30-inch Drop</td></tr> <tr><td>3</td><td>Pushed</td></tr> <tr><td>4</td><td>Vibrocore (Rotasonic/Geoprobe)</td></tr> <tr><td>5</td><td>Other - See text if applicable</td></tr> </table>	Code	Description	a	3.25-inch O.D., 2.42-inch I.D. Split Spoon	b	2.00-inch O.D., 1.50-inch I.D. Split Spoon	c	Shelby Tube	d	Grab Sample	e	Single-Tube Core Barrel	f	Double-Tube Core Barrel	g	2.50-inch O.D., 2.00-inch I.D. WSDOT	h	3.00-inch O.D., 2.375-inch I.D. Mod. California	i	Other - See text if applicable	1	300-lb Hammer, 30-inch Drop	2	140-lb Hammer, 30-inch Drop	3	Pushed	4	Vibrocore (Rotasonic/Geoprobe)	5	Other - See text if applicable		<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Code</th> <th style="text-align: left;">Description</th> </tr> <tr><td>PP = 1.0</td><td>Pocket Penetrometer, tsf</td></tr> <tr><td>TV = 0.5</td><td>Torvane, tsf</td></tr> <tr><td>PID = 100</td><td>Photoionization Detector VOC screening, ppm</td></tr> <tr><td>W = 10</td><td>Moisture Content, %</td></tr> <tr><td>D = 120</td><td>Dry Density, pcf</td></tr> <tr><td>-200 = 60</td><td>Material smaller than No. 200 sieve, %</td></tr> <tr><td>GS</td><td>Grain Size - See separate figure for data</td></tr> <tr><td>AL</td><td>Atterberg Limits - See separate figure for data</td></tr> <tr><td>GT</td><td>Other Geotechnical Testing</td></tr> <tr><td>CA</td><td>Chemical Analysis</td></tr> </table>	Code	Description	PP = 1.0	Pocket Penetrometer, tsf	TV = 0.5	Torvane, tsf	PID = 100	Photoionization Detector VOC screening, ppm	W = 10	Moisture Content, %	D = 120	Dry Density, pcf	-200 = 60	Material smaller than No. 200 sieve, %	GS	Grain Size - See separate figure for data	AL	Atterberg Limits - See separate figure for data	GT	Other Geotechnical Testing	CA	Chemical Analysis
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Groundwater																																																						
Approximate water level at time of drilling (ATD)																																																						
Approximate water level at time after drilling/excavation/well																																																						

B-HDD1

LAI Project No: 1490005.010



- Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
 2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
 3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Bangor-Keyport
Force Main Replacement
Kitsap County, Washington

Log of Boring B-HDD1

Figure
4
(1 of 2)

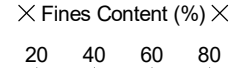
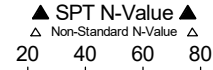
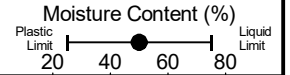
B-HDD1

LAI Project No: 1490005.010

SAMPLE DATA

SOIL PROFILE

WELL DETAIL
(DOE#: BNL-713)



Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Soil Profile Description	Well Detail	Moisture Content (%)	SPT N-Value	Fines Content (%)	
35	220	S-7	b2	67	W = 18 -200 = 10	[Vertical Line]	SP-SM	Gray, fine to coarse SAND with silt and gravel (very dense, wet) - Observed drillers add water to the casing - Flushing the casing may have affected SPT blow counts	[Well Diagram]	●	▲	×	
		S-8A	d		W = 19	[Vertical Line]					●		
40	215	S-8	b2	8		[Vertical Line]						▲	

Boring Completed 12/21/21
Total Depth of Boring = 41.5 ft.

- Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
 2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
 3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Kitsap County, Washington

Log of Boring B-HDD1

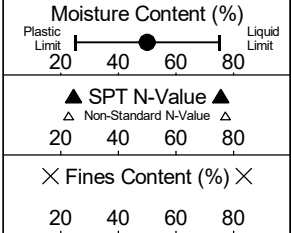
Figure
4
(2 of 2)

B-HDD2

LAI Project No: 1490005.010

SAMPLE DATA

SOIL PROFILE



Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Soil Description
0						AC	SP	7 inches of ASPHALT (ASPHALT)
255		S-1A	d					Gray-brown to brown, fine to coarse SAND with gravel and cobbles (loose to medium dense, moist) (FILL) -3-inch-diameter cobble at 3 ft
		S-1B	d					
5		S-1C	b2	2		GM		-6-inch silt lens at 4 ft -Iron staining at 4.3 ft
250		S-2A	d			CL-ML		Brown to dark brown, silty GRAVEL with sand (very loose, wet) (ICE CONTACT DEPOSITS) Light gray to blue-gray, clayey SILT with sand (stiff, wet)
		S-2B	d					
10		S-2C						
245		S-2D	b2	17	W = 18 AL			-Lenses of silty sand at 7.5 ft and 9.5 ft -Iron staining throughout the sample
15		S-3A	d		W = 7			Dark gray, silty, fine to coarse SAND with gravel and cobbles (very dense, moist to wet) -Increase in gravel content
		S-3B	b2	68	W = 9 GS			
240		S-4A	d		W = 8 -200 = 24			-4-inch-diameter cobble at 18 ft
20		S-4B	b2	90	W = 11 GS			-Grades to very silty and with gravel -4-inch-diameter cobble at 21.5 ft
235								
25		S-5	b2	48	W = 17 GS			-Decrease in gravel content
230		S-6A	d		W = 16 -200 = 25			
30		S-6B	b2	11				- Observed drillers add water to the casing - Flushing the casing may have affected SPT blow counts -Grades to medium dense

Groundwater

ATD

Boring Completed 12/21/21
Total Depth of Boring = 31.5 ft.

- Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
 2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
 3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

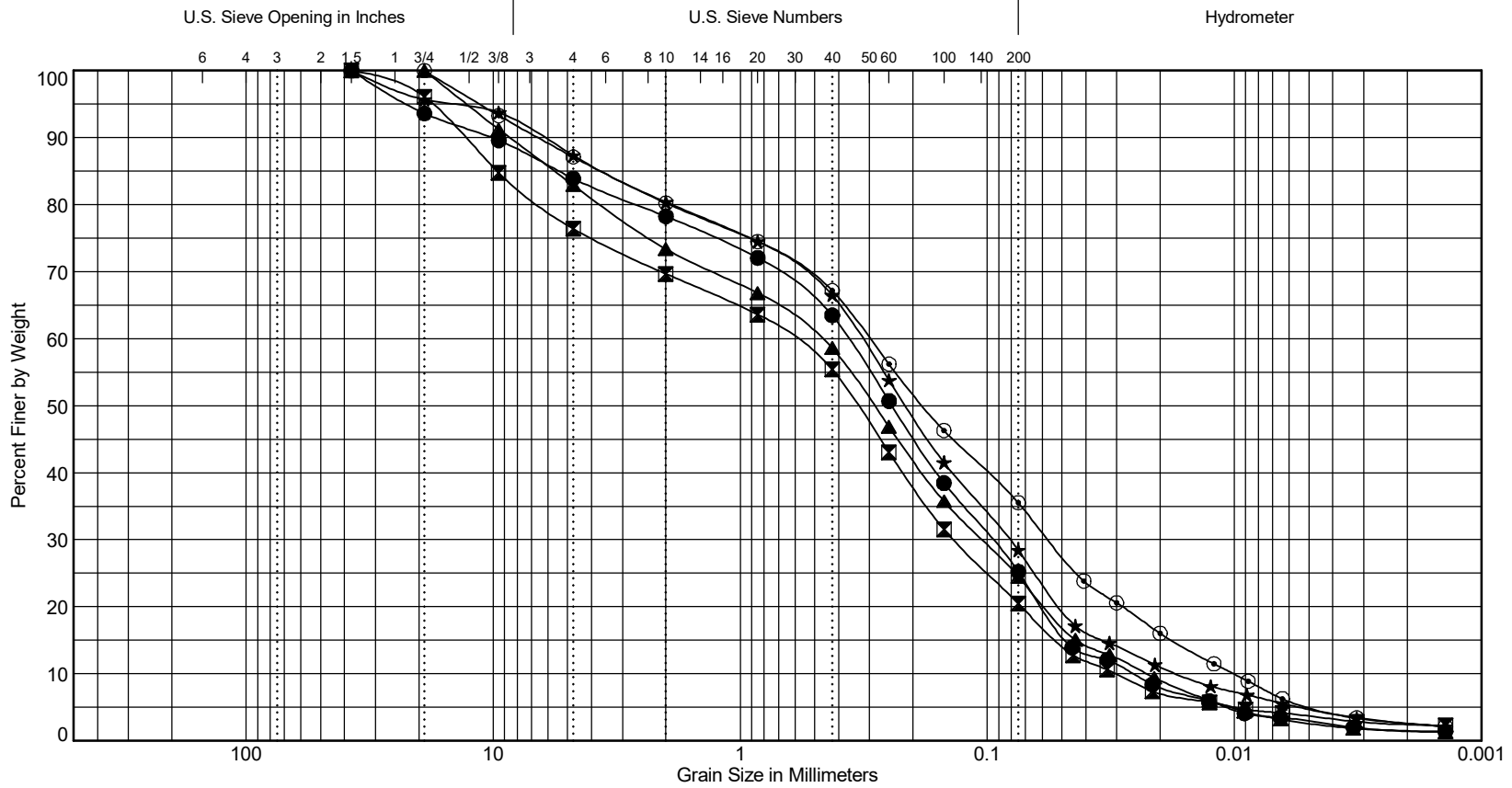
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Bangor-Keyport
Force Main Replacement
Kitsap County, Washington

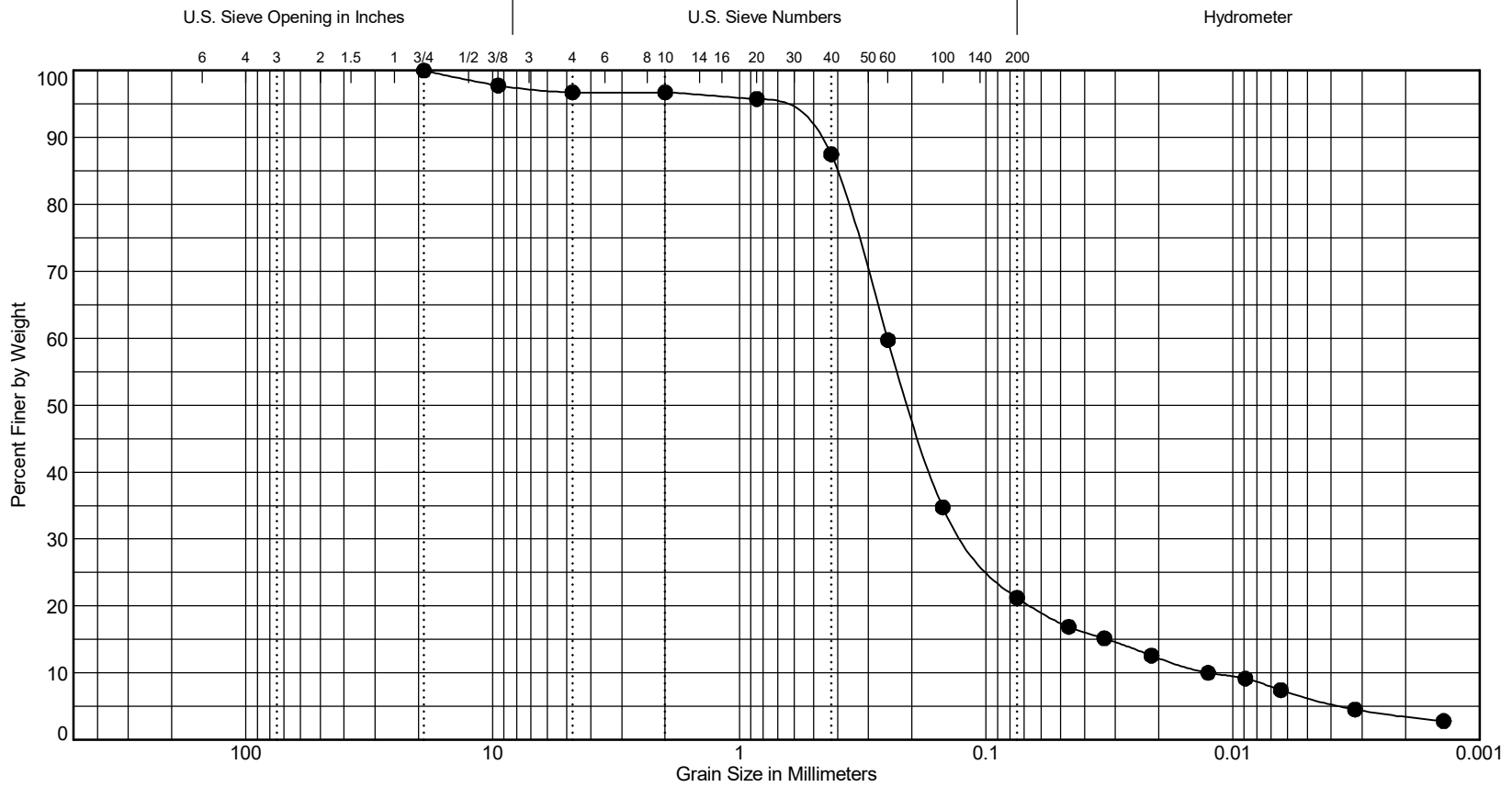
Log of Boring B-HDD2

Figure
5



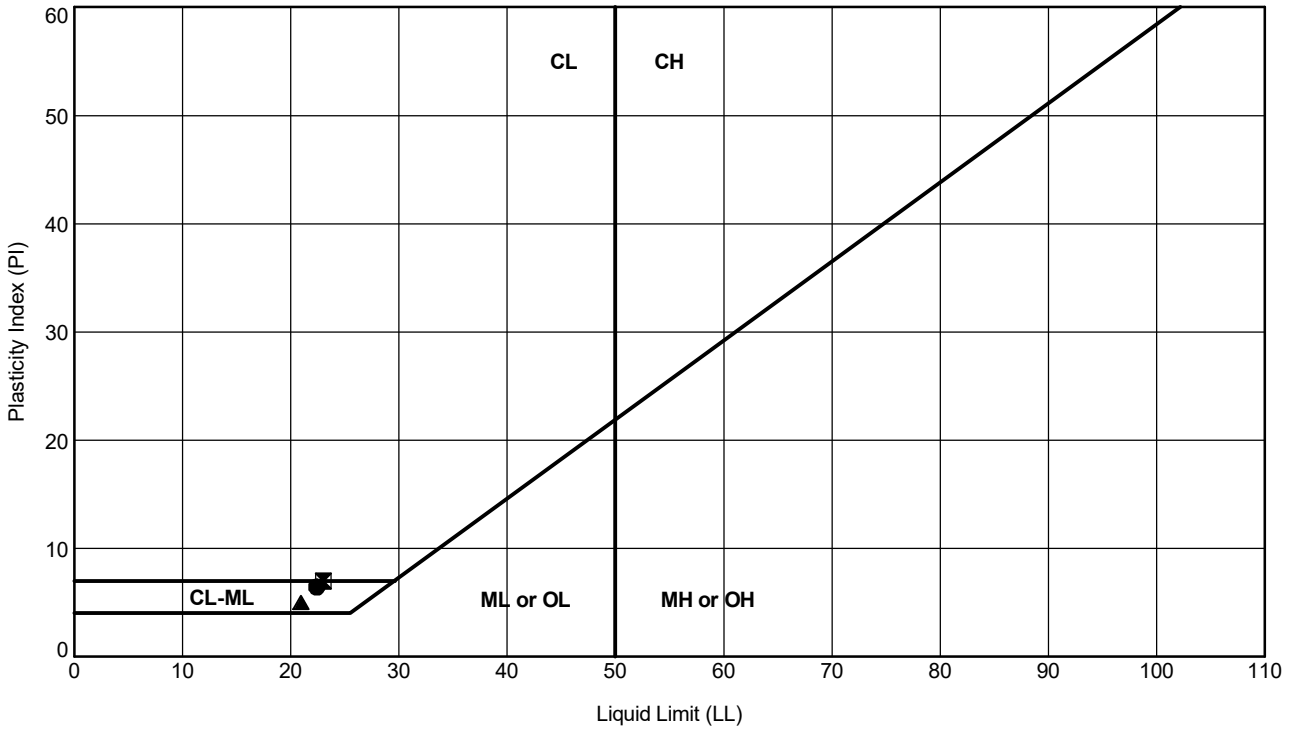
Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

Symbol	Exploration Number	Sample Number	Depth (ft)	Natural Moisture (%)	Soil Description	Unified Soil Classification
●	B-HDD1	S-4B	20.0	8	Gravelly, silty, fine to coarse SAND	SM
⊠	B-HDD1	S-5B	25.0	11	Silty, gravelly, fine to coarse SAND	SM
▲	B-HDD1	S-6B	30.0	10	Gravelly, silty, fine to coarse SAND	SM
★	B-HDD2	S-3B	15.0	9	Silty, fine to coarse SAND with gravel	SM
⊙	B-HDD2	S-4B	20.0	11	Very silty, fine to coarse SAND with gravel	SM



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

Symbol	Exploration Number	Sample Number	Depth (ft)	Natural Moisture (%)	Soil Description	Unified Soil Classification
●	B-HDD2	S-5	25.0	17	Silty, fine to coarse SAND	SM



ATTERBERG LIMIT TEST RESULTS

Symbol	Exploration Number	Sample Number	Depth (ft)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Natural Moisture (%)	Soil Description	Unified Soil Classification
●	B-HDD1	S-3B	15.0	22	16	6	18	Clayey SILT with sand	CL-ML
⊠	B-HDD1	S-4A	17.0	23	16	7	14	Clayey SILT with sand	CL-ML
▲	B-HDD2	S-2D	10.0	21	16	5	18	Clayey SILT with sand	CL-ML

ASTM D 4318 Test Method

ATTACHMENT 1

Sample Photograph Log



1. Boring B-HDD1, 0 to 5 feet deep.



2. Boring B-HDD1, Sample S-1, 5 feet deep.



3. Boring B-HDD1, 5 to 10 feet deep.



4. Boring B-HDD1, Sample S-2, 10 feet deep.



5. Boring B-HDD1, 10 to 15 feet deep.



6. Boring B-HDD1, Sample S-3, 15 feet deep.



7. Boring B-HDD1, 15 to 20 feet deep.



8. Boring B-HDD1, Sample S-4B, 20 feet deep.



9. Boring B-HDD1, 20 to 25 feet deep.



10. Boring B-HDD1, Sample S-5, 25 feet deep.



11. Boring B-HDD1, Sample S-5B, 25 feet deep.



12. Boring B-HDD1, 25 to 30 feet deep.



13. Boring B-HDD1, Sample S-6B, 30 feet deep.



14. Boring B-HDD1, 30 to 35 feet deep.



15. Boring B-HDD1, Sample S-7, 35 feet deep.



16. Boring B-HDD1, 35 to 40 feet deep.

1/27/22 Y:\1490005.010\1490005.010\Sup Geotech Report_Clear Creek HDD\Figure 1-8.docx



17. Boring B-HDD2, 0 to 5 feet deep.



18. Boring B-HDD2, Sample S-1C, 5 feet deep.



19. Boring B-HDD2, 5 to 10 feet deep.



20. Boring B-HDD2, 10 to 15 feet deep.



21. Boring B-HDD2, Sample S-2, 10 feet deep.



22. Boring B-HDD2, Sample S-3, 15 feet deep.

1/27/22 Y:\1490005.010\A\SUP Geotech Report_Clear Creek HDD\Figure 1-11.docx



23. Boring B-HDD2, 15 to 20 feet deep.



24. Boring B-HDD2, Sample S-4B, 20 feet deep.



25. Boring B-HDD2, 20 to 25 feet deep.



26. Boring B-HDD2, Sample S-5, 25 feet deep.



27. Boring B-HDD2, 25 to 30 feet deep.

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INADVERTENT DISCOVERY PLAN

PLAN AND PROCEDURES FOR THE DISCOVERY OF CULTURAL RESOURCES AND HUMAN SKELETAL REMAINS

Site Name(s): Bangor-Keyport
Force Main Replacement Project

Location: Unincorporated Kitsap
County

Project Lead/Organization:
Kitsap County Public Works

County: Kitsap

1. INTRODUCTION

The IDP outlines procedures to perform in the event of a discovery of archaeological materials or human remains, in accordance with applicable state and federal laws. An IDP is required, as part of Agency Terms and Conditions for all grants and loans, for any project that creates disturbance above or below the ground. An IDP is not a substitute for a formal cultural resource review (Executive 21-02 or Section 106).

The Project includes funding from the Public Works Trust Fund administered through the Washington State Department of Commerce and U.S. Department of Defense Community Infrastructure Program (DCIP) administered through the Office of Local Defense Community Cooperation (OLDCC). Naval Base Kitsap is providing technical assistance to OLDCC for Section 106 compliance.

Once completed, **the IDP shall always be kept at the project site** during all project activities. All staff, contractors, and volunteers shall be familiar with its contents and know where to find it.

2. ARCHAEOLOGICAL MONITORING METHODOLOGY

Archaeological monitoring is observation by an archaeologist of ground disturbance to assess the presence or potential presence of archaeological resources. Archaeological monitoring uses a range of tools, methods, and strategies, including variable levels of effort and modes of communication to fulfill the goal of detecting and determining the significance of archaeological resources encountered during ground disturbance.

2.1 Team Qualifications and Structure

The Project Archaeologist will oversee all Archaeological Monitors and shall meet the Secretary of the Interior's Professional Qualifications Standards for archaeology (36 CFR Part 61). All Archaeological Monitors will be capable of providing cultural resource orientation to construction personnel.

2.2 Health and Safety

The County will provide a copy of the Project contractor's Health and Safety Plan (HASP) to the Project Archaeologist. If any provisions in Project contractor's HASP warrant coordination to incorporate archaeological monitoring, the Project Archaeologist will consult with BFT regarding any requested changes. The Project Archaeologist will

provide archaeological field personnel a copy of the Project contractor's HASP and applicable COVID-19 safety measures.

The County, or its designee, will provide all necessary and appropriate orientation and training regarding site-specific safety procedures and hazards. Archaeological Monitors will abide by OSHA regulations and all additional site safety requirements at all times.

If archaeological resources are found in association with hazardous waste, HAZWOPER-certified archaeological staff will make a decision regarding the extent of examination feasible and warranted for evaluation of the resource. Safety concerns will take precedence at all times during the monitoring process.

2.3 Monitoring

Archaeological monitoring may be conducted under differing levels of effort; these include On-Site or On-Call as described below. Areas to be monitored will be verified based on review of construction plans by the Project Archaeologist as they are available.

2.3.1 Monitoring Approach

Based on summary of archaeological potential provided above and limited depth of ground disturbance, On-Site monitoring is recommended to be required for excavation activities shown in the attached map and is based on DAHP probability models and sedimentary depositional history. The western end of the project alignment along and adjacent to the WA-3 corridor contains a moderate to moderately low risk for cultural resources based on the DAHP predictive model, and only On-call monitoring is recommended for this portion of the alignment. The entire project alignment east of the WA-3 corridor represents high and very high risks for cultural resources according to the DAHP predictive model. However, geotechnical explorations conducted in association with the project identified glacial till immediately below fill material along the project alignment between WA-3 and Silverdale Way NW. Since it is highly unlikely that significant cultural resources are present within these types of deposits, On-site monitoring is recommended only for excavation activities east of Silverdale Way NW, with on-call monitoring for all work west of Silverdale Way NW (also refer to Section 10).

2.3.2 General Archaeological Monitoring Techniques

Archaeological Monitors will observe excavation and soil removal from multiple perspectives in front of and around working equipment, requiring close communication with construction supervisors and equipment operators. Excavated spoils may be examined in concert with monitoring excavations. Spoils may be placed directly in a truck for removal and disposal, limiting observation of excavated matrix; if possible, the Archaeological Monitor will remove objects of interest as they appear. Spoils stockpiled on-site will be examined. The purpose of these observations is to identify any archaeological resources and to rapidly assess the significance of the resources.

At times, Archaeological Monitors may request, through the County (or designee), assistance from equipment operators at locations where potentially significant archaeological resources may be present. They may request permission to enter

excavation areas to clean and examine profile walls, obtain matrix samples or artifacts, or quickly record stratigraphy at locations where archaeological resources are likely or visible. They may request that excavation be conducted in thin lifts or otherwise modified excavation procedures to provide exposures of subsurface deposits and stratigraphic profiles.

The Archaeological Monitors will follow instructions in the Project specific HASP, and also from on-site representatives in matters pertaining to safety. Archaeological Monitors will keep a log of activities on monitoring forms (digital or paper) for each day in which monitoring is conducted. The archaeologist will watch for precontact or historic-period layers or lenses of organic material or shell, artifacts or features, or other organically enriched midden soils that may indicate past human use of the landscape.

Archaeological Monitors will record areas of native soil and fill in order to develop a chronology of fill placement and a summary of filling techniques. These records will enable assessment of archaeological resources if any are discovered. Archaeological Monitors may use various methods of recording, including written description, mapping, photography, GPS, and video.

Archaeological Monitors will wear appropriate personal protection equipment at all times, and have appropriate archaeological equipment, including camera and phone (or smartphone), shovel and trowel, ¼-inch screen, flagging/pin flags, tarp, bags, ruler/tape measure, and monitoring forms. Archaeological Monitors will have a copy of this IDP and site HASPs while on site.

2.3.3 On-site Archaeological Monitoring

On-site monitoring requires the active, continuous attention of an Archaeological Monitor who is physically present during construction ground disturbance. On-site monitoring is required for excavations east of Silverdale Way (refer to Section 10).

2.3.4 On-call Archaeological Monitoring

An Archaeological Monitor will be available on an On-Call basis in the event suspected archaeological resources are discovered at any time when an Archaeological Monitor is not present. The Project Archaeologist will attempt to identify the discovery using available information, including verbal descriptions and photos, to determine if the discovery is archaeological or not before ordering an inadvertent discovery field visit by an Archaeological Monitor.

3. CULTURAL RESOURCE DISCOVERIES

A cultural resource discovery could be prehistoric or historic artifacts. Examples include (see images for further examples):

- An accumulation of shell, burned rocks, or other food related materials.
- Bones, intact or in small pieces.
- An area of charcoal or very dark stained soil with artifacts.
- Stone tools or waste flakes (for example, an arrowhead or stone chips).
- Modified or stripped trees, often cedar or aspen, or other modified natural

features, such as rock drawings.

- Agricultural or logging materials that appear older than 50 years. These could include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, and many other items.
- Clusters of tin cans or bottles, or other debris that appear older than 50 years.
- Old munitions casings. ***Always assume these are live and never touch or move.***
- Buried railroad tracks, decking, foundations, or other industrial materials.
- Remnants of homesteading. These could include bricks, nails, household items, toys, food containers, and other items associated with homes or farming sites.

The above list does not cover every possible cultural resource. When in doubt, assume the material is a cultural resource.

4. ON-SITE RESPONSIBILITIES

If any employee, contractor, or subcontractor believes that they have uncovered cultural resources or human remains at any point in the project, take the following steps to ***Stop-Protect-Notify***. **If you suspect that the discovery includes human remains, also follow Section 6.**

STEP A: Stop Work.

All work must stop immediately in the vicinity of the discovery.

STEP B: Protect the Discovery.

Leave the discovery and the surrounding area untouched and create a clear, identifiable, and wide boundary (30 feet or larger) with temporary fencing, flagging, stakes, or other clear markings. Provide protection and ensure integrity of the discovery until cleared by the Department of Archaeological and Historical Preservation (DAHP) or a licensed, professional archaeologist.

Do not permit vehicles, equipment, or unauthorized personnel to traverse the discovery site. Do not allow work to resume within the boundary until the requirements of this IDP are met.

STEP C: Notify Project Archaeologist

The County will contact the archaeologist. If there is a monitoring plan in place, the archaeologist will follow the outlined procedure.

STEP D: Notify Project contacts.

Project Lead Contacts

County Primary Contact

Name: Barbara Zaroff
Organization: Kitsap County Public Works
Phone: (360) 337-5777
Email: bzaroff@co.kitsap.wa.us

County Alternate Contact

Name: Floyd Bayless
Organization: Kitsap County Public Works
Phone: (360) 337-5631
Email: fbayless@co.kitsap.wa.us

Project Archaeologist

Name: Dave Iversen M.A., RPA
Organization: ASM Affiliates
Phone: (360) 572-4870
Email: diversen@asmaffiliates.com

Office of Local Defense Community Cooperation

Name: Michelle Volkema
Organization: U.S. Department of Defense
Phone: (703) 697-2176
Email: michelle.a.volkema.civ@mail.mil

Public Works Board (PWB)

Name: Mark Rentfrow, Program Manager & Tribal Liaison
Organization: Washington State Department of Commerce
Phone: (360) 529-6432
Email: mark.rentfrow@commerce.wa.gov

STEP E: County will notify DAHP.

Once notified, the Kitsap County will contact DAHP to report and confirm the discovery.

DAHP will provide the steps to assist with identification. DAHP and Tribal representatives may coordinate a site visit following any necessary safety protocols. DAHP may also inform the County of additional steps to further protect the site.

Do not continue work until DAHP has issued an approval for work to proceed in the area of, or near, the discovery.

DAHP Contacts:

Name: Rob Whitlam, PhD
Title: State Archaeologist
Cell: 360-890-2615
Email: Rob.Whitlam@dahp.wa.gov
Main Office: 360-586-3065

Human Remains/Bones:

Name: Guy Tasa, PhD
Title: State Anthropologist
Cell: 360-790-1633 (24/7)
Email: Guy.Tasa@dahp.wa.gov

5. TRIBAL CONTACTS

In the event cultural resources are discovered, the following tribes will be contacted.

Tribe: Port Gamble S'Klallam Tribe
Name: Laura Price
Title: Interim THPO
Phone: 360-297-6358
Email: lives@pgst.nsn.us;
thpo@pgst.nsn.us

Tribe: Suquamish Tribe
Name: Dennis Lewarch
Title: THPO
Phone: 360-394-8529
Email: dlewarch@suquamish.nsn.us

Tribe: Lower Elwha Klallam Tribe
Name: Bill White
Title: Cultural Resources Department
Phone: 360-460-1617
Email: bill.white@elwha.org

Tribe: Skokomish Tribe
Name: Kris Miller
Title: THPO
Phone: 360-426-4232 ext. 215
Email: shlanay1@skokomish.org

Tribe: Jamestown S'Klallam Tribe
Name: Allie Taylor
Title: THPO
Phone: 360-683-1109
Email: ataylor@jamestowntribe.org

6. SPECIAL PROCEDURES FOR THE DISCOVERY OF HUMAN SKELETAL REMAINS

Any human skeletal remains, regardless of antiquity or ethnic origin, will at all times be treated with dignity and respect. Follow the steps under **Stop-Protect-Notify**. For specific instructions on how to handle a human remains discovery, see: [RCW 68.50.645: Skeletal human remains—Duty to notify—Ground disturbing activities—Coroner determination—Definitions.](#)

Suggestion: If you are unsure whether the discovery is human bone or not, contact

Guy Tasa with DAHP, for identification and next steps. Do not pick up the discovery.

Guy Tasa, PhD State Physical Anthropologist

Guy.Tasa@dahp.wa.gov

(360) 790-1633 (Cell/Office)

For discoveries that are confirmed or suspected human remains, follow these steps:

1. Notify law enforcement and the Medical Examiner/Coroner using the contacts below. **Do not call 911** unless it is the only number available to you.
 - Local Medical Examiner or Coroner name and phone:
Jeff Wallis, Coroner, 360-337-7077
 - Local Law Enforcement main name and phone:
Kitsap County Sheriff, 360-337-7101
 - Local Non-Emergency phone number (911 if without a non-emergency number)
Kitsap County Sheriff, 360-337-7101
2. The Medical Examiner/Coroner (with assistance of law enforcement personnel) will determine if the remains are human or if the discovery site constitutes a crime scene and will notify DAHP.
3. **DO NOT speak with the media, allow photography or disturbance of the remains, or release any information about the discovery on social media.**
4. If the remains are determined to be non-forensic, cover the remains with a tarp or other materials (not soil or rocks) for temporary protection and to shield them from being photographed by others or disturbed.

Further activities:

- Per [RCW 27.44.055](#), [RCW 68.50](#), and [RCW 68.60](#), DAHP will have jurisdiction over non-forensic human remains. Ecology staff will participate in consultation. The Project Lead/Organization may also participate in consultation.
- Documentation of human skeletal remains and funerary objects will be agreed upon through the consultation process described in [RCW 27.44.055](#), [RCW 68.50](#), and [RCW 68.60](#).
- When consultation and documentation activities are complete, work in the discovery area may resume as described in Section 8.

If the project occurs on federal lands (such as a national forest or park or a military reservation) the provisions of the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) apply and the responsible federal agency will follow its provisions. Note that state highways that cross federal lands are on an easement and are not owned by the state.

If the project occurs on non-federal lands, the Project Lead/Organization will comply with applicable state and federal laws, and the above protocol.

7. DOCUMENTATION OF ARCHAEOLOGICAL MATERIALS

Archaeological resources discovered during construction are protected by state law [RCW 27.53](#) and assumed eligible for inclusion in the National Register of Historic Places under Criterion D until a formal Determination of Eligibility is made.

The Project Lead/Organization must ensure that proper documentation and field assessments are made of all discovered cultural resources in cooperation with all parties: the federal agencies (if any), DAHP, affected tribes, and the archaeologist.

An archaeologist will record all prehistoric and historic cultural material discovered during project construction on a standard DAHP archaeological site or isolate inventory form. They will photograph site overviews, features, and artifacts and prepare stratigraphic profiles and soil/sediment descriptions for minimal subsurface exposures. They will document discovery locations on scaled site plans and site location maps.

Cultural features, horizons, and artifacts detected in buried sediments may require the archaeologist to conduct further evaluation using hand-dug test units. They will excavate units in a controlled fashion to expose features, collect samples from undisturbed contexts, or to interpret complex stratigraphy. They may also use a test unit or trench excavation to determine if an intact occupation surface is present. They will only use test units when necessary to gather information on the nature, extent, and integrity of subsurface cultural deposits to evaluate the site's significance. They will conduct excavations using standard archaeological techniques to precisely document the location of cultural deposits, artifacts, and features.

The archaeologist will record spatial information, depth of excavation levels, natural and cultural stratigraphy, presence or absence of cultural material, and depth to sterile soil, regolith, or bedrock for each unit on a standard form. They will complete test excavation unit level forms, which will include plan maps for each excavation level and artifact counts and material types, number, and vertical provenience (depth below surface and stratum association where applicable) for all recovered artifacts. They will draw a stratigraphic profile for at least one wall of each test excavation unit.

The archaeologist will screen sediments excavated for purposes of cultural resources investigation through 1/8-inch mesh, unless soil conditions warrant 1/4-inch mesh.

The archaeologist will analyze, catalogue, and temporarily curate all prehistoric and historic artifacts collected from the surface and from probes and excavation units. The ultimate disposition of cultural materials will be determined in consultation with the federal agencies (if any), DAHP, and the affected tribe(s).

Within 90 days of concluding fieldwork, the archaeologist will provide a technical report describing any and all monitoring and resultant archaeological excavations to the Project Lead/Organization, who will forward the report to the federal agencies (if any), DAHP, and the affected tribe(s) for review and comment.

If assessment activities expose human remains (burials, isolated teeth, or bones), the archaeologist and Project Lead/Organization will follow the process described in Section 6.

8. PROCEEDING WITH WORK

The Project Lead/Organization shall work with the archaeologist, DAHP, and affected tribe(s) to determine the appropriate discovery boundary and where work can continue.

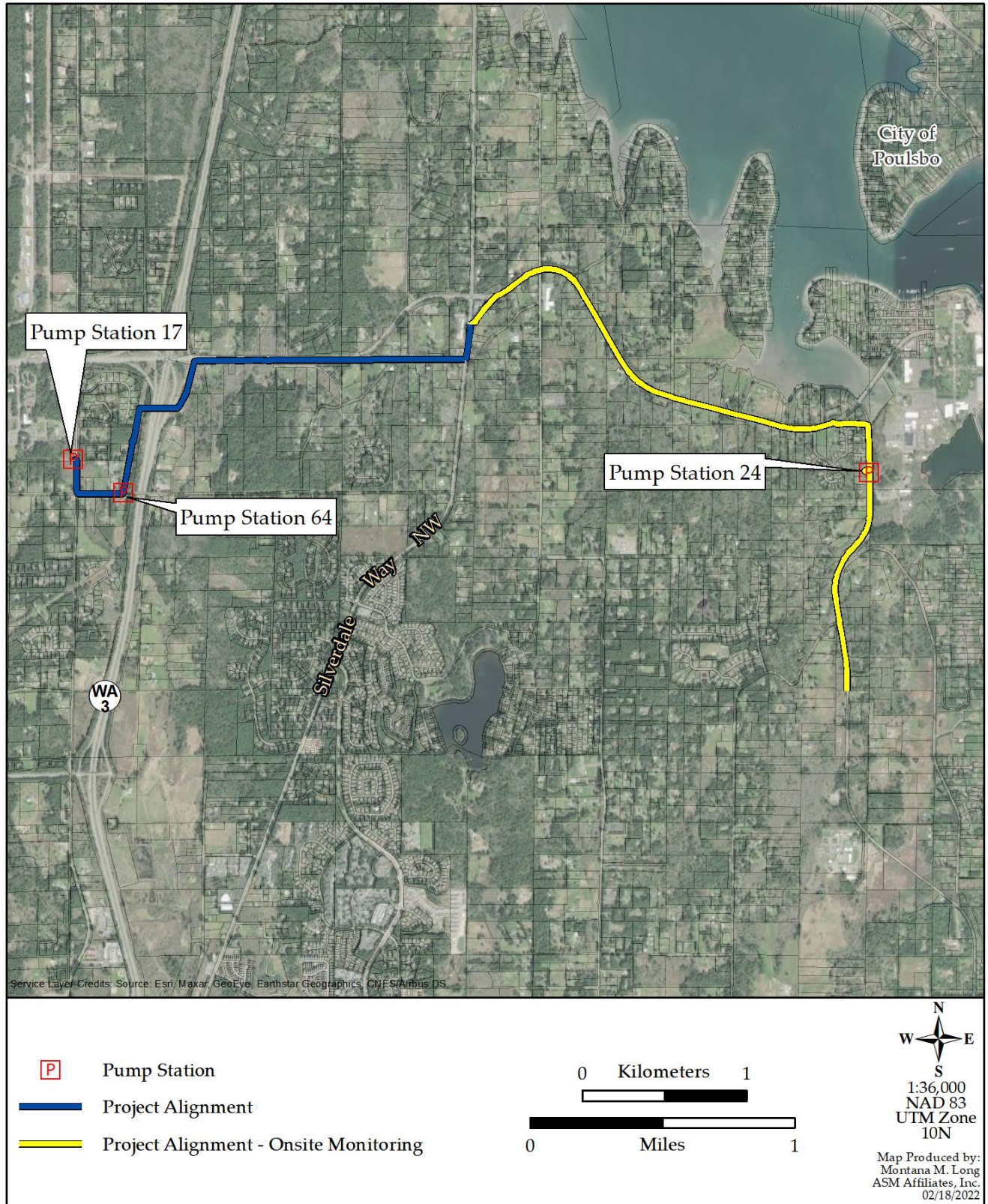
Work may continue at the discovery location only after the process outlined in this plan is followed and the Project Lead/Organization, DAHP, any affected tribe(s), and the federal agencies (if any) determine that compliance with state and federal laws is complete.

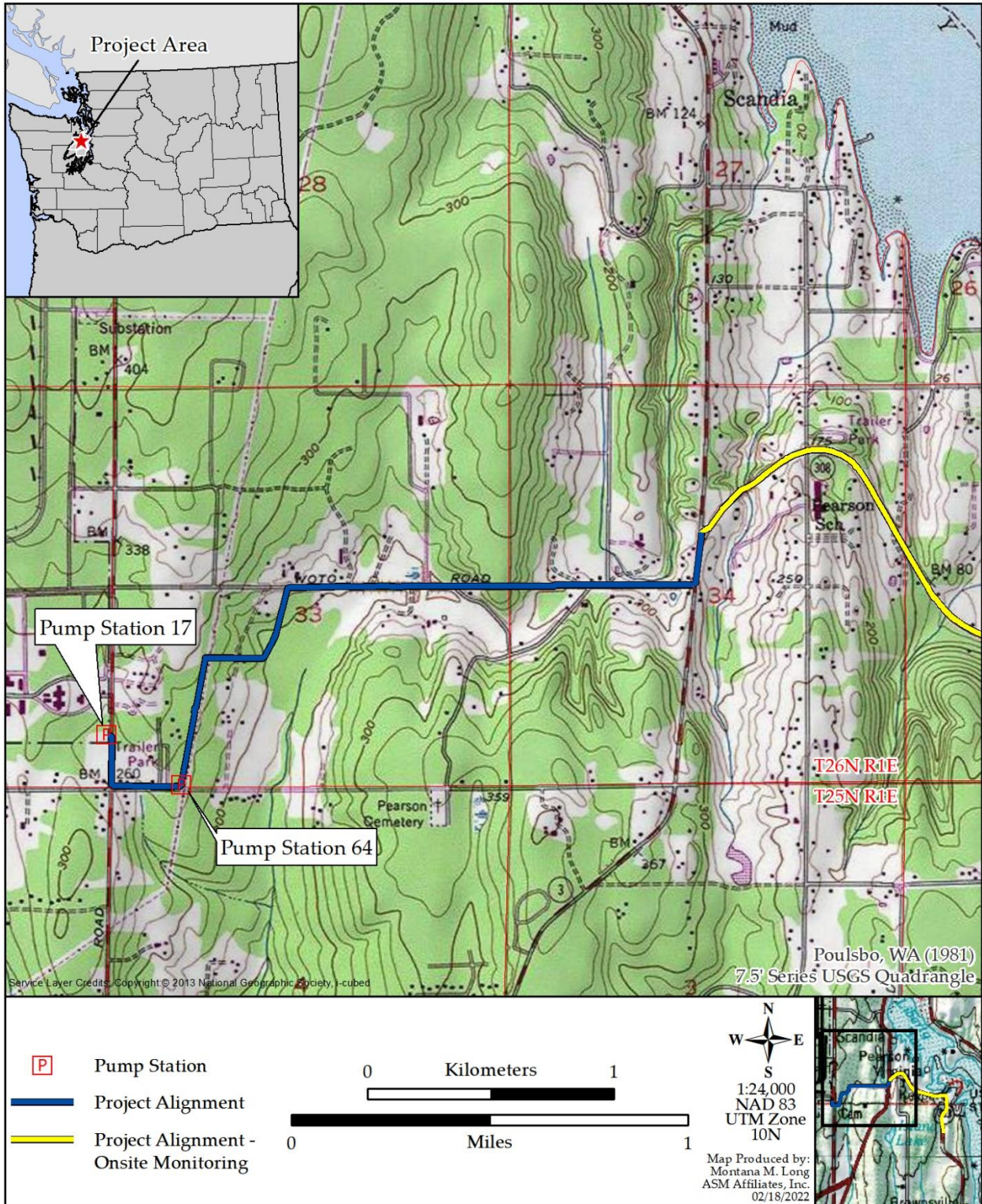
9. ORGANIZATION RESPONSIBILITY

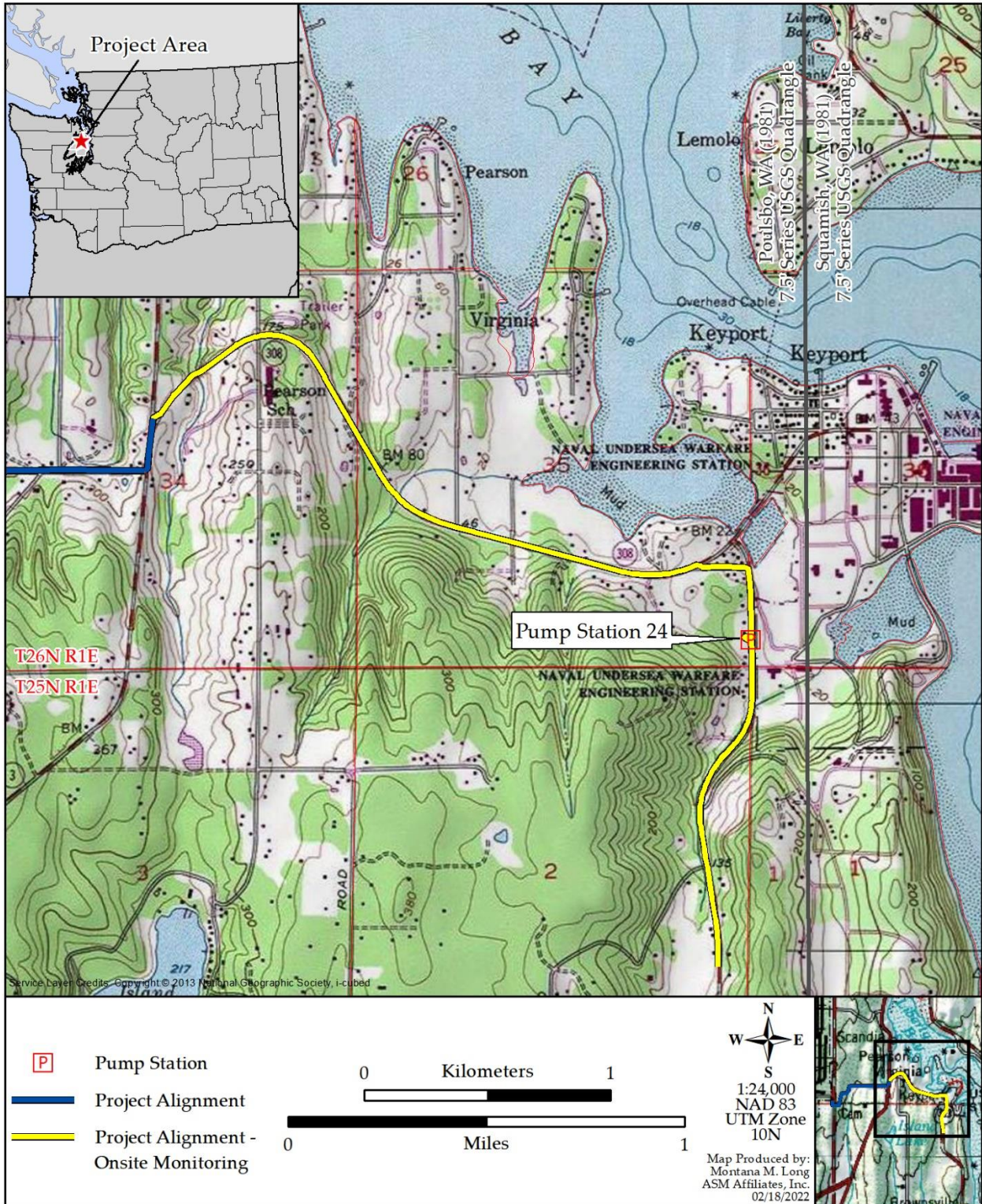
The Project Lead/Organization is responsible for ensuring:

- This IDP has complete and accurate information.
- This IDP is immediately available to all field staff at the site and available by request to any party.
- This IDP is implemented to address any discovery at the site.
- That all field staff, contractors, and volunteers are instructed on how to implement this IDP.

10. FIGURES







11. ADDITIONAL RESOURCES

Informative Video

It is recommended that all project staff, contractors, and volunteers view this informative video explaining the value of IDP protocol and what to do in the event of a discovery. The target audience is anyone working on the project who could unexpectedly find cultural resources or human remains while excavating or digging. The video is also posted on DAHP's inadvertent discovery language website.

[Ecology's IDP Video](https://www.youtube.com/watch?v=ioX-4cXfbDY) (<https://www.youtube.com/watch?v=ioX-4cXfbDY>)

Informational Resources

[DAHP](https://dahp.wa.gov) (<https://dahp.wa.gov>)

[Washington State Archeology \(DAHP 2003\)](#)



Stone artifacts from Oregon.

https://dahp.wa.gov/sites/default/files/Field%20Guide%20to%20WA%20Arch_0.pdf

[Association of Washington Archaeologists](https://www.archaeologyinwashington.com) (<https://www.archaeologyinwashington.com>)

Potentially Interested Tribes

[Tribal Contacts: Interactive Map of Tribes by Area](https://dahp.wa.gov/archaeology/tribal-consultation-information) (<https://dahp.wa.gov/archaeology/tribal-consultation-information>)

[Tribal Contacts - WSDOT Tribal Contact Website](https://wsdot.wa.gov/tribal/TribalContacts.htm) (<https://wsdot.wa.gov/tribal/TribalContacts.htm>)

Implement the IDP if you see...

Chipped stone artifacts.

Examples are:

- Glass-like material.
- Angular material.
- “Unusual” material or shape for the area.
- Regularity of flaking.
- Variability of size.



Stone artifacts from Washington.



Biface-knife, scraper, or pre-form found in NE Washington. Thought to be a well knapped object of great antiquity. Courtesy of Methow Salmon Rec. Foundation.

Implement the IDP if you see...

Ground stone artifacts.

Examples are:

- Unusual or unnatural shapes or unusual stone.
- Striations or scratching.
- Etching, perforations, or pecking.
- Regularity in modifications.
- Variability of size, function, or complexity.



Above: Fishing Weight - credit [CRITFC Treaty Fishing Rights website](#).



Artifacts from unknown locations (left and right images).



Implement the IDP if you see...

Bone or shell artifacts, tools, or beads.

Examples are:

- Smooth or carved materials.
- Unusual shape.
- Pointed as if used as a tool.
- Wedge shaped like a “shoehorn”.
- Variability of size.
- Beads from shell (dentalium) or tusk.



Upper Left: *Bone Awls from Oregon.*

Upper Center: *Bone Wedge from California.*

Upper Right: *Plateau dentalium choker and bracelet, from Nez Perce National Historical Park, 19th century, made using Antalis pretiosa shells*
Credit: *Nez Perce - Nez Perce National Historical Park, NEPE 8762, Public Domain.*

Above: *Tooth Pendants.*

Right: *Bone Pendants. Both from Oregon and Washington.*

Implement the IDP if you see...

Culturally modified trees, fiber, or wood artifacts.

Examples are:

- Trees with bark stripped or peeled, carvings, axe cuts, de-limbing, wood removal, and other human modifications.
- Fiber or wood artifacts in a wet environment.
- Variability of size, function, and complexity.



Left and Below: *Culturally modified tree and an old carving on an aspen (Courtesy of DAHP). These are examples of above ground cultural resources.*

Right, Top to Bottom: *Artifacts from Mud Bay, Olympia: Toy war club, two strand cedar rope, wet basketry.*



Implement the IDP if you see...

Strange, different, or interesting looking dirt, rocks, or shells.

Human activities leave traces in the ground that may or may not have artifacts associated with them. Examples are:

- “Unusual” accumulations of rock (especially fire-cracked rock).
- “Unusual” shaped accumulations of rock (such as a shape similar to a fire ring).
- Charcoal or charcoal-stained soils, burnt-looking soils, or soil that has a “layer cake” appearance.
- Accumulations of shell, bones, or artifacts. Shells may be crushed.
- Look for the “unusual” or out of place (for example, rock piles in areas with otherwise few rocks).



Shell Midden pocket in modern fill discovered in sewer trench.



Underground oven. Courtesy of DAHP.

Shell Midden with fire cracked rock.



Hearth excavated near Hamilton, WA.

Implement the IDP if you see...

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Agricultural or logging equipment. May include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, etc.
- Domestic items including square or wire nails, amethyst colored glass, or painted stoneware.



Left: Top to Bottom: *Willow pattern serving bowl and slip joint pocket knife discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*

Right: *Collections of historic artifacts discovered during excavations in eastern Washington cities.*



Implement the IDP if you see...

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Railway tokens, coins, and buttons.
- Spectacles, toys, clothing, and personal items.
- Items helping to understand a culture or identity.
- Food containers and dishware.



Main Image: Dishes, bottles, work boot found at the North Shore Japanese bath house (ofuro) site, Courtesy Bob Muckle, Archaeologist, Capilano University, B.C. This is an example of an above ground resource.



Right, from Top to Bottom:
Coins, token, spectacles and
Montgomery Ward pitchfork
toy discovered during
Seattle Smith Cove
shantytown (45-KI-1200)
excavation.



Implement the IDP if you see...

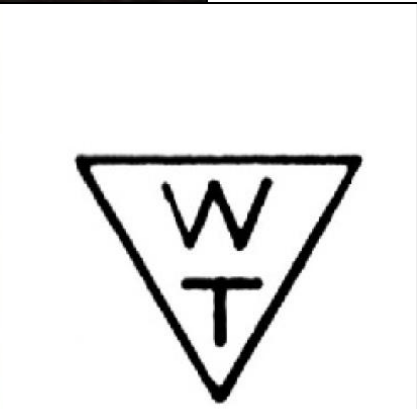
- Old munition casings – if you see ammunition of any type – ***always assume they are live and never touch or move!***
- Tin cans or glass bottles with an older manufacturer’s technique – maker’s mark, distinct colors such as turquoise, or an older method of opening the container.



Far Left: .303 British cartridge found by a WCC planting crew on Skagit River. ***Don't ever touch something like this!***

Left: Maker's mark on bottom of old bottle.

Right: Old beer can found in Oregon. ACME was owned by Olympia Brewery. Courtesy of Heather Simmons.



Logo employed by Whithall Tatum & Co. between 1924 to 1938 (Lockhart et al. 2016).



Can opening dates, courtesy of W.M. Schroeder.

Implement the IDP if you see...

Historic foundations or buried structures.

Examples are:

- Foundations.
- Railroad and trolley tracks.
- Remnants of structures.



Counter Clockwise, Left to Right: *Historic structure 45KI924, in WSDOT right of way for SR99 tunnel. Remnants of Smith Cove shantytown (45-KI-1200) discovered during Ecology CSO excavation, City of Spokane historic trolley tracks (above ground historic resources) uncovered during stormwater project, intact foundation of historic home that survived the Great Ellensburg Fire of July 4, 1889, uncovered beneath parking lot in Ellensburg.*

Implement the IDP if you see...

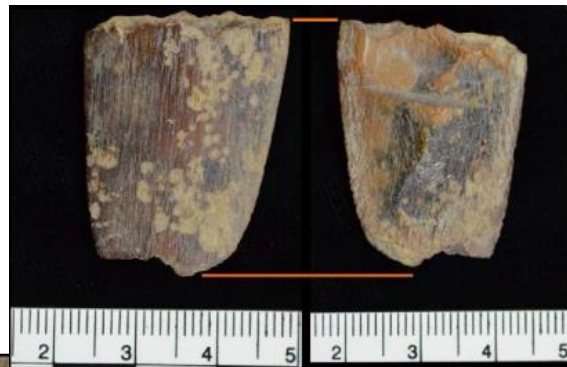
Potential human remains.

Examples are:

- Grave headstones that appear to be older than 50 years.
- Bones or bone tools--intact or in small pieces. It can be difficult to differentiate animal from human so they must be identified by an expert.
- These are all examples of animal bones and are not human.

Center: *Bone wedge tool, courtesy of Smith Cove Shantytown excavation (45KI1200).*

Other images (Top Right, Bottom Left, and Bottom) Center: Courtesy of DAHP.



Directly Above: *This is a real discovery at an Ecology sewer project site.*

What would you do if you found these items at a site? Who would be the first person you would call?

Hint: Read the plan!



APPENDIX I
PRE-BID MEETING SIGN-IN FORM

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PLEASE WRITE LEGIBILITY – PLEASE LEAVE BUSINESS CARD

Kitsap County Public Works Wastewater Division

2022-104 IFB

Bangor-Keyport Force Main Replacement

Pre-Bid & Site Visit Sign-in Sheet

Wednesday, February 23, 2022 @ 1:00PM

Name	Company	Phone	Email
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APPENDIX J
KITSAP COUNTY HDPE INVENTORY

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Technical Memorandum

Date: 8/13/2021

Project: Bangor-Keyport FM

To: Erika Schuyler and Tom Hubert

From: Erika Kim

Subject: Available On-Hand HDPE Materials

The following HDPE pipe and fittings are available following the completion of the Brownsville Hwy Emergency FM Repair project, for use in the next phase of the Bangor-Keyport FM project.

18" HDPE DR 26

QTY	DESCRIPTION
6,600 FT	18" IPS DR26 HDPE PIPE
11	18" 90-DEG ELB HDPE
26	18" 45-DEG ELB HDPE
4	18" 22.5-DEG ELB HDPE
34	18" BACKUP RING HDPE FLG
34	18" ADAPTOR FLG X BW
6	18" SERVICE SADDLE X 4" FNPT
1	18" TEE HDPE

30" HDPE DR 11

QTY	DESCRIPTION
386 FT	30" IPS DR11 HDPE PIPE
1	30" 22.5-DEG ELB HDPE BW

MISCELLANEOUS MATERIALS

QTY	DESCRIPTION
6	4" BALL VALVE FNPT
4	AIR/VAC ASSEMBLIES
1	24" X 18" FLG CONCENTRIC REDUCER DI



APPENDIX K
CONSTRUCTION STORMWATER POLLUTION
PREVENTION PLAN

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Construction Stormwater General Permit (CSWGP)

Stormwater Pollution Prevention Plan (SWPPP)

for

Bangor-Keyport Force Main Replacement

Prepared for:

Department of Ecology
Bellingham Field Office

Permittee / Owner	Developer	Operator / Contractor
Kitsap County Department of Public Works	Kitsap County Department of Public Works	To Be Determined (TBD)

Project Location:

Section 33 Township 26 North, Range 01 East
Section 34 Township 26 North, Range 01 East
Section 35 Township 26 North, Range 01 East
Section 36 Township 26 North, Range 01 East
Section 02 Township 25 North, Range 01 East
Section 01 Township 25 North, Range 01 East
Kitsap County

Update as necessary.

Certified Erosion and Sediment Control Lead (CESCL)

Name	Organization	Contact Phone Number
TBD	TBD	TBD

SWPPP Prepared By

Name	Organization	Contact Phone Number
Eric Stoita	Murraysmith	(425)-394-6030

SWPPP Preparation Date

February 2022

Project Construction Dates

Activity / Phase	Start Date	End Date
Construction	June 2022	September 2023

List of Acronyms and Abbreviations

Acronym / Abbreviation	Explanation
303(d)	Section of the Clean Water Act pertaining to Impaired Waterbodies
BFO	Bellingham Field Office of the Department of Ecology
BMP(s)	Best Management Practice(s)
CESCL	Certified Erosion and Sediment Control Lead
CO₂	Carbon Dioxide
CRO	Central Regional Office of the Department of Ecology
CSWGP	Construction Stormwater General Permit
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ERO	Eastern Regional Office of the Department of Ecology
ERTS	Environmental Report Tracking System
ESC	Erosion and Sediment Control
GULD	General Use Level Designation
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
NWRO	Northwest Regional Office of the Department of Ecology
pH	Power of Hydrogen
RCW	Revised Code of Washington
SPCC	Spill Prevention, Control, and Countermeasure
su	Standard Units
SWMMEW	Stormwater Management Manual for Eastern Washington
SWMMWW	Stormwater Management Manual for Western Washington
SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control
SWRO	Southwest Regional Office of the Department of Ecology
TMDL	Total Maximum Daily Load
VFO	Vancouver Field Office of the Department of Ecology
WAC	Washington Administrative Code
WSDOT	Washington Department of Transportation
WWHM	Western Washington Hydrology Model

Project Information (1.0)

Project/Site Name: Bangor-Keyport Force Main Replacement
Street/Location: The project is located within County right-of-way, County easements and Washington State Department of Transportation (WSDOT) right-of-way.
City: Silverdale State: WA Zip code: 98383
Subdivision: N/A
Receiving waterbodies: Liberty Bay, Dyes Inlet

Existing Conditions (1.1)

Total acreage (including support activities such as off-site equipment staging yards, material storage areas, borrow areas).

Total acreage: 51.6 acres (Based on average ROW width along alignment)

Disturbed acreage: 6.53 acres

Existing structure/surface: 5.76 acres

Landscape Topography:

This project is primarily located in the existing asphalt-paved public right-of-way. The project area generally features flat to mild slopes within both Kitsap County and WSDOT rights-of-way.

Drainage Patterns:

Sheet flow, drainage ditches & piped conveyance along the roadside for the majority of alignment

Existing Vegetation:

Large trees adjacent to road along majority of alignment, mixed suburban vegetation adjacent to road in residential areas.

Critical Areas (wetlands, streams, high erosion risk, steep or difficult to stabilize slopes):

Project impacts are limited to temporary wetland/waterway buffer impacts associated with excavations that will be backfilled and revegetated following construction. Impacts to wetlands and waterways are avoided. The table below provides a summary of unavoidable wetland/waterway buffer impacts (i.e., dredge/fill or clearing activity) in terms of area for the project area wetlands/waterways.

Buffer Impact Summary Table	
<i>Feature</i>	<i>Temporary Impact Area (sf)</i>

Waterway 2 buffer	1,526 sf
Wetland B buffer	2,780 sf
Waterway 4 buffer	592 sf
Waterway 5 buffer	618 sf
Waterway 8 buffer	870 sf
Waterway 17A buffer	113 sf
Waterway 18 buffer	336 sf
Waterway 19 buffer	3,674 sf
Wetland M buffer	889 sf
Wetland N buffer	647 sf
Wetland O buffer	13 sf
Buffer impact for each feature exclusive of overlapping buffers. Total wetland/waterway buffer impacts are 8,215 sf.	

List of known impairments for 303(d) listed or Total Maximum Daily Load (TMDL) for the receiving waterbody:

Liberty Bay – Fecal Coliform, 303(d) List Category 5.

Table 3. Freshwater fecal coliform criteria¹.

Freshwater Criteria (Extraordinary Primary Contact)	Geometric Mean	Not more than 10 % (90th Percentile)
Freshwater tributaries to Liberty Bay	50 cfu/100 mL	100 cfu/100 mL

cfu = colony forming units

Table 4. Marine fecal coliform criteria for Liberty Bay¹.

Marine Criteria	Geometric Mean	Not more than 10 % (90th Percentile)
Liberty Bay (<i>Shellfish Harvesting & Primary Contact Recreation</i>)	14 cfu/100 mL	43 cfu/100 mL

¹ Source: Liberty Bay Watershed Fecal Coliform Bacteria Total Maximum Daily Load: TMDL and Water Quality Implementation Plan, Washington State Department of Ecology, 2013

Dyes Inlet – Fecal Coliform, 303(d) List Category 5.

Table 3. Freshwater fecal coliform bacteria standards².

Freshwater Standard	PART I Geometric Mean (cfu/100 mL)	PART II 90th Percentile (cfu/100 mL)
Freshwater tributaries to Dyes Inlet and western Sinclair Inlet (Primary Contact)	100	200
Freshwater tributaries to eastern Sinclair Inlet & Rich Passage (Karcher, Sacco, and Beaver creeks) (Extraordinary Primary Contact)	50	100

Table 4. Marine fecal coliform bacteria standards².

Marine Standard	Part I Geometric Mean (cfu/100 mL)	Part II 90th Percentile (cfu/100 mL)
Sinclair and Dyes Inlets (shellfish harvesting & primary contact recreation)	14	43

There are no suspected and/or known contaminants associated with the construction activity.

Proposed Construction Activities (1.2)

Description of site development (example: subdivision):

The Kitsap County Department of Public Works is replacing approximately 26,800 linear feet of corroded sewer force main pipe. The replacement pipe and appurtenances will generally run in a west-to-east alignment, beginning near the intersection of Clear Creek Road NW and NW Mountain View Rd and terminating near the midpoint of Brownsville HWY NE.

Description of construction activities (example: site preparation, demolition, excavation):

Existing Asphalt will be cut and removed. Utility trenches will be excavated, stabilized with shoring, and trench dewatering as necessary. Soils will be removed from the site and disposed of properly. Structural backfill will be imported and used to backfill the utility trenches. The removed pavement will be replaced in-kind with asphalt.

Construction activities will include the following elements:

² Source: Sinclair and Dyes Inlets Fecal Coliform Bacteria Total Maximum Daily Load: TMDL and Water Quality Implementation Plan, Washington State Department of Ecology, Revised 2012

- Open cut trench excavation and installation of pipe, in both paved & unpaved areas
- Horizontal Directional Drilled (HDD) installation of pipe beneath a segment of Clear Creek Rd NW
- Cured-In-Place-Pipe rehabilitation of the existing force main beneath State Route 3
- Tree removal & replanting in select locations
- Installation of precast concrete structures in select locations

Description of site drainage including flow from and onto adjacent properties. Must be consistent with Site Map in Appendix A:

STA 9+80 to approximately STA 87+00:

This portion of the project is located within the approximate limits of the Dyes Inlet Watershed and features drainage patterns conveying flows in a generally southern and southeastern fashion towards the headwaters of Clear Creek, and then to the receiving waters of Dyes Inlet.

STA 87+00 to approximately STA 277+90:

This portion of the project is located within the approximate limits of the Liberty Bay Watershed and features drainage patterns conveying flows in a generally northeastern fashion towards the receiving waters of Liberty Bay.

Description of final stabilization (example: extent of revegetation, paving, landscaping):

Area of disturbance will primarily be within existing paved areas and will be replaced with like material. No new impervious area will be created. Disturbances to roadside landscaping and vegetated areas will be restored with like vegetation and landscaping features.

Contaminated Site Information: Proposed activities regarding contaminated soils or groundwater (example: on-site treatment system, authorized sanitary sewer discharge):

There is no known and/or suspected contamination within the site area. Contractor shall implement BMPs for contaminated soils or groundwater as needed to maintain compliance with applicable regulatory requirements.

Construction Stormwater Best Management Practices (BMPs) (2.0)

The SWPPP is a living document reflecting current conditions and changes throughout the life of the project. These changes may be informal (i.e. hand-written notes and deletions). Update the SWPPP when the CESCL has noted a deficiency in BMPs or deviation from original design.

The 13 Elements (2.1)

Element 1: Preserve Vegetation / Mark Clearing Limits (2.1.1)

Construction limits will be clearly marked prior to construction activities beginning. Areas to be preserved, including all sensitive areas and their buffers, shall be clearly delineated both in the field and on the plans prior to commencement of grubbing activities. In general, natural vegetation and native topsoil shall be retained in an undisturbed state to the maximum extent possible. Wood slash or hog fuel may be used above the preserved areas and buffer zones to increase sediment retention on site and identify areas for the preservation of existing vegetation.

List and describe BMPs:

BMP C101: Preserving Natural Vegetation – Preserving natural vegetation on steep slopes and near roadside swales.

BMP C102: Buffer Zones – Buffer zone needed near body of water along part of the force main repair. Vegetative buffer zones can also be used and incorporated into the natural landscape.

BMP C103: High Visibility Fence – Intended to

- Restrict clearing to approved limits.
- Prevent disturbance of sensitive areas, their buffers, and other areas required to be left undisturbed.
- Protect areas where marking with survey tape may not provide adequate protection.

Installation Schedules: Prior to soil disturbance

Inspection and Maintenance plan: Inspect and maintain weekly

Responsible Staff: TBD

Element 2: Establish Construction Access (2.1.2)

Majority of construction is within paved areas and will be used for construction access. Vehicles will be restricted to stay on the existing paved surface when available eliminating excess dust. Construction site will move based on completed sections of the force main.

Construction access or activities occurring on unpaved areas will be minimized. Access points shall be stabilized to minimize the tracking of sediment onto public roads. Street sweeping/cleaning shall be employed as necessary to prevent sediment from entering state waters. All wash wastewaters shall be controlled on site.

List and describe BMPs:

BMP C140: Dust Control – Will implement dust control when deemed necessary. On very dry days with high wind, will water down potential sources of dust caused by construction activities. Reduce speed of vehicles travelling near construction area.

Installation Schedules: During construction when necessary

Inspection and Maintenance plan: Daily check on dust and weather conditions

Responsible Staff: TBD

Element 3: Control Flow Rates (2.1.3)

Will you construct stormwater retention and/or detention facilities?

Yes **No**

Will you use permanent infiltration ponds or other low impact development (example: rain gardens, bio-retention, porous pavement) to control flow during construction?

Yes **No**

Storm water discharges from the site will be controlled in order to protect the properties and waterways downstream of the project site.

List and describe BMPs:

BMP C207: Check Dams – Reduce the velocity of flow in existing swales and ditches with biobag check dams

BMP C209: Outlet Protection – Outlet protection prior to discharge to existing roadside swales.

BMP C220: Storm Drain Inlet Protection – Storm Drain Inlet protection prior to construction in particular area, can use geotextile fabric over storm drains to let water run through but keep construction debris and sediment out.

Installation Schedules: Prior to construction

Inspection and Maintenance plan: Inspect and maintain weekly

Responsible Staff: TBD

Element 4: Install Sediment Controls (2.1.4)

All stormwater runoff from disturbed areas shall pass through an appropriate sediment removal BMP before leaving the construction site.

Prior to site grubbing operations, a silt fence will be installed downgrade of areas where soil will be exposed. At paved work areas, sediment will be removed in and adjacent to construction work areas manually or using mechanical sweepers, as needed, to minimize tracking of sediments on vehicle tires away from the site and to minimize wash off of sediments from adjacent streets in runoff.

Whenever possible, sediment laden water shall be discharged into onsite or adjacent, relatively level, vegetated areas (BMP C240).

If turbid water is observed discharging from the site, construction process shall halt until the problem is resolved. Sandbags can be used to block off water and divert to a pump system to keep the turbid water from discharging off site.

List and describe BMPs:

BMP C220: Storm Drain Inlet Protection – Prevent coarse sediment from entering drainage systems.

BMP C233: Silt Fence – Silt Fences contain sediment laden water on-site for infiltration.

BMP C240 Sediment Trap – Sediment trap or on-site tank may be used if proposed sediment controls are ineffective.

Installation Schedules: Prior to construction

Inspection and Maintenance plan: Inspect and maintain weekly

Responsible Staff: TBD

Element 5: Stabilize Soils (2.1.5)

West of the Cascade Mountains Crest

Season	Dates	Number of Days Soils Can be Left Exposed
During the Dry Season	May 1 – September 30	7 days
During the Wet Season	October 1 – April 30	2 days

Soils must be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast.

Anticipated project dates: Start date: June 2022 End date: September 2023

Will you construct during the wet season?

Yes No

Exposed and unworked soils shall be stabilized with the application of effective BMPs to minimize erosion throughout the life of the project.

The Project site is located west of the Cascade Mountain Crest. As such, no soils shall remain exposed and unworked for more than 7 days during the dry season (May 1 to September 30) and 2 days during the wet season (October 1 to April 30). Regardless of the time of year, all soils shall be stabilized at the end of the shift before a holiday or weekend if needed based on weather forecasts.

List and describe BMPs:

BMP C125: Top Soiling/Composting – Prior to permanent seeding to help establish seeding.

BMP C140: Dust Control – To prevent wind transport of dust exposed soil surfaces onto roadways, drainage ways and surface waters. Soils that are exposed will be kept moist to prevent dust.

Installation Schedules: Once stockpiles are present

Inspection and Maintenance plan: Inspect and maintain weekly

Responsible Staff: TBD

Element 6: Protect Slopes (2.1.6)

West of the Cascade Mountains Crest

Describe how slopes will be designed, constructed, and protected to minimize erosion.

Temporary pipe slope drains must handle the peak 10-minute flow rate from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year, 1-hour flow rate predicted by an approved continuous runoff model, increased by a factor of 1.6, may be used.

The hydrologic analysis must use the existing land cover condition for predicting flow rates from tributary areas outside the project limits.

For tributary areas on the project site, the analysis must use the temporary or permanent project land cover condition, whichever will produce the highest flow rates.

If using the Western Washington Hydrology Model (WWHM) to predict flows, bare soil areas should be modeled as “landscaped area”.

Describe how you will reduce scouring within constructed channels that are cut down a slope.

Will steep slopes be present at the site during construction?

Yes **No**

Steep slopes within the project area will be left as is to the maximum extent feasible. When steep slopes must be disturbed for project construction, a biosock will be used as per WSDOT Standard Plan I-30.40-02 to help secure the slope and mitigate excess flow of water. Erosion Control Blankets will be used in tandem with the biosock where needed. See Detail 1, Sheet G-6.

List and describe BMPs:

BMP C122: Nets and Blankets – When necessary, will use Erosion Control Blankets on steep slopes during construction.

Installation Schedules: Prior to construction where steep slope is affected

Inspection and Maintenance plan: Daily

Responsible Staff: TBD

Element 7: Protect Drain Inlets (2.1.7)

All existing storm drains and culverts during construction will be protected with biobags or equivalent. Priority will be given to keep all access roads clean and keep street wash water separate from entering storm drains until treated.

If excess sediment enters storm drains due to construction activities, they shall be jetted clean and pumped out of the catch basins where feasible.

List and describe BMPs:

BMP C220: Storm Drain Inlet Protection – To prevent sediment from entering drainage systems prior to site stabilization, install catch basin protection within onsite and nearby downstream catch basins.

Installation Schedules: Prior to Construction

Inspection and Maintenance plan: Inspected and maintained weekly, in the event of a storm, inspected daily.

Responsible Staff: TBD

Element 8: Stabilize Channels and Outlets (2.1.8)

Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches, will be installed at the outlets of all conveyance systems.

Site runoff is to be conveyed into the existing storm system. Efforts will be made to prevent downstream erosion and protect catch basins with storm drain outlet protection. No slopes need to be stabilized.

List and describe BMPs:

BMP C202: Channel Lining – Protect impacted channels by providing a channel liner using either blankets or riprap.

BMP 122: Nets and Blankets – Where channel restoration is required, prevent erosion and hold seed and mulch in place on steep slopes and in channels so that vegetation can become well established.

BMP C209: Outlet Protection – Prevent scour at conveyance outlets and minimize the potential for downstream erosion by reducing the velocity of concentrated stormwater flows, install organic or synthetic erosion blankets at conveyance outlets.

Installation Schedules: Prior to construction

Inspection and Maintenance plan: Inspect and maintain weekly

Responsible Staff: TBD

Element 9: Control Pollutants (2.1.9)

The following pollutants are anticipated to be present on-site:

Table 2 – Pollutants

Pollutant (and source, if applicable)
Gas and Diesel Fuel
Petroleum products
Concrete Wash
Asphalt products/waste

All pollutants, including waste materials and demolition debris, will be handled in accordance with the BMPs listed below. Chemical, liquid products, petroleum products and other polluting materials will be locked down to minimize the risk of theft and vandalism and will be taken off site when construction activities are not occurring to further minimize that risk.

List and describe BMPs:

BMP C150: Materials on Hand – Keep erosion prevention and sediment control materials on the project site at all times to be used for regular maintenance and emergency situations

BMP C151: Concrete Handling – Prevent concrete slurry and process water from entering existing surface water. Contain concrete dust when cutting into concrete.

BMP C152: Saw cutting and Surfacing Pollution Prevention – This process prevents slurry from entering surface water. This includes disposing of slurry properly.

BMP C153: Materials Delivery, Storage and Containment – This process is used to store materials in safe areas with secondary containment. This includes a spill kit on site.

BMP C154: Concrete Washout Area – Used only approved washout facility.

Installation Schedules: Prior to construction

Inspection and Maintenance plan: Inspect and maintain weekly

Responsible Staff: TBD

Will maintenance, fueling, and/or repair of heavy equipment and vehicles occur on-site?

Yes **No**

All pollutants, including waste materials and demolition debris, that occur onsite shall be handled and disposed of in a manner that meets or exceeds groundwater or surface water quality standards. The spill protection and prevention BMPs that will be used to control potential pollutants and their sources are discussed below.

- All vehicles, equipment, and petroleum product storage/dispensing areas will be inspected regularly to detect any leaks or spills, and to identify maintenance needs to prevent leaks or spills.
- On-site fueling tanks and petroleum product storage containers shall include secondary containment.
- Spill prevention measures, such as drip pans, will be used when conduction maintenance and repair of vehicles or equipment.
- In order to perform emergency repairs on site, temporary plastic will be placed beneath and, if raining, over the vehicle.
- Contaminated surfaces shall be cleaned immediately following any discharge or spill incident.

List and describe BMPs:

BMP C153: Materials Delivery, Storage and Containment – This process is used to store materials in safe areas with secondary containment. This includes having a spill kit on site.

Installation Schedules: Prior to construction

Inspection and Maintenance plan: Inspect and maintain weekly

Responsible Staff: TBD

Will wheel wash or tire bath system BMPs be used during construction?

Yes **No**

List and describe BMPs: N/A

Installation Schedules: N/A

Inspection and Maintenance plan: N/A

Responsible Staff: N/A

Will pH-modifying sources be present on-site?

Yes No If yes, check the source(s).

Table 3 – pH-Modifying Sources

	None
X	Bulk cement
	Cement kiln dust
	Fly ash
	Other cementitious materials
X	New concrete washing or curing waters

X	Waste streams generated from concrete grinding and sawing
X	Exposed aggregate processes
	Dewatering concrete vaults
X	Concrete pumping and mixer washout waters
	Recycled concrete
	Other (i.e. calcium lignosulfate) [please describe]

Stormwater with pH levels exceeding water quality standards may be treated to lower the pH levels using BMP C252: High pH Neutralization Using CO2 to neutralized waters prior to discharging

List and describe BMPs:

BMP C151: Concrete Handling – Prevent concrete slurry and process water from entering existing surface water. Contain concrete dust when cutting into concrete.

BMP C152: Saw cutting and Surfacing Pollution Prevention – This process prevents slurry from entering surface water. This includes disposing of slurry properly.

BMP C153: Materials Delivery, Storage and Containment – This process is used to store materials in safe areas with secondary containment. This includes a spill kit on site.

BMP C252: High pH Neutralization Using CO2 – Treating and Disposing of High pH Water

Installation Schedules: Prior to pollutant generating activities

Inspection and Maintenance plan: Inspect and maintain weekly

Responsible Staff: TBD

Concrete trucks must not be washed out onto the ground, or into storm drains, open ditches, streets, or streams. Excess concrete must not be dumped on-site, except in designated concrete washout areas with appropriate BMPs installed.

Element 10: Control Dewatering (2.1.10)

All dewatering water from open cut excavations shall be discharged into a controlled conveyance system prior to discharge.

Channels will be stabilized, per Element #8

Clean, non-turbid dewatering water will be discharged to systems tributary to the receiving waters of the State in a manner that does not cause erosion, flooding, or a violation of State water quality standards in the receiving water.

Highly turbid dewatering water will be filtered using geotextile fabric socks/bags/cells prior to discharge. For small volumes of localized dewatering, a sediment bag with outfall to a ditch or swale may be used.

Highly turbid dewatering water from soils known or suspected to be contaminated, or from use of construction equipment, will require additions monitoring and treatment as required for the specific pollutants based on the receiving waters into which the discharge is occurring. Such monitoring is the responsibility of the Contractor.

Table 4 – Dewatering BMPs

	Infiltration
X	Transport off-site in a vehicle (vacuum truck for legal disposal)
X	Ecology-approved on-site chemical treatment or other suitable treatment technologies
	Sanitary or combined sewer discharge with local sewer district approval (last resort)
X	Use of sedimentation bag with discharge to ditch or swale (small volumes of localized dewatering)

List and describe BMPs:

BMP C203: Water Bars – A small ditch or ridge of materials constructed diagonally across a road or right-of-way to divert stormwater runoff from the road surface, wheel tracks, or a shallow road ditch.

Installation Schedules: Prior to dewatering

Inspection and Maintenance plan: Inspect and maintain weekly

Responsible Staff: TBD

Element 11: Maintain BMPs (2.1.11)

All temporary and permanent Erosion and Sediment Control (ESC) BMPs shall be maintained and repaired as needed to ensure continued performance of their intended function.

Maintenance and repair shall be conducted in accordance with each particular BMP specification (see *Volume II of the SWMMWW* or *Chapter 7 of the SWMMEW*).

Visual monitoring of all BMPs installed at the site will be conducted at least once every calendar week and within 24 hours of any stormwater or non-stormwater discharge from the site. If the site becomes inactive and is temporarily stabilized, the inspection frequency may be reduced to once every calendar month.

All temporary ESC BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed.

Trapped sediment shall be stabilized on-site or removed. Disturbed soil resulting from removal of either BMPs or vegetation shall be permanently stabilized.

Additionally, protection must be provided for all BMPs installed for the permanent control of stormwater from sediment and compaction. BMPs that are to remain in place following completion of construction shall be examined and restored to full operating condition. If sediment enters these BMPs during construction, the sediment shall be removed and the facility shall be returned to conditions specified in the construction documents.

Element 12: Manage the Project (2.1.12)

The project will be managed based on the following principles:

- Projects will be phased to the maximum extent practicable and seasonal work limitations will be taken into account.
- Inspection and monitoring:
 - Inspection, maintenance and repair of all BMPs will occur as needed to ensure performance of their intended function.
 - Site inspections and monitoring will be conducted in accordance with Special Condition S4 of the CSWGP. Sampling locations are indicated on the [Site Map](#). Sampling station(s) are located in accordance with applicable requirements of the CSWGP.
- Maintain an updated SWPPP.
 - The SWPPP will be updated, maintained, and implemented in accordance with Special Conditions S3, S4, and S9 of the CSWGP.

As site work progresses the SWPPP will be modified routinely to reflect changing site conditions. The SWPPP will be reviewed monthly to ensure the content is current.

Table 5 – Management

X	Design the project to fit the existing topography, soils, and drainage patterns
X	Emphasize erosion control rather than sediment control
X	Minimize the extent and duration of the area exposed
X	Keep runoff velocities low
X	Retain sediment on-site
X	Thoroughly monitor site and maintain all ESC measures
	Schedule major earthwork during the dry season
	Other (please describe)

Relevant BMPs to control dewatering that will/may be applied for this project include.

BMP C160: Certified Erosion and Sediment Control Lead – The project proponent designates as least one person as the responsible representative in charge of erosion and sediment control (ESC), and water quality protection.

BMP C162: Scheduling – Sequencing a construction project reduces the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking.

Element 13: Protect Low Impact Development (LID) BMPs (2.1.13)

No LID BMP will be used since the project is within an existing roadway. Any existing LIDs will be preserved.

Pollution Prevention Team (3.0)

Table 7 – Team Information

Title	Name(s)	Phone Number
Certified Erosion and Sediment Control Lead (CESCL)	TBD	TBD
Resident Engineer	TBD	TBD
Emergency Ecology Contact	Ecology High Turbidity Hotline	425-649-7000
Emergency Permittee/ Owner Contact	TBD	TBD
Non-Emergency Owner Contact	TBD	TBD
Monitoring Personnel	TBD by Contractor	TBD
Ecology Regional Office	NW Regional Office	425-649-7000

Monitoring and Sampling Requirements (4.0)

Monitoring includes visual inspection, sampling for water quality parameters of concern, and documentation of the inspection and sampling findings in a site log book. A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Stormwater sampling data

Create your own Site Inspection Form or use the Construction Stormwater Site Inspection Form found on Ecology's website. <https://www.ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Construction-stormwater-permit>

File a blank form under Appendix D.

The site log book must be maintained on-site within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

Numeric effluent limits may be required for certain discharges to 303(d) listed waterbodies. See CSWGP Special Condition S8 and Section 5 of this template.

Complete the following paragraph for sites that discharge to impaired waterbodies for fine sediment, turbidity, phosphorus, or pH:

The receiving waterbodies, Liberty Bay and Dyes Inlet, are impaired for: none. All stormwater and dewatering discharges from the site are subject to an **effluent limit** of 8.5 su for pH and/or 25 NTU for turbidity.

Site Inspection (4.1)

Site inspections will be conducted at least once every calendar week and within 24 hours following any discharge from the site. For sites that are temporarily stabilized and inactive, the required frequency is reduced to once per calendar month.

The discharge point(s) are indicated on the Site Map (see Appendix A) and in accordance with the applicable requirements of the CSWGP.

Stormwater Quality Sampling (4.2)

Turbidity Sampling (4.2.1)

Requirements include calibrated turbidity meter or transparency tube to sample site discharges for compliance with the CSWGP. Sampling will be conducted at all discharge points at least once per calendar week.

Method for sampling turbidity:

Table 8 – Turbidity Sampling Method

X	Turbidity Meter/Turbidimeter (required for disturbances 5 acres or greater in size)
	Transparency Tube (option for disturbances less than 1 acre and up to 5 acres in size)

The benchmark for turbidity value is 25 nephelometric turbidity units (NTU) and a transparency less than 33 centimeters.

If the discharge's turbidity is 26 to 249 NTU or the transparency is less than 33 cm but equal to or greater than 6 cm, the following steps will be conducted:

1. Review the SWPPP for compliance with Special Condition S9. Make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.
3. Document BMP implementation and maintenance in the site log book.

If the turbidity exceeds 250 NTU or the transparency is 6 cm or less at any time, the following steps will be conducted:

1. Telephone or submit an electronic report to the applicable Ecology Region's Environmental Report Tracking System (ERTS) within 24 hours.
<https://www.ecology.wa.gov/About-us/Get-involved/Report-an-environmental-issue>
 - Central Region (Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima): (509) 575-2490
 - Eastern Region (Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman): (509) 329-3400
 - Northwest Region (King, Kitsap, Island, San Juan, Skagit, Snohomish, Whatcom): (425) 649-7000
 - Southwest Region (Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, Wahkiakum,): (360) 407-6300
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period
3. Document BMP implementation and maintenance in the site log book.
4. Continue to sample discharges daily until one of the following is true:
 - Turbidity is 25 NTU (or lower).
 - Transparency is 33 cm (or greater).

- Compliance with the water quality limit for turbidity is achieved.
 - 1 - 5 NTU over background turbidity, if background is less than 50 NTU
 - 1% - 10% over background turbidity, if background is 50 NTU or greater
- The discharge stops or is eliminated.

pH Sampling (4.2.2)

pH monitoring is required for “Significant concrete work” (i.e. greater than 1000 cubic yards poured concrete or recycled concrete over the life of the project). The use of engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD] or fly ash) also requires pH monitoring.

For significant concrete work, pH sampling will start the first day concrete is poured and continue until it is cured, typically three (3) weeks after the last pour.

For engineered soils and recycled concrete, pH sampling begins when engineered soils or recycled concrete are first exposed to precipitation and continues until the area is fully stabilized.

If the measured pH is 8.5 or greater, the following measures will be taken:

1. Prevent high pH water from entering storm sewer systems or surface water.
2. Adjust or neutralize the high pH water to the range of 6.5 to 8.5 su using appropriate technology such as carbon dioxide (CO₂) sparging (liquid or dry ice).
3. Written approval will be obtained from Ecology prior to the use of chemical treatment other than CO₂ sparging or dry ice.

Method for sampling pH:

Table 8 – pH Sampling Method

	pH meter
X	pH test kit
	Wide range pH indicator paper

Discharges to 303(d) or Total Maximum Daily Load (TMDL) Waterbodies (5.0)

303(d) Listed Waterbodies (5.1)

Is the receiving water 303(d) (Category 5) listed for turbidity, fine sediment, phosphorus, or pH?

Yes **No**

List the impairment(s):

The receiving waterbodies, Liberty Bay and Dyes Inlet, are impaired for: **none**. All stormwater and dewatering discharges from the site are subject to an **effluent limit** of **8.5 su for pH and/or 25 NTU for turbidity**.

List and describe BMPs:

N/A

TMDL Waterbodies (5.2)

Waste Load Allocation for CWSGP discharges:

N/A

List and describe BMPs:

N/A

Discharges to TMDL receiving waterbodies will meet in-stream water quality criteria at the point of discharge.
--

The Construction Stormwater General Permit Proposed New Discharge to an Impaired Water Body form is included in Appendix F.

Reporting and Record Keeping (6.0)

Record Keeping (6.1)

Site Log Book (6.1.1)

A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Sample logs

Records Retention (6.1.2)

Records will be retained during the life of the project and for a minimum of three (3) years following the termination of permit coverage in accordance with Special Condition S5.C of the CSWGP.

Permit documentation to be retained on-site:

- CSWGP
- Permit Coverage Letter
- SWPPP
- Site Log Book

Permit documentation will be provided within 14 days of receipt of a written request from Ecology. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with Special Condition S5.G.2.b of the CSWGP.

Updating the SWPPP (6.1.3)

The SWPPP will be modified if:

- Found ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site.
- There is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the State.

The SWPPP will be modified within seven (7) days if inspection(s) or investigation(s) determine additional or modified BMPs are necessary for compliance. An updated timeline for BMP implementation will be prepared.

Reporting (6.2)

Discharge Monitoring Reports (6.2.1)

Cumulative soil disturbance is one (1) acre or larger; therefore, Discharge Monitoring Reports (DMRs) will be submitted to Ecology monthly. If there was no discharge during a given monitoring period the DMR will be submitted as required, reporting “No Discharge”. The DMR due date is fifteen (15) days following the end of each calendar month.

DMRs will be reported online through Ecology’s WQWebDMR System.

To sign up for WQWebDMR go to:

<https://www.ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance/WQWebPortal-guidance>

Notification of Noncompliance (6.2.2)

If any of the terms and conditions of the permit is not met, and the resulting noncompliance may cause a threat to human health or the environment, the following actions will be taken:

1. Ecology will be notified within 24-hours of the failure to comply by calling the applicable Regional office ERTS phone number (Regional office numbers listed below).
2. Immediate action will be taken to prevent the discharge/pollution or otherwise stop or correct the noncompliance. If applicable, sampling and analysis of any noncompliance will be repeated immediately and the results submitted to Ecology within five (5) days of becoming aware of the violation.
3. A detailed written report describing the noncompliance will be submitted to Ecology within five (5) days, unless requested earlier by Ecology.

Anytime turbidity sampling indicates turbidity is 250 NTUs or greater, or water transparency is 6 cm or less, the Ecology Regional office will be notified by phone within 24 hours of analysis as required by Special Condition S5.A of the CSWGP.

- Central Region at (509) 575-2490 for Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, or Yakima County
- Eastern Region at (509) 329-3400 for Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, or Whitman County
- Northwest Region at (425) 649-7000 for Island, King, Kitsap, San Juan, Skagit, Snohomish, or Whatcom County

- Southwest Region at (360) 407-6300 for Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, or Wahkiakum

Include the following information:

1. Your name and / Phone number
2. Permit number
3. City / County of project
4. Sample results
5. Date / Time of call
6. Date / Time of sample
7. Project name

In accordance with Special Condition S4.D.5.b of the CSWGP, the Ecology Regional office will be notified if chemical treatment other than CO₂ sparging is planned for adjustment of high pH water.

Appendix/Glossary

A. Site Map

Separate, see plans

B. BMP Detail

Download BMPs from the Ecology Construction Stormwater website at:
<https://www.ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Stormwater-manuals>

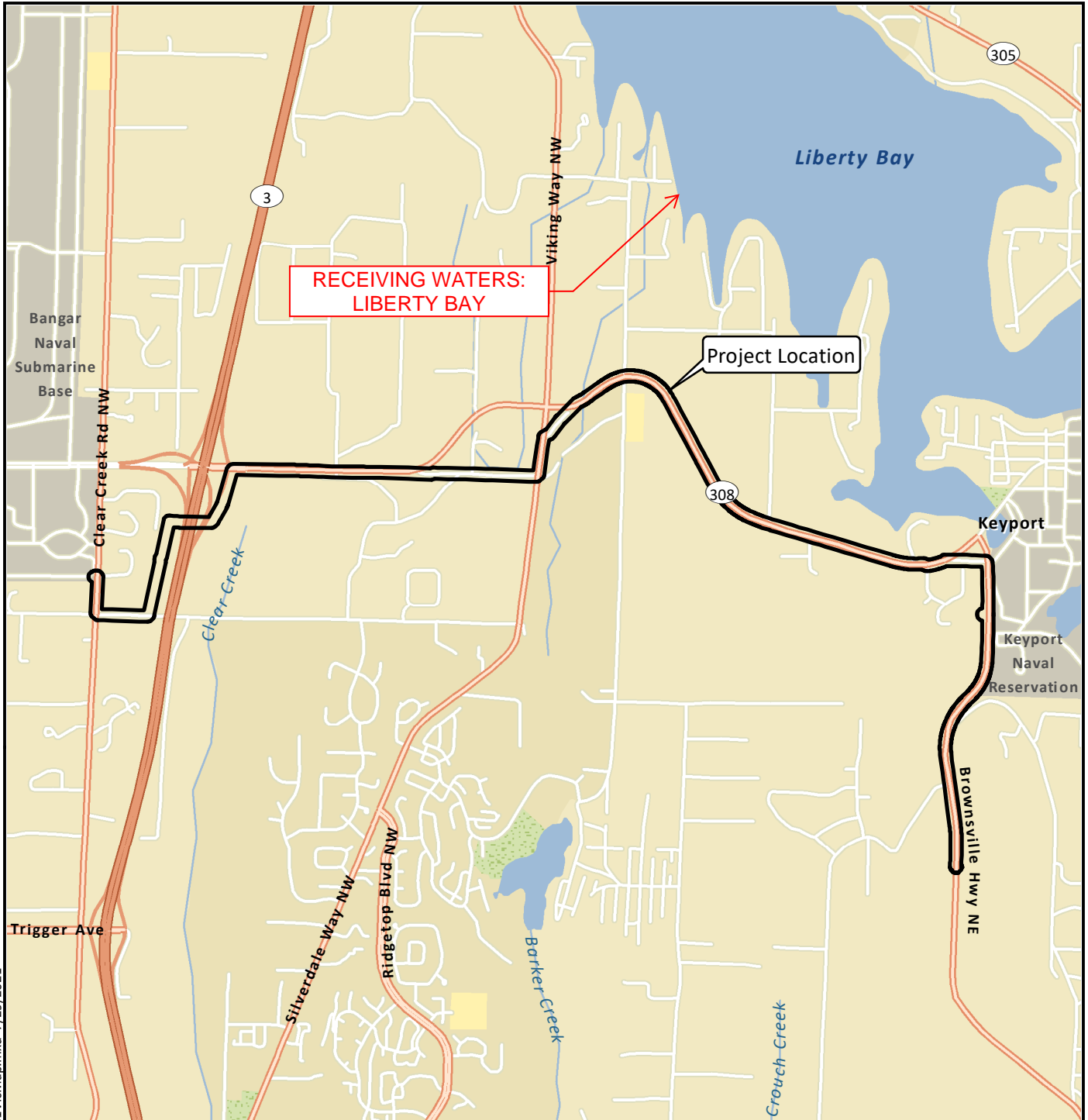
C. Correspondence

N/A

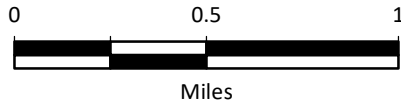
D. Site Inspection Form

See attached site inspection form downloaded from Ecology's website.
<https://www.ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Construction-stormwater-permit>

CSWPPP APPENDIX A -
SITE MAP



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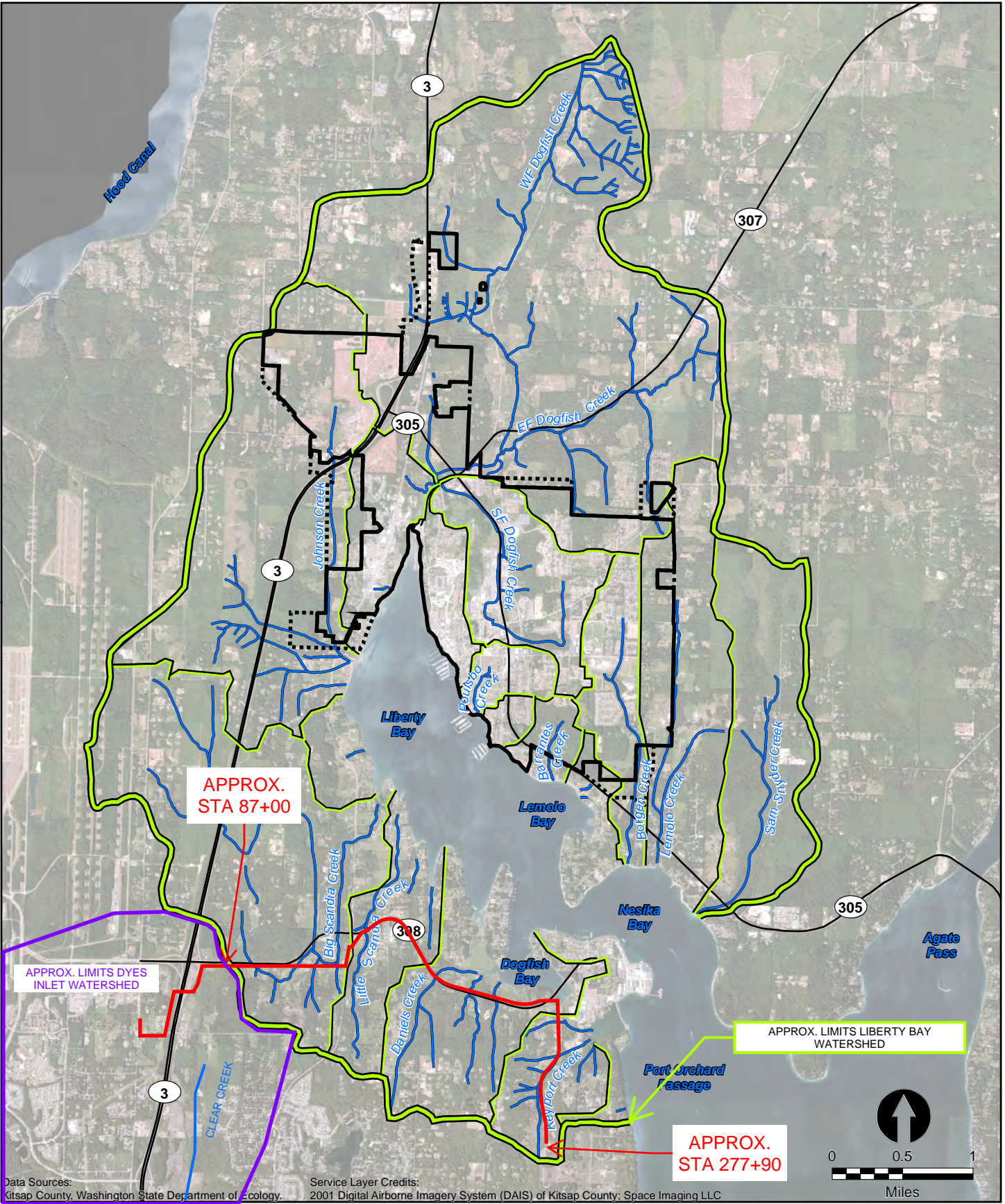
Data Source: Esri 2012



Bangor-Keyport
 Forcemain Replacement
 Kitsap County, Washington

Vicinity Map

Figure
1



Data Sources: Kitsap County, Washington State Department of Ecology. Service Layer Credits: 2001 Digital Airborne Imagery System (DAIS) of Kitsap County; Space Imaging LLC



- Liberty Bay Watershed
- Basin Boundary
- Streams
- City of Poulsbo
- PUTA
- Highway

Figure 2-1
Liberty Bay Watershed,
Streams and Primary Basins
TMDL Implementation Plan
City of Poulsbo

CSWPPP APPENDIX B - BMP DESCRIPTIONS/DETAILS

BMP C101: Preserving Natural Vegetation

Purpose

The purpose of preserving natural vegetation is to reduce erosion wherever practicable. Limiting site disturbance is the single most effective method for reducing erosion. For example, conifers can hold up to about 50 percent of all rain that falls during a storm. Up to 20-30 percent of this rain may never reach the ground but is taken up by the tree or evaporates. Another benefit is that the rain held in the tree can be released slowly to the ground after the storm.

Conditions of Use

Natural vegetation should be preserved on steep slopes, near perennial and intermittent water-courses or swales, and on building sites in wooded areas.

- As required by local governments.
- Phase construction to preserve natural vegetation on the project site for as long as possible during the construction period.

Design and Installation Specifications

Natural vegetation can be preserved in natural clumps or as individual trees, shrubs and vines.

The preservation of individual plants is more difficult because heavy equipment is generally used to remove unwanted vegetation. The points to remember when attempting to save individual plants are:

- Is the plant worth saving? Consider the location, species, size, age, vigor, and the work involved. Local governments may also have ordinances to save natural vegetation and trees.
- Fence or clearly mark areas around trees that are to be saved. It is preferable to keep ground disturbance away from the trees at least as far out as the dripline.

Plants need protection from three kinds of injuries:

- *Construction Equipment* - This injury can be above or below the ground level. Damage results from scarring, cutting of roots, and compaction of the soil. Placing a fenced buffer zone around plants to be saved prior to construction can prevent construction equipment injuries.
- *Grade Changes* - Changing the natural ground level will alter grades, which affects the plant's ability to obtain the necessary air, water, and minerals. Minor fills usually do not cause problems although sensitivity between species does vary and should be checked. Trees can typically tolerate fill of 6 inches or less. For shrubs and other plants, the fill should be less.

When there are major changes in grade, it may become necessary to supply air to the roots of plants. This can be done by placing a layer of gravel and a tile system over the roots before the fill is made. The tile system should be laid out on the original grade leading from a dry well

around the tree trunk. The system should then be covered with small stones to allow air to circulate over the root area.

Lowering the natural ground level can seriously damage trees and shrubs. The highest percentage of the plant roots are in the upper 12 inches of the soil and cuts of only 2-3 inches can cause serious injury. To protect the roots it may be necessary to terrace the immediate area around the plants to be saved. If roots are exposed, construction of retaining walls may be needed to keep the soil in place. Plants can also be preserved by leaving them on an undisturbed, gently sloping mound. To increase the chances for survival, it is best to limit grade changes and other soil disturbances to areas outside the dripline of the plant.

- *Excavations* - Protect trees and other plants when excavating for drainfields, power, water, and sewer lines. Where possible, the trenches should be routed around trees and large shrubs. When this is not possible, it is best to tunnel under them. This can be done with hand tools or with power augers. If it is not possible to route the trench around plants to be saved, then the following should be observed:
 - Cut as few roots as possible. When you have to cut, cut clean. Paint cut root ends with a wood dressing like asphalt base paint if roots will be exposed for more than 24-hours.
 - Backfill the trench as soon as possible.
 - Tunnel beneath root systems as close to the center of the main trunk to preserve most of the important feeder roots.

Some problems that can be encountered with a few specific trees are:

- Maple, Dogwood, Red alder, Western hemlock, Western red cedar, and Douglas fir do not readily adjust to changes in environment and special care should be taken to protect these trees.
- The windthrow hazard of Pacific silver fir and madrona is high, while that of Western hemlock is moderate. The danger of windthrow increases where dense stands have been thinned. Other species (unless they are on shallow, wet soils less than 20 inches deep) have a low windthrow hazard.
- Cottonwoods, maples, and willows have water-seeking roots. These can cause trouble in sewer lines and infiltration fields. On the other hand, they thrive in high moisture conditions that other trees would not.
- Thinning operations in pure or mixed stands of Grand fir, Pacific silver fir, Noble fir, Sitka spruce, Western red cedar, Western hemlock, Pacific dogwood, and Red alder can cause serious disease problems. Disease can become established through damaged limbs, trunks, roots, and freshly cut stumps. Diseased and weakened trees are also susceptible to insect attack.

Maintenance Standards

Inspect flagged and/or fenced areas regularly to make sure flagging or fencing has not been removed or damaged. If the flagging or fencing has been damaged or visibility reduced, it shall be repaired or replaced immediately and visibility restored.

If tree roots have been exposed or injured, “prune” cleanly with an appropriate pruning saw or loppers directly above the damaged roots and recover with native soils. Treatment of sap flowing trees (fir, hemlock, pine, soft maples) is not advised as sap forms a natural healing barrier.

If tree roots have been exposed or injured, “prune” cleanly with an appropriate pruning saw or loppers directly above the damaged roots and recover with native soils. Treatment of sap flowing trees (fir, hemlock, pine, soft maples) is not advised as sap forms a natural healing barrier.

BMP C102: Buffer Zones

Purpose

Creation of an undisturbed area or strip of natural vegetation or an established suitable planting that will provide a living filter to reduce soil erosion and stormwater runoff velocities.

Conditions of Use

Buffer zones are used along streams, wetlands and other bodies of water that need protection from erosion and sedimentation. Contractors can use vegetative buffer zone BMPs to protect natural swales and they can incorporate them into the natural landscaping of an area.

Do not use critical-areas buffer zones as sediment treatment areas. These areas shall remain completely undisturbed. The local permitting authority may expand the buffer widths temporarily to allow the use of the expanded area for removal of sediment.

The types of buffer zones can change the level of protection required as shown below:

Designated Critical Area Buffers - buffers that protect Critical Areas, as defined by the Washington State Growth Management Act, and are established and managed by the local permitting authority. These should not be disturbed and must be protected with sediment control BMPs to prevent impacts. The local permitting authority may expand the buffer widths temporarily to allow the use of the expanded area for removal of sediment.

Vegetative Buffer Zones - areas that may be identified in undisturbed vegetation areas or managed vegetation areas that are outside any Designated Critical Area Buffer. They may be utilized to provide an additional sediment control area and/or reduce runoff velocities. If being used for preservation of natural vegetation, they should be arranged in clumps or strips. They can be used to protect natural swales and incorporated into the natural landscaping area.

Design and Installation Specifications

- Preserving natural vegetation or plantings in clumps, blocks, or strips is generally the easiest and most successful method.
- Leave all unstable steep slopes in natural vegetation.
- Mark clearing limits and keep all equipment and construction debris out of the natural areas and buffer zones. Steel construction fencing is the most effective method to protect sensitive areas and buffers. Alternatively, wire-backed silt fence on steel posts is marginally effective. Flagging alone is typically not effective.
- Keep all excavations outside the dripline of trees and shrubs.
- Do not push debris or extra soil into the buffer zone area because it will cause damage by

burying and smothering vegetation.

- Vegetative buffer zones for streams, lakes or other waterways shall be established by the local permitting authority or other state or federal permits or approvals.

Maintenance Standards

Inspect the area frequently to make sure flagging remains in place and the area remains undisturbed. Replace all damaged flagging immediately. Remove all materials located in the buffer area that may impede the ability of the vegetation to act as a filter.

BMP C103: High-Visibility Fence

Purpose

High-visibility fencing is intended to:

- Restrict clearing to approved limits.
- Prevent disturbance of sensitive areas, their buffers, and other areas required to be left undisturbed.
- Limit construction traffic to designated construction entrances, exits, or internal roads.
- Protect areas where marking with survey tape may not provide adequate protection.

Conditions of Use

To establish clearing limits plastic, fabric, or metal fence may be used:

- At the boundary of sensitive areas, their buffers, and other areas required to be left uncleared.
- As necessary to control vehicle access to and on the site.

Design and Installation Specifications

High-visibility plastic fence shall be composed of a high-density polyethylene material and shall be at least four feet in height. Posts for the fencing shall be steel or wood and placed every 6 feet on center (maximum) or as needed to ensure rigidity. The fencing shall be fastened to the post every six inches with a polyethylene tie. On long continuous lengths of fencing, a tension wire or rope shall be used as a top stringer to prevent sagging between posts. The fence color shall be high-visibility orange. The fence tensile strength shall be 360 lbs/ft using the ASTM D4595 testing method.

If appropriate install fabric silt fence in accordance with [BMP C233: Silt Fence](#) to act as high-visibility fence. Silt fence shall be at least 3 feet high and must be highly visible to meet the requirements of this BMP.

Metal fences shall be designed and installed according to the manufacturer's specifications.

Metal fences shall be at least 3 feet high and must be highly visible.

Fences shall not be wired or stapled to trees.

Maintenance Standards

If the fence has been damaged or visibility reduced, it shall be repaired or replaced immediately and visibility restored.

BMP C120: Temporary and Permanent Seeding

Purpose

Seeding reduces erosion by stabilizing exposed soils. A well-established vegetative cover is one of the most effective methods of reducing erosion.

Conditions of Use

Use seeding throughout the project on disturbed areas that have reached final grade or that will remain unworked for more than 30 days.

The optimum seeding windows for western Washington are April 1 through June 30 and September 1 through October 1.

Between July 1 and August 30 seeding requires irrigation until 75 percent grass cover is established.

Between October 1 and March 30 seeding requires a cover of mulch or an erosion control blanket until 75 percent grass cover is established.

Review all disturbed areas in late August to early September and complete all seeding by the end of September. Otherwise, vegetation will not establish itself enough to provide more than average protection.

Mulch is required at all times for seeding because it protects seeds from heat, moisture loss, and transport due to runoff. Mulch can be applied on top of the seed or simultaneously by hydroseeding. See [BMP C121: Mulching](#) for specifications.

Seed and mulch all disturbed areas not otherwise vegetated at final site stabilization. Final stabilization means the completion of all soil disturbing activities at the site and the establishment of a permanent vegetative cover, or equivalent permanent stabilization measures (such as pavement, riprap, gabions, or geotextiles) which will prevent erosion. See [BMP T5.13: Post-Construction Soil Quality and Depth](#).

Design and Installation Specifications

General

- Install channels intended for vegetation before starting major earthwork and hydroseed with a Bonded Fiber Matrix. For vegetated channels that will have high flows, install erosion control blankets over the top of hydroseed. Before allowing water to flow in vegetated channels, establish 75 percent vegetation cover. If vegetated channels cannot be established by seed

before water flow; install sod in the channel bottom — over top of hydromulch and erosion control blankets.

- Confirm the installation of all required surface water control measures to prevent seed from washing away.
- Hydroseed applications shall include a minimum of 1,500 pounds per acre of mulch with 3 percent tackifier. See [BMP C 121: Mulching](#) for specifications.
- Areas that will have seeding only and not landscaping may need compost or meal-based mulch included in the hydroseed in order to establish vegetation. Re-install native topsoil on the disturbed soil surface before application. See [BMP T5.13: Post-Construction Soil Quality and Depth](#).
- When installing seed via hydroseeding operations, only about 1/3 of the seed actually ends up in contact with the soil surface. This reduces the ability to establish a good stand of grass quickly. To overcome this, consider increasing seed quantities by up to 50 percent.
- Enhance vegetation establishment by dividing the hydromulch operation into two phases:
 - Phase 1- Install all seed and fertilizer with 25-30 percent mulch and tackifier onto soil in the first lift.
 - Phase 2- Install the rest of the mulch and tackifier over the first lift.

Or, enhance vegetation by:

- Installing the mulch, seed, fertilizer, and tackifier in one lift.
- Spread or blow straw over the top of the hydromulch at a rate of 800-1000 pounds per acre.
- Hold straw in place with a standard tackifier.

Both of these approaches will increase cost moderately but will greatly improve and enhance vegetative establishment. The increased cost may be offset by the reduced need for:

- Irrigation.
- Reapplication of mulch.
- Repair of failed slope surfaces.

This technique works with standard hydromulch (1,500 pounds per acre minimum) and Bonded Fiber Matrix/ Mechanically Bonded Fiber Matrix (BFM/MBFMs) (3,000 pounds per acre minimum).

- Seed may be installed by hand if:
 - Temporary and covered by straw, mulch, or topsoil.
 - Permanent in small areas (usually less than 1 acre) and covered with mulch, topsoil, or erosion blankets.
- The seed mixes listed in [Table II-3.4: Temporary and Permanent Seed Mixes](#) include

recommended mixes for both temporary and permanent seeding.

- Apply these mixes, with the exception of the wet area seed mix, at a rate of 120 pounds per acre. This rate can be reduced if soil amendments or slow-release fertilizers are used. Apply the wet area seed mix at a rate of 60 pounds per acre.
- Consult the local suppliers or the local conservation district for their recommendations. The appropriate mix depends on a variety of factors, including location, exposure, soil type, slope, and expected foot traffic. Alternative seed mixes approved by the local authority may be used, depending on the soil type and hydrology of the area.

Table II-3.4: Temporary and Permanent Seed Mixes

Common Name	Latin Name	% Weight	% Purity	% Germination
Temporary Erosion Control Seed Mix				
A standard mix for areas requiring a temporary vegetative cover.				
Chewings or annual blue grass	<i>Festuca rubra var. commutata</i> or <i>Poa anna</i>	40	98	90
Perennial rye	<i>Lolium perenne</i>	50	98	90
Redtop or colonial bentgrass	<i>Agrostis alba</i> or <i>Agrostis tenuis</i>	5	92	85
White dutch clover	<i>Trifolium repens</i>	5	98	90
Landscaping Seed Mix				
A recommended mix for landscaping seed.				
Perennial rye blend	<i>Lolium perenne</i>	70	98	90
Chewings and red fescue blend	<i>Festuca rubra var. commutata</i> or <i>Festuca rubra</i>	30	98	90
Low-Growing Turf Seed Mix				
A turf seed mix for dry situations where there is no need for watering. This mix requires very little maintenance.				
Dwarf tall fescue (several varieties)	<i>Festuca arundinacea var.</i>	45	98	90
Dwarf perennial rye (Barclay)	<i>Lolium perenne var. barclay</i>	30	98	90
Red fescue	<i>Festuca rubra</i>	20	98	90
Colonial bentgrass	<i>Agrostis tenuis</i>	5	98	90
Bioswale Seed Mix				
A seed mix for bioswales and other intermittently wet areas.				
Tall or meadow fes-	<i>Festuca arundin-</i>	75-80	98	90

Table II-3.4: Temporary and Permanent Seed Mixes (continued)

Common Name	Latin Name	% Weight	% Purity	% Germination
cue	<i>acea</i> or <i>Festuca elatior</i>			
Seaside/Creeping bentgrass	<i>Agrostis palustris</i>	10-15	92	85
Redtop bentgrass	<i>Agrostis alba</i> or <i>Agrostis gigantea</i>	5-10	90	80
Wet Area Seed Mix				
A low-growing, relatively non-invasive seed mix appropriate for very wet areas that are not regulated wetlands. Consult Hydraulic Permit Authority (HPA) for seed mixes if applicable.				
Tall or meadow fescue	<i>Festuca arundinacea</i> or <i>Festuca elatior</i>	60-70	98	90
Seaside/Creeping bentgrass	<i>Agrostis palustris</i>	10-15	98	85
Meadow foxtail	<i>Alepocurus pratensis</i>	10-15	90	80
Alsike clover	<i>Trifolium hybridum</i>	1-6	98	90
Redtop bentgrass	<i>Agrostis alba</i>	1-6	92	85
Meadow Seed Mix				
A recommended meadow seed mix for infrequently maintained areas or non-maintained areas where colonization by native plants is desirable. Likely applications include rural road and utility right-of-way. Seeding should take place in September or very early October in order to obtain adequate establishment prior to the winter months. Consider the appropriateness of clover, a fairly invasive species, in the mix. Amending the soil can reduce the need for clover.				
Redtop or Oregon bentgrass	<i>Agrostis alba</i> or <i>Agrostis oregonensis</i>	20	92	85
Red fescue	<i>Festuca rubra</i>	70	98	90
White dutch clover	<i>Trifolium repens</i>	10	98	90

Roughening and Rototilling

- The seedbed should be firm and rough. Roughen all soil no matter what the slope. Track walk slopes before seeding if engineering purposes require compaction. Backblading or smoothing of slopes greater than 4H:1V is not allowed if they are to be seeded.
- Restoration-based landscape practices require deeper incorporation than that provided by a simple single-pass rototilling treatment. Wherever practical, initially rip the subgrade to improve long-term permeability, infiltration, and water inflow qualities. At a minimum,

permanent areas shall use soil amendments to achieve organic matter and permeability performance defined in engineered soil/landscape systems. For systems that are deeper than 8 inches complete the rototilling process in multiple lifts, or prepare the engineered soil system per specifications and place to achieve the specified depth.

Fertilizers

- Conducting soil tests to determine the exact type and quantity of fertilizer is recommended. This will prevent the over-application of fertilizer.
- Organic matter is the most appropriate form of fertilizer because it provides nutrients (including nitrogen, phosphorus, and potassium) in the least water-soluble form.
- In general, use 10-4-6 N-P-K (nitrogen-phosphorus-potassium) fertilizer at a rate of 90 pounds per acre. Always use slow-release fertilizers because they are more efficient and have fewer environmental impacts. Do not add fertilizer to the hydromulch machine, or agitate, more than 20 minutes before use. Too much agitation destroys the slow-release coating.
- There are numerous products available that take the place of chemical fertilizers. These include several with seaweed extracts that are beneficial to soil microbes and organisms. If 100 percent cottonseed meal is used as the mulch in hydroseed, chemical fertilizer may not be necessary. Cottonseed meal provides a good source of long-term, slow-release, available nitrogen.

Bonded Fiber Matrix and Mechanically Bonded Fiber Matrix

- On steep slopes use Bonded Fiber Matrix (BFM) or Mechanically Bonded Fiber Matrix (MBFM) products. Apply BFM/MBFM products at a minimum rate of 3,000 pounds per acre with approximately 10 percent tackifier. Achieve a minimum of 95 percent soil coverage during application. Numerous products are available commercially. Most products require 24-36 hours to cure before rainfall and cannot be installed on wet or saturated soils. Generally, products come in 40-50 pound bags and include all necessary ingredients except for seed and fertilizer.
- Install products per manufacturer's instructions.
- BFMs and MBFMs provide good alternatives to blankets in most areas requiring vegetation establishment. Advantages over blankets include:
 - BFMs and MBFMs do not require surface preparation.
 - Helicopters can assist in installing BFM and MBFMs in remote areas.
 - On slopes steeper than 2.5H:1V, blanket installers may require ropes and harnesses for safety.
 - Installing BFM and MBFMs can save at least \$1,000 per acre compared to blankets.

Maintenance Standards

Reseed any seeded areas that fail to establish at least 75 percent cover (100 percent cover for areas that receive sheet or concentrated flows). If reseeding is ineffective, use an alternate method such as sodding, mulching, nets, or blankets.

- Reseed and protect by mulch any areas that experience erosion after achieving adequate cover. Reseed and protect by mulch any eroded area.
- Supply seeded areas with adequate moisture, but do not water to the extent that it causes run-off.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology’s website at:

<https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies>

BMP C122: Nets and Blankets

Purpose

Erosion control nets and blankets are intended to prevent erosion and hold seed and mulch in place on steep slopes and in channels so that vegetation can become well established. In addition, some nets and blankets can be used to permanently reinforce turf to protect drainage ways during high flows.

Nets (commonly called matting) are strands of material woven into an open, but high-tensile strength net (for example, coconut fiber matting). Blankets are strands of material that are not tightly woven, but instead form a layer of interlocking fibers, typically held together by a biodegradable or photodegradable netting (for example, excelsior or straw blankets). They generally have lower tensile strength than nets, but cover the ground more completely. Coir (coconut fiber) fabric comes as both nets and blankets.

Conditions of Use

Erosion control netting and blankets shall be made of natural plant fibers unaltered by synthetic materials.

Erosion control nets and blankets should be used:

- To aid permanent vegetated stabilization of slopes 2H:1V or greater and with more than 10 feet of vertical relief.
- For drainage ditches and swales (highly recommended). The application of appropriate netting or blanket to drainage ditches and swales can protect bare soil from channelized runoff while vegetation is established. Nets and blankets also can capture a great deal of sediment due to their open, porous structure. Nets and blankets can be used to permanently stabilize channels and may provide a cost-effective, environmentally preferable alternative to riprap.

Disadvantages of nets and blankets include:

- Surface preparation is required.
- On slopes steeper than 2.5H:1V, net and blanket installers may need to be roped and harnessed for safety.
- They cost at least \$4,000-6,000 per acre installed.

Advantages of nets and blankets include:

- Installation without mobilizing special equipment.
- Installation by anyone with minimal training
- Installation in stages or phases as the project progresses.
- Installers can hand place seed and fertilizer as they progress down the slope.
- Installation in any weather.
- There are numerous types of nets and blankets that can be designed with various parameters in mind. Those parameters include: fiber blend, mesh strength, longevity, biodegradability, cost, and availability.

An alternative to nets and blankets in some limited conditions is [BMP C202: Riprap Channel Lining](#). Ensure that [BMP C202: Riprap Channel Lining](#) is appropriate before using it as a substitute for nets and blankets.

Design and Installation Specifications

- See [Figure II-3.3: Channel Installation \(Clackamas County et al., 2008\)](#) and [Figure II-3.4: Slope Installation](#) for typical orientation and installation of nets and blankets used in channels and as slope protection. Note: these are typical only; all nets and blankets must be installed per manufacturer's installation instructions.
- Installation is critical to the effectiveness of these products. If good ground contact is not achieved, runoff can concentrate under the product, resulting in significant erosion.
- Installation of nets and blankets on slopes:
 1. Complete final grade and track walk up and down the slope.
 2. Install hydromulch with seed and fertilizer.
 3. Dig a small trench, approximately 12 inches wide by 6 inches deep along the top of the slope.
 4. Install the leading edge of the net/blanket into the small trench and staple approximately every 18 inches. NOTE: Staples are metal, "U"-shaped, and a minimum of 6 inches long. Longer staples are used in sandy soils. Biodegradable stakes are also available.
 5. Roll the net/blanket slowly down the slope as the installer walks backward. NOTE: The net/blanket rests against the installer's legs. Staples are installed as the net/blanket is unrolled. It is critical that the proper staple pattern is used for the net/blanket being installed. The net/blanket is not to be allowed to roll down the slope on its own as this stretches the net/blanket, making it impossible to maintain soil contact. In addition, no one is allowed to walk on the net/blanket after it is in place.
 6. If the net/blanket is not long enough to cover the entire slope length, the trailing edge of the upper net/blanket should overlap the leading edge of the lower net/blanket and be stapled. On steeper slopes, this overlap should be installed in a small trench, stapled, and covered with soil.
- With the variety of products available, it is impossible to cover all the details of appropriate use and installation. Therefore, it is critical that the designer consult the manufacturer's information and that a site visit takes place in order to ensure that the product specified is appropriate. Information is also available in WSDOT's *Standard Specifications for Road, Bridge, and Municipal Construction* Division 8-01 and Division 9-14 ([WSDOT, 2016](#)).
- Use jute matting in conjunction with mulch ([BMP C121: Mulching](#)). Excelsior, woven straw blankets and coir (coconut fiber) blankets may be installed without mulch. There are many other types of erosion control nets and blankets on the market that may be appropriate in certain circumstances.
- In general, most nets (e.g., jute matting) require mulch in order to prevent erosion because they have a fairly open structure. Blankets typically do not require mulch because they usually provide complete protection of the surface.
- Extremely steep, unstable, wet, or rocky slopes are often appropriate candidates for use of synthetic blankets, as are riverbanks, beaches and other high-energy environments. If

synthetic blankets are used, the soil should be hydromulched first.

- 100-percent biodegradable blankets are available for use in sensitive areas. These organic blankets are usually held together with a paper or fiber mesh and stitching which may last up to a year.
- Most netting used with blankets is photodegradable, meaning it breaks down under sunlight (not UV stabilized). However, this process can take months or years even under bright sun. Once vegetation is established, sunlight does not reach the mesh. It is not uncommon to find non-degraded netting still in place several years after installation. This can be a problem if maintenance requires the use of mowers or ditch cleaning equipment. In addition, birds and small animals can become trapped in the netting.

Maintenance Standards

- Maintain good contact with the ground. Erosion must not occur beneath the net or blanket.
- Repair and staple any areas of the net or blanket that are damaged or not in close contact with the ground.
- Fix and protect eroded areas if erosion occurs due to poorly controlled drainage.

Figure II-3.3: Channel Installation

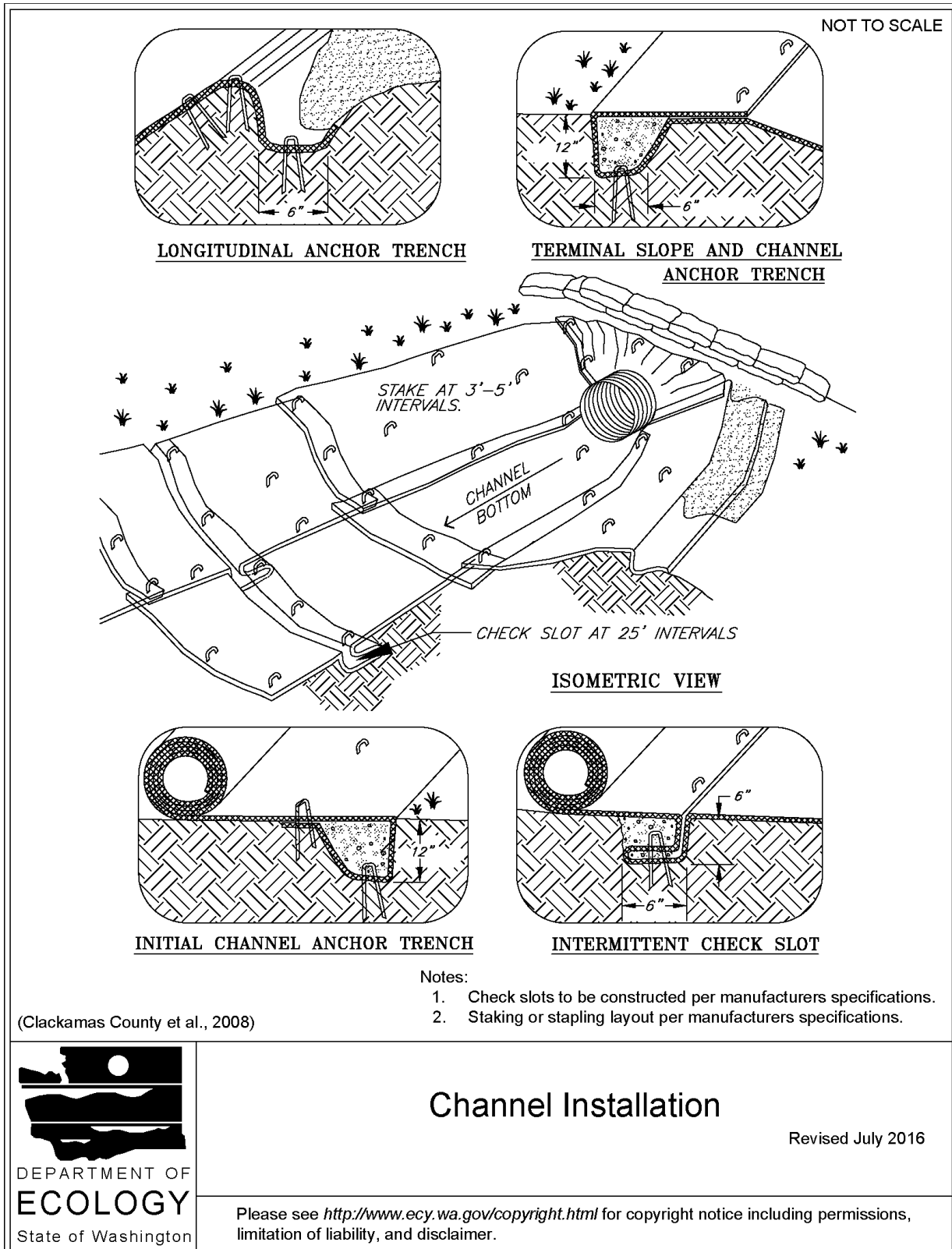
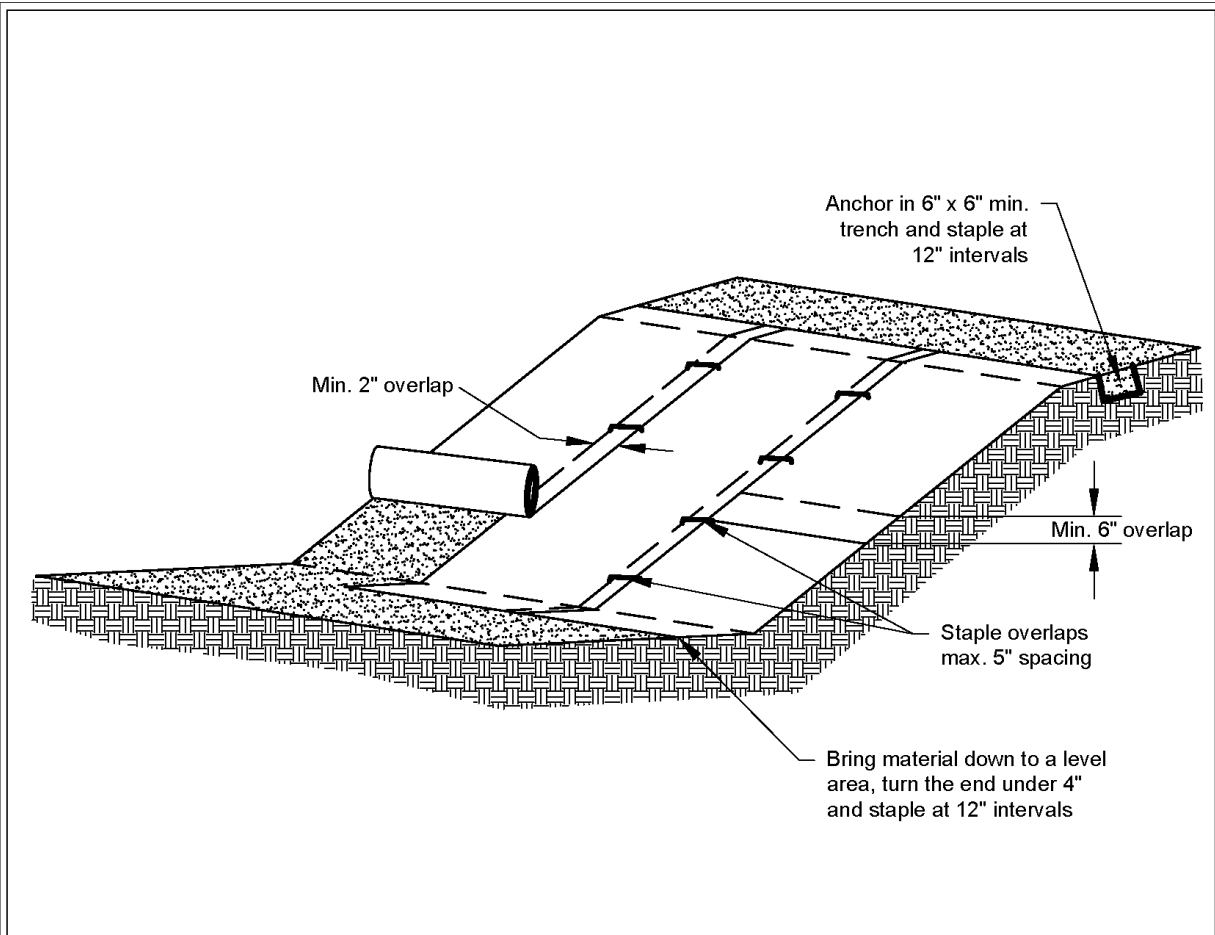


Figure II-3.4: Slope Installation



Notes:

1. Slope surface shall be smooth before placement for proper soil contact.
2. Stapling pattern as per manufacturer's recommendations.
3. Do not stretch blankets/matting tight - allow the rolls to mold to any irregularities.
4. For slopes less than 3H:1V, rolls may be placed in horizontal strips.
5. If there is a berm at the top of the slope, anchor upslope of the berm.
6. Lime, fertilize, and seed before installation. Planting of shrubs, trees, etc. should occur after installation.

NOT TO SCALE



Slope Installation

Revised June 2016

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BMP C125: Topsoiling / Composting

Purpose

Topsoiling and composting provide a suitable growth medium for final site stabilization with vegetation. While not a permanent cover practice in itself, topsoiling and composting are an integral component of providing permanent cover in those areas where there is an unsuitable soil surface for plant growth. Use this BMP in conjunction with other BMPs such as [BMP C120: Temporary and Permanent Seeding](#), [BMP C121: Mulching](#), or [BMP C124: Sodding](#). Implementation of this BMP may meet the post-construction requirements of [BMP T5.13: Post-Construction Soil Quality and Depth](#).

Native soils and disturbed soils that have been organically amended not only retain much more stormwater, but also serve as effective biofilters for urban pollutants and, by supporting more vigorous plant growth, reduce the water, fertilizer and pesticides needed to support installed landscapes. Topsoil does not include any subsoils but only the material from the top several inches including organic debris.

Conditions of Use

- Permanent landscaped areas shall contain healthy topsoil that reduces the need for fertilizers, improves overall topsoil quality, provides for better vegetative health and vitality, improves hydrologic characteristics, and reduces the need for irrigation.
- Leave native soils and the duff layer undisturbed to the maximum extent practicable. Stripping of existing, properly functioning soil system and vegetation for the purpose of topsoiling during construction is not acceptable. Preserve existing soil systems in undisturbed and uncompacted conditions if functioning properly.
- Areas that already have good topsoil, such as undisturbed areas, do not require soil amendments.
- Restore, to the maximum extent practical, native soils disturbed during clearing and grading to a condition equal to or better than the original site condition's moisture-holding capacity. Use on-site native topsoil, incorporate amendments into on-site soil, or import blended topsoil to meet this requirement.
- Topsoiling is a required procedure when establishing vegetation on shallow soils, and soils of critically low pH (high acid) levels.
- Beware of where the topsoil comes from, and what vegetation was on site before disturbance. Invasive plant seeds may be included and could cause problems for establishing native plants, landscaped areas, or grasses.
- Topsoil from the site will contain mycorrhizal bacteria that are necessary for healthy root growth and nutrient transfer. These native mycorrhiza are acclimated to the site and will provide optimum conditions for establishing grasses. Use commercially available mycorrhiza products when using off-site topsoil.

Design and Installation Specifications

Meet the following requirements for disturbed areas that will be developed as lawn or landscaped areas at the completed project site:

- Maximize the depth of the topsoil wherever possible to provide the maximum possible infiltration capacity and beneficial growth medium. Topsoil shall have:
 - A minimum depth of 8-inches. Scarify subsoils below the topsoil layer at least 4-inches with some incorporation of the upper material to avoid stratified layers, where feasible. Ripping or re-structuring the subgrade may also provide additional benefits regarding the overall infiltration and interflow dynamics of the soil system.
 - A minimum organic content of 10% dry weight in planting beds, and 5% organic matter content in turf areas. Incorporate organic amendments to a minimum 8-inch depth except where tree roots or other natural features limit the depth of incorporation.
 - A pH between 6.0 and 8.0 or matching the pH of the undisturbed soil.
 - If blended topsoil is imported, then fines should be limited to 25 percent passing through a 200 sieve.
- Mulch planting beds with 2 inches of organic material
- Accomplish the required organic content, depth, and pH by returning native topsoil to the site, importing topsoil of sufficient organic content, and/or incorporating organic amendments. When using the option of incorporating amendments to meet the organic content requirement, use compost that meets the compost specification for Bioretention (See [BMP T7.30: Bioretention](#)), with the exception that the compost may have up to 35% biosolids or manure.
- Sections 3 through 7 of *Building Soil: Guidelines and Resources for Implementing Soil Quality and Depth BMP T5.13 in WDOE Stormwater Management Manual for Western Washington* ([Stenn et al., 2016](#)), provides useful guidance for implementing whichever option is chosen. It includes guidance for pre-approved default strategies and guidance for custom strategies. Check with your local jurisdiction concerning its acceptance of this guidance.
- The final composition and construction of the soil system will result in a natural selection or favoring of certain plant species over time. For example, incorporation of topsoil may favor grasses, while layering with mildly acidic, high-carbon amendments may favor more woody vegetation.
- Allow sufficient time in scheduling for topsoil spreading prior to seeding, sodding, or planting.
- Take care when applying top soil to subsoils with contrasting textures. Sandy topsoil over clayey subsoil is a particularly poor combination, as water creeps along the junction between the soil layers and causes the topsoil to slough. If topsoil and subsoil are not properly bonded, water will not infiltrate the soil profile evenly and it will be difficult to establish vegetation. The best method to promote bonding is to actually work the topsoil into the layer below for a depth of at least 6 inches.
- Field exploration of the site shall be made to determine if there is surface soil of sufficient quantity and quality to justify stripping. Topsoil shall be friable and loamy (loam, sandy loam,

silt loam, sandy clay loam, and clay loam). Avoid areas of natural ground water recharge.

- Stripping shall be confined to the immediate construction area. A 4-inch to 6-inch stripping depth is common, but depth may vary depending on the particular soil. All surface runoff control structures shall be in place prior to stripping.
- Do not place topsoil while in a frozen or muddy condition, when the subgrade is excessively wet, or when conditions exist that may otherwise be detrimental to proper grading or proposed sodding or seeding.
- In any areas requiring grading, remove and stockpile the duff layer and topsoil on site in a designated, controlled area, not adjacent to public resources and critical areas. Reapply stockpiled topsoil to other portions of the site where feasible.
- Locate the topsoil stockpile so that it meets specifications and does not interfere with work on the site. It may be possible to locate more than one pile in proximity to areas where topsoil will be used.
- Stockpiling of topsoil shall occur in the following manner:
 - Side slopes of the stockpile shall not exceed 2H:1V.
 - Between October 1 and April 30:
 - An interceptor dike with gravel outlet and silt fence shall surround all topsoil.
 - Within 2 days complete erosion control seeding, or covering stockpiles with clear plastic, or other mulching materials.
 - Between May 1 and September 30:
 - An interceptor dike with gravel outlet and silt fence shall surround all topsoil if the stockpile will remain in place for a longer period of time than active construction grading.
 - Within 7 days complete erosion control seeding, or covering stockpiles with clear plastic, or other mulching materials.
- When native topsoil is to be stockpiled and reused the following should apply to ensure that the mycorrhizal bacterial, earthworms, and other beneficial organisms will not be destroyed:
 - Re-install topsoil within 4 to 6 weeks.
 - Do not allow the saturation of topsoil with water.
 - Do not use plastic covering.

Maintenance Standards

- Inspect stockpiles regularly, especially after large storm events. Stabilize any areas that have eroded.
- Establish soil quality and depth toward the end of construction and once established, protect from compaction, such as from large machinery use, and from erosion.

- Plant and mulch soil after installation.
- Leave plant debris or its equivalent on the soil surface to replenish organic matter.
- Reduce and adjust, where possible, the use of irrigation, fertilizers, herbicides and pesticides, rather than continuing to implement formerly established practices.

BMP C140: Dust Control

Purpose

Dust control prevents wind transport of dust from disturbed soil surfaces onto roadways, drainage ways, and surface waters.

Conditions of Use

Use dust control in areas (including roadways) subject to surface and air movement of dust where on-site or off-site impacts to roadways, drainage ways, or surface waters are likely.

Design and Installation Specifications

- Vegetate or mulch areas that will not receive vehicle traffic. In areas where planting, mulching, or paving is impractical, apply gravel or landscaping rock.
- Limit dust generation by clearing only those areas where immediate activity will take place, leaving the remaining area(s) in the original condition. Maintain the original ground cover as long as practical.
- Construct natural or artificial windbreaks or windscreens. These may be designed as enclosures for small dust sources.
- Sprinkle the site with water until the surface is wet. Repeat as needed. To prevent carryout of mud onto the street, refer to [BMP C 105: Stabilized Construction Access](#) and [BMP C 106: Wheel Wash](#).
- Irrigation water can be used for dust control. Irrigation systems should be installed as a first step on sites where dust control is a concern.
- Spray exposed soil areas with a dust palliative, following the manufacturer's instructions and cautions regarding handling and application. Used oil is prohibited from use as a dust suppressant. Local governments may approve other dust palliatives such as calcium chloride or PAM.
- PAM ([BMP C 126: Polyacrylamide \(PAM\) for Soil Erosion Protection](#)) added to water at a rate of 0.5 pounds per 1,000 gallons of water per acre and applied from a water truck is more effective than water alone. This is due to increased infiltration of water into the soil and reduced evaporation. In addition, small soil particles are bonded together and are not as easily transported by wind. Adding PAM may reduce the quantity of water needed for dust control. Note that the application rate specified here applies to this BMP, and is not the same application rate that is specified in [BMP C 126: Polyacrylamide \(PAM\) for Soil Erosion Protection](#), but the downstream protections still apply.

Refer to [BMP C 126: Polyacrylamide \(PAM\) for Soil Erosion Protection](#) for conditions of use. PAM shall not be directly applied to water or allowed to enter a water body.

- Contact your local Air Pollution Control Authority for guidance and training on other dust control measures. Compliance with the local Air Pollution Control Authority constitutes

compliance with this BMP.

- Use vacuum street sweepers.
- Remove mud and other dirt promptly so it does not dry and then turn into dust.
- Techniques that can be used for unpaved roads and lots include:
 - Lower speed limits. High vehicle speed increases the amount of dust stirred up from unpaved roads and lots.
 - Upgrade the road surface strength by improving particle size, shape, and mineral types that make up the surface and base materials.
 - Add surface gravel to reduce the source of dust emission. Limit the amount of fine particles (those smaller than .075 mm) to 10 to 20 percent.
 - Use geotextile fabrics to increase the strength of new roads or roads undergoing reconstruction.
 - Encourage the use of alternate, paved routes, if available.
 - Apply chemical dust suppressants using the admix method, blending the product with the top few inches of surface material. Suppressants may also be applied as surface treatments.
 - Limit dust-causing work on windy days.
 - Pave unpaved permanent roads and other trafficked areas.

Maintenance Standards

Respray area as necessary to keep dust to a minimum.

BMP C150: Materials on Hand

Purpose

Keep quantities of erosion prevention and sediment control materials on the project site at all times to be used for regular maintenance and emergency situations such as unexpected heavy rains. Having these materials on-site reduces the time needed to replace existing or implement new BMPs when inspections indicate that existing BMPs are not meeting the Construction SWPPP requirements. In addition, contractors can save money by buying some materials in bulk and storing them at their office or yard.

Conditions of Use

- Construction projects of any size or type can benefit from having materials on hand. A small commercial development project could have a roll of plastic and some gravel available for immediate protection of bare soil and temporary berm construction. A large earthwork project, such as highway construction, might have several tons of straw, several rolls of plastic, flexible

pipe, sandbags, geotextile fabric and steel “T” posts.

- Materials should be stockpiled and readily available before any site clearing, grubbing, or earthwork begins. A large contractor or project proponent could keep a stockpile of materials that are available for use on several projects.
- If storage space at the project site is at a premium, the contractor could maintain the materials at their office or yard. The office or yard must be less than an hour from the project site.

Design and Installation Specifications

Depending on project type, size, complexity, and length, materials and quantities will vary. A good minimum list of items that will cover numerous situations includes:

- Clear Plastic, 6 mil
- Drainpipe, 6 or 8 inch diameter
- Sandbags, filled
- Straw Bales for mulching
- Quarry Spalls
- Washed Gravel
- Geotextile Fabric
- Catch Basin Inserts
- Steel "T" Posts
- Silt fence material
- Straw Wattles

Maintenance Standards

- All materials with the exception of the quarry spalls, steel “T” posts, and gravel should be kept covered and out of both sun and rain.
- Re-stock materials as needed.

BMP C151: Concrete Handling

Purpose

Concrete work can generate process water and slurry that contain fine particles and high pH, both of which can violate water quality standards in the receiving water. Concrete spillage or concrete discharge to waters of the State is prohibited. Use this BMP to minimize and eliminate concrete, concrete process water, and concrete slurry from entering waters of the State.

Conditions of Use

Any time concrete is used, utilize these management practices. Concrete construction project components include, but are not limited to:

- Curbs
- Sidewalks
- Roads
- Bridges
- Foundations
- Floors
- Runways

Disposal options for concrete, in order of preference are:

1. Off-site disposal
2. Concrete wash-out areas (see [BMP C154: Concrete Washout Area](#))
3. De minimus washout to formed areas awaiting concrete

Design and Installation Specifications

- Wash concrete truck drums at an approved off-site location or in designated concrete washout areas only. Do not wash out concrete trucks onto the ground (including formed areas awaiting concrete), or into storm drains, open ditches, streets, or streams. Refer to [BMP C154: Concrete Washout Area](#) for information on concrete washout areas.
 - Return unused concrete remaining in the truck and pump to the originating batch plant for recycling. Do not dump excess concrete on site, except in designated concrete washout areas as allowed in [BMP C154: Concrete Washout Area](#).
- Wash small concrete handling equipment (e.g. hand tools, screeds, shovels, rakes, floats, trowels, and wheelbarrows) into designated concrete washout areas or into formed areas awaiting concrete pour.
- At no time shall concrete be washed off into the footprint of an area where an infiltration feature will be installed.
- Wash equipment difficult to move, such as concrete paving machines, in areas that do not directly drain to natural or constructed stormwater conveyance or potential infiltration areas.
- Do not allow washwater from areas, such as concrete aggregate driveways, to drain directly (without detention or treatment) to natural or constructed stormwater conveyances.
- Contain washwater and leftover product in a lined container when no designated concrete washout areas (or formed areas, allowed as described above) are available. Dispose of contained concrete and concrete washwater (process water) properly.

- Always use forms or solid barriers for concrete pours, such as pilings, within 15-feet of surface waters.
- Refer to [BMP C252: Treating and Disposing of High pH Water](#) for pH adjustment requirements.
- Refer to the Construction Stormwater General Permit (CSWGP) for pH monitoring requirements if the project involves one of the following activities:
 - Significant concrete work (as defined in the CSWGP).
 - The use of soils amended with (but not limited to) Portland cement-treated base, cement kiln dust or fly ash.
 - Discharging stormwater to segments of water bodies on the 303(d) list (Category 5) for high pH.

Maintenance Standards

Check containers for holes in the liner daily during concrete pours and repair the same day.

BMP C152: Sawcutting and Surfacing Pollution Prevention

Purpose

Sawcutting and surfacing operations generate slurry and process water that contains fine particles and high pH (concrete cutting), both of which can violate the water quality standards in the receiving water. Concrete spillage or concrete discharge to waters of the State is prohibited. Use this BMP to minimize and eliminate process water and slurry created through sawcutting or surfacing from entering waters of the State.

Conditions of Use

Utilize these management practices anytime sawcutting or surfacing operations take place. Sawcutting and surfacing operations include, but are not limited to:

- Sawing
- Coring
- Grinding
- Roughening
- Hydro-demolition
- Bridge and road surfacing

Design and Installation Specifications

- Vacuum slurry and cuttings during cutting and surfacing operations.
- Slurry and cuttings shall not remain on permanent concrete or asphalt pavement overnight.
- Slurry and cuttings shall not drain to any natural or constructed drainage conveyance including stormwater systems. This may require temporarily blocking catch basins.
- Dispose of collected slurry and cuttings in a manner that does not violate ground water or surface water quality standards.
- Do not allow process water generated during hydro-demolition, surface roughening or similar operations to drain to any natural or constructed drainage conveyance including stormwater systems. Dispose of process water in a manner that does not violate ground water or surface water quality standards.
- Handle and dispose of cleaning waste material and demolition debris in a manner that does not cause contamination of water. Dispose of sweeping material from a pick-up sweeper at an appropriate disposal site.

Maintenance Standards

Continually monitor operations to determine whether slurry, cuttings, or process water could enter waters of the state. If inspections show that a violation of water quality standards could occur, stop operations and immediately implement preventive measures such as berms, barriers, secondary containment, and/or vacuum trucks.

BMP C153: Material Delivery, Storage, and Containment

Purpose

Prevent, reduce, or eliminate the discharge of pollutants to the stormwater system or watercourses from material delivery and storage. Minimize the storage of hazardous materials on-site, store materials in a designated area, and install secondary containment.

Conditions of Use

Use at construction sites with delivery and storage of the following materials:

- Petroleum products such as fuel, oil and grease
- Soil stabilizers and binders (e.g., Polyacrylamide)
- Fertilizers, pesticides and herbicides
- Detergents
- Asphalt and concrete compounds

- Hazardous chemicals such as acids, lime, adhesives, paints, solvents, and curing compounds
- Any other material that may be detrimental if released to the environment

Design and Installation Specifications

- The temporary storage area should be located away from vehicular traffic, near the construction entrance(s), and away from waterways or storm drains.
- Safety Data Sheets (SDS) should be supplied for all materials stored. Chemicals should be kept in their original labeled containers.
- Hazardous material storage on-site should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- During the wet weather season (Oct 1 – April 30), consider storing materials in a covered area.
- Materials should be stored in secondary containments, such as an earthen dike, horse trough, or even a children’s wading pool for non-reactive materials such as detergents, oil, grease, and paints. Small amounts of material may be secondarily contained in “bus boy” trays or concrete mixing trays.
- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and, when possible, within secondary containment.
- If drums must be kept uncovered, store them at a slight angle to reduce ponding of rainwater on the lids to reduce corrosion. Domed plastic covers are inexpensive and snap to the top of drums, preventing water from collecting.
- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 shall be stored in approved containers and drums and shall not be overfilled. Containers and drums shall be stored in temporary secondary containment facilities.
- Temporary secondary containment facilities shall provide for a spill containment volume able to contain 10% of the total enclosed container volume of all containers, or 110% of the capacity of the largest container within its boundary, whichever is greater.
- Secondary containment facilities shall be impervious to the materials stored therein for a minimum contact time of 72 hours.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- During the wet weather season (Oct 1 – April 30), each secondary containment facility shall be covered during non-working days, prior to and during rain events.
- Keep material storage areas clean, organized and equipped with an ample supply of appropriate spill clean-up material (spill kit).
- The spill kit should include, at a minimum:

- 1-Water Resistant Nylon Bag
- 3-Oil Absorbent Socks 3"x 4'
- 2-Oil Absorbent Socks 3"x 10'
- 12-Oil Absorbent Pads 17"x19"
- 1-Pair Splash Resistant Goggles
- 3-Pair Nitrile Gloves
- 10-Disposable Bags with Ties
- Instructions

Maintenance Standards

- Secondary containment facilities shall be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills shall be collected and placed into drums. These liquids shall be handled as hazardous waste unless testing determines them to be non-hazardous.
- Re-stock spill kit materials as needed.

BMP C154: Concrete Washout Area

Purpose

Prevent or reduce the discharge of pollutants from concrete waste to stormwater by conducting washout off-site, or performing on-site washout in a designated area.

Conditions of Use

Concrete washout areas are implemented on construction projects where:

- Concrete is used as a construction material
- It is not possible to dispose of all concrete wastewater and washout off-site (ready mix plant, etc.).
- Concrete truck drums are washed on-site.

Note that auxiliary concrete truck components (e.g. chutes and hoses) and small concrete handling equipment (e.g. hand tools, screeds, shovels, rakes, floats, trowels, and wheelbarrows) may be washed into formed areas awaiting concrete pour.

At no time shall concrete be washed off into the footprint of an area where an infiltration feature will be installed.

Design and Installation Specifications

Implementation

- Perform washout of concrete truck drums at an approved off-site location or in designated concrete washout areas only.
- Do not wash out concrete onto non-formed areas, or into storm drains, open ditches, streets, or streams.
- Wash equipment difficult to move, such as concrete paving machines, in areas that do not directly drain to natural or constructed stormwater conveyance or potential infiltration areas.
- Do not allow excess concrete to be dumped on-site, except in designated concrete washout areas as allowed above.
- Concrete washout areas may be prefabricated concrete washout containers, or self-installed structures (above-grade or below-grade).
- Prefabricated containers are most resistant to damage and protect against spills and leaks. Companies may offer delivery service and provide regular maintenance and disposal of solid and liquid waste.
- If self-installed concrete washout areas are used, below-grade structures are preferred over above-grade structures because they are less prone to spills and leaks.
- Self-installed above-grade structures should only be used if excavation is not practical.
- Concrete washout areas shall be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

Education

- Discuss the concrete management techniques described in this BMP with the ready-mix concrete supplier before any deliveries are made.
- Educate employees and subcontractors on the concrete waste management techniques described in this BMP.
- Arrange for the contractor's superintendent or Certified Erosion and Sediment Control Lead (CESCL) to oversee and enforce concrete waste management procedures.
- A sign should be installed adjacent to each concrete washout area to inform concrete equipment operators to utilize the proper facilities.

Contracts

Incorporate requirements for concrete waste management into concrete supplier and subcontractor agreements.

Location and Placement

- Locate concrete washout areas at least 50 feet from sensitive areas such as storm drains, open ditches, water bodies, or wetlands.
- Allow convenient access to the concrete washout area for concrete trucks, preferably near the area where the concrete is being poured.
- If trucks need to leave a paved area to access the concrete washout area, prevent track-out with a pad of rock or quarry spalls (see [BMP C 105: Stabilized Construction Access](#)). These areas should be far enough away from other construction traffic to reduce the likelihood of accidental damage and spills.
- The number of concrete washout areas you install should depend on the expected demand for storage capacity.
- On large sites with extensive concrete work, concrete washout areas should be placed in multiple locations for ease of use by concrete truck drivers.

Concrete Truck Washout Procedures

- Washout of concrete truck drums shall be performed in designated concrete washout areas only.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated concrete washout areas or properly disposed of off-site.

Concrete Washout Area Installation

- Concrete washout areas should be constructed as shown in the figures below, with a recommended minimum length and minimum width of 10 ft, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
- Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
- Lath and flagging should be commercial type.
- Liner seams shall be installed in accordance with manufacturers' recommendations.
- Soil base shall be prepared free of rocks or other debris that may cause tears or holes in the plastic lining material.

Maintenance Standards

Inspection and Maintenance

- Inspect and verify that concrete washout areas are in place prior to the commencement of concrete work.
- Once concrete wastes are washed into the designated washout area and allowed to harden,

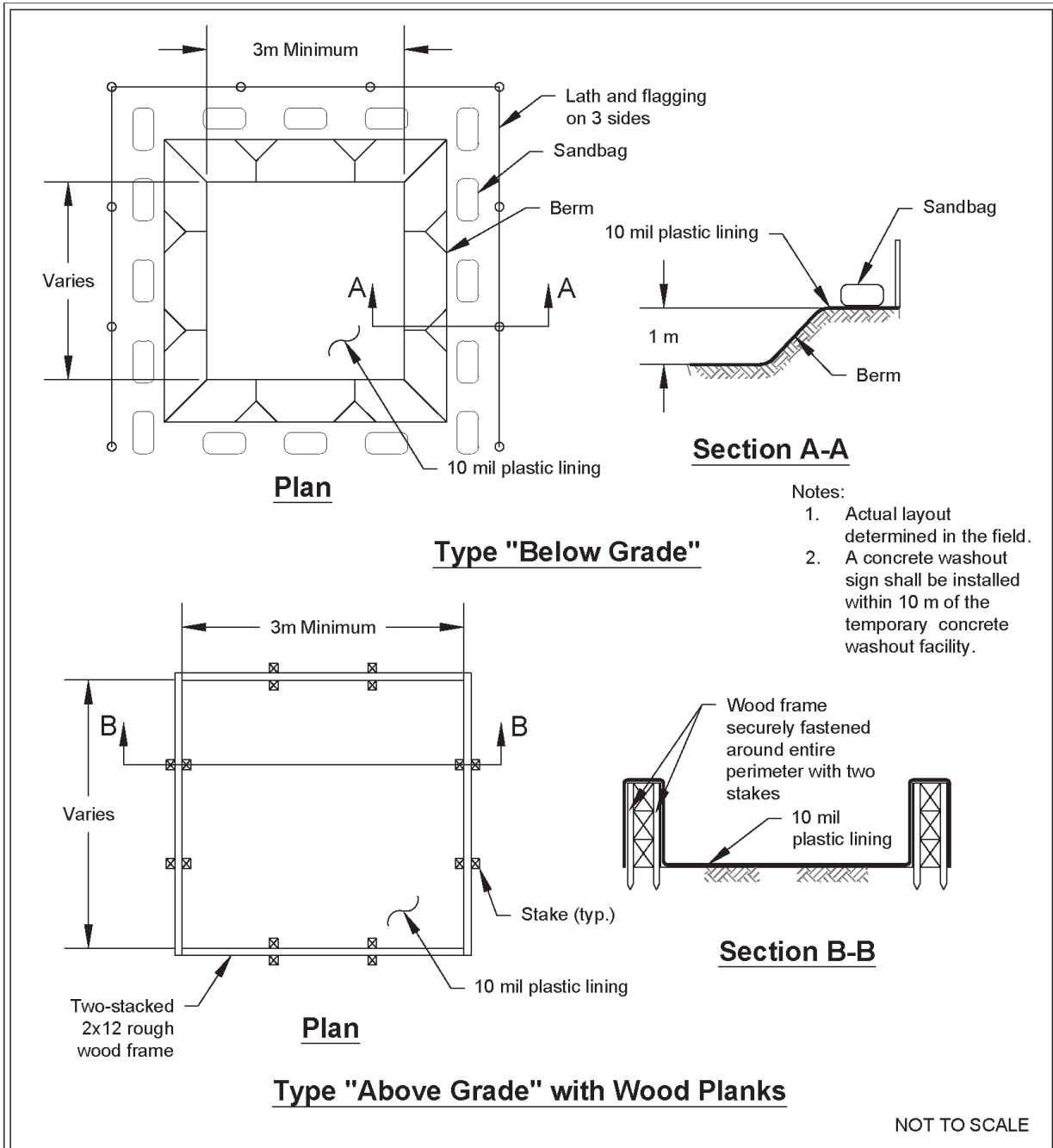
the concrete should be broken up, removed, and disposed of per applicable solid waste regulations. Dispose of hardened concrete on a regular basis.

- During periods of concrete work, inspect the concrete washout areas daily to verify continued performance.
 - Check overall condition and performance.
 - Check remaining capacity (% full).
 - If using self-installed concrete washout areas, verify plastic liners are intact and side-walls are not damaged.
 - If using prefabricated containers, check for leaks.
- Maintain the concrete washout areas to provide adequate holding capacity with a minimum freeboard of 12 inches.
- Concrete washout areas must be cleaned, or new concrete washout areas must be constructed and ready for use once the concrete washout area is 75% full.
- If the concrete washout area is nearing capacity, vacuum and dispose of the waste material in an approved manner.
 - Do not discharge liquid or slurry to waterways, storm drains or directly onto ground.
 - Do not discharge to the sanitary sewer without local approval.
 - Place a secure, non-collapsing, non-water collecting cover over the concrete washout area prior to predicted wet weather to prevent accumulation and overflow of precipitation.
 - Remove and dispose of hardened concrete and return the structure to a functional condition. Concrete may be reused on-site or hauled away for disposal or recycling.
- When you remove materials from a self-installed concrete washout area, build a new structure; or, if the previous structure is still intact, inspect for signs of weakening or damage, and make any necessary repairs. Re-line the structure with new plastic after each cleaning.

Removal of Concrete Washout Areas

- When concrete washout areas are no longer required for the work, the hardened concrete, slurries and liquids shall be removed and properly disposed of.
- Materials used to construct concrete washout areas shall be removed from the site of the work and disposed of or recycled.
- Holes, depressions or other ground disturbance caused by the removal of the concrete washout areas shall be backfilled, repaired, and stabilized to prevent erosion.

Figure II-3.7: Concrete Washout Area with Wood Planks

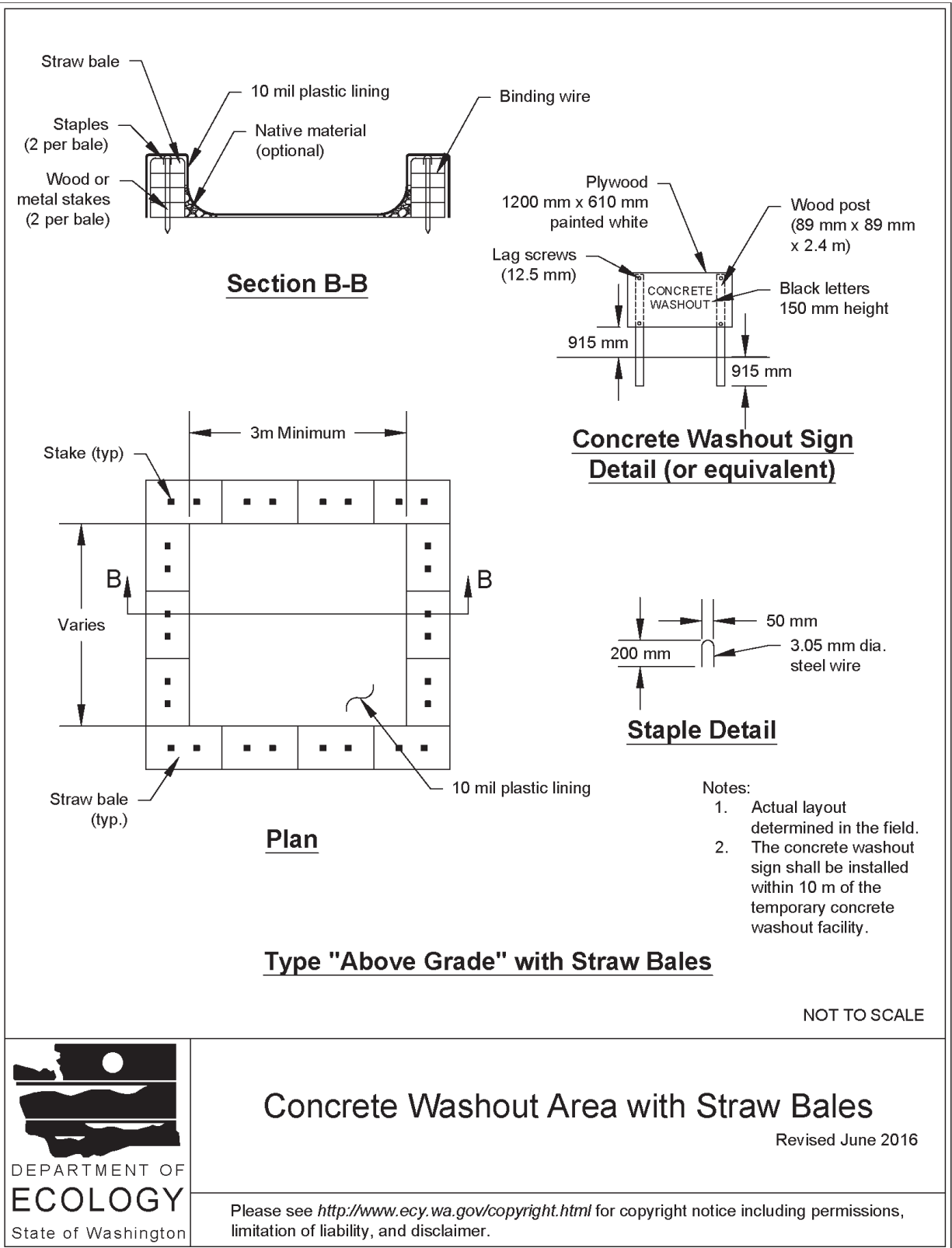


Concrete Washout Area with Wood Planks

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Figure II-3.8: Concrete Washout Area with Straw Bales

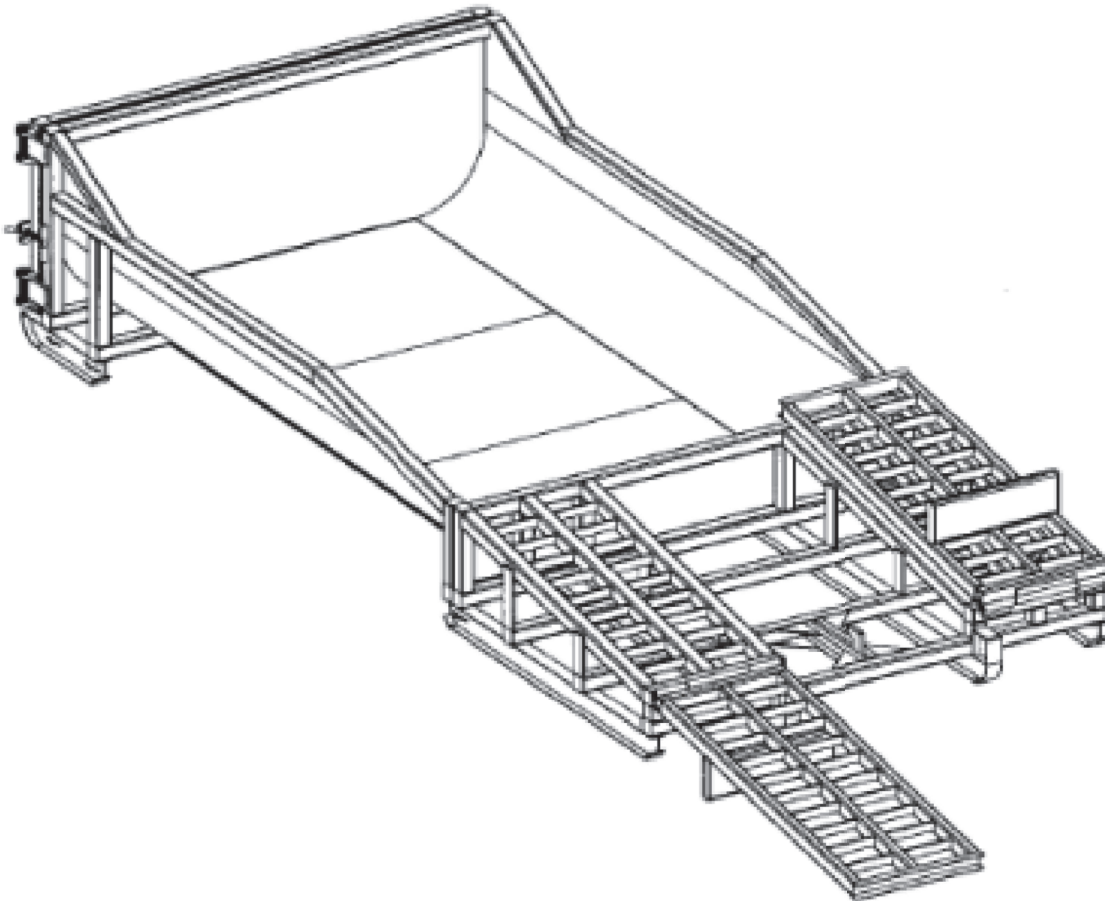


Concrete Washout Area with Straw Bales

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Figure II-3.9: Prefabricated Concrete Washout Container w/Ramp



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Prefabricated Concrete Washout Container w/Ramp

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BMP C160: Certified Erosion and Sediment Control Lead

Purpose

The project proponent designates at least one person as the responsible representative in charge of erosion and sediment control (ESC), and water quality protection. The designated person shall be responsible for ensuring compliance with all local, state, and federal erosion and sediment control and water quality requirements. Construction sites one acre or larger that discharge to waters of the State must designate a Certified Erosion and Sediment Control Lead (CESCL) as the responsible representative.

Conditions of Use

A CESCL shall be made available on projects one acre or larger that discharge stormwater to surface waters of the state. Sites less than one acre may have a person without CESCL certification conduct inspections.

The CESCL shall:

- Have a current certificate proving attendance in an erosion and sediment control training course that meets the minimum ESC training and certification requirements established by Ecology.

Ecology has provided the minimum requirements for CESCL course training, as well as a list of ESC training and certification providers at:

<https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Certified-erosion-sediment-control>

OR

- Be a Certified Professional in Erosion and Sediment Control (CPESC). For additional information go to:

<http://www.envirocertintl.org/cpesc/>

Specifications

- CESCL certification shall remain valid for three years.
- The CESCL shall have authority to act on behalf of the contractor or project proponent and shall be available, or on-call, 24 hours per day throughout the period of construction.
- The Construction SWPPP shall include the name, telephone number, fax number, and address of the designated CESCL. See [II-2 Construction Stormwater Pollution Prevention Plans \(Construction SWPPPs\)](#).
- A CESCL may provide inspection and compliance services for multiple construction projects in the same geographic region, but must be on site whenever earthwork activities are

occurring that could generate release of turbid water.

- Duties and responsibilities of the CESCL shall include, but are not limited to the following:
 - Maintaining a permit file on site at all times which includes the Construction SWPPP and any associated permits and plans.
 - Directing BMP installation, inspection, maintenance, modification, and removal.
 - Updating all project drawings and the Construction SWPPP with changes made.
 - Completing any sampling requirements including reporting results using electronic Discharge Monitoring Reports (WebDMR).
 - Facilitate, participate in, and take corrective actions resulting from inspections performed by outside agencies or the owner.
 - Keeping daily logs, and inspection reports. Inspection reports should include:
 - Inspection date/time.
 - Weather information; general conditions during inspection and approximate amount of precipitation since the last inspection.
 - Visual monitoring results, including a description of discharged stormwater. The presence of suspended sediment, turbid water, discoloration, and oil sheen shall be noted, as applicable.
 - Any water quality monitoring performed during inspection.
 - General comments and notes, including a brief description of any BMP repairs, maintenance or installations made as a result of the inspection.
 - A summary or list of all BMPs implemented, including observations of all erosion/sediment control structures or practices. The following shall be noted:
 1. Locations of BMPs inspected.
 2. Locations of BMPs that need maintenance.
 3. Locations of BMPs that failed to operate as designed or intended.
 4. Locations of where additional or different BMPs are required.

BMP C162: Scheduling

Purpose

Sequencing a construction project reduces the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking.

Conditions of Use

The construction sequence schedule is an orderly listing of all major land-disturbing activities together with the necessary erosion and sedimentation control measures planned for the project. This type of schedule guides the contractor on work to be done before other work is started so that serious erosion and sedimentation problems can be avoided.

Following a specified work schedule that coordinates the timing of land-disturbing activities and the installation of control measures is perhaps the most cost-effective way of controlling erosion during construction. The removal of ground cover leaves a site vulnerable to erosion. Construction sequencing that limits land clearing, provides timely installation of erosion and sedimentation controls, and restores protective cover quickly can significantly reduce the erosion potential of a site.

Design Considerations

- Minimize construction during rainy periods.
- Schedule projects to disturb only small portions of the site at any one time. Complete grading as soon as possible. Immediately stabilize the disturbed portion before grading the next portion. Practice staged seeding in order to revegetate cut and fill slopes as the work progresses.

BMP C202: Riprap Channel Lining

Purpose

To protect channels by providing a channel liner using riprap.

Conditions of Use

Use this BMP when natural soils or vegetated stabilized soils in a channel are not adequate to prevent channel erosion.

Use this BMP when a permanent ditch or pipe system is to be installed and a temporary measure is needed.

An alternative to riprap channel lining is [BMP C122: Nets and Blankets](#).

The Federal Highway Administration recommends not using geotextile liners whenever the slope exceeds 10 percent or the shear stress exceeds 8 lbs/ft².

Design and Installation Specifications

- Since riprap is typically used where erosion potential is high, construction must be sequenced so that the riprap is put in place with the minimum possible delay.
- Disturb areas awaiting riprap only when final preparation and placement of the riprap can follow immediately behind the initial disturbance. Where riprap is used for outlet protection, the riprap should be placed before or in conjunction with the construction of the pipe or channel so that it is in place when the pipe or channel begins to operate.
- The designer, after determining the riprap size that will be stable under the flow conditions, shall consider that size to be a minimum size and then, based on riprap gradations actually available in the area, select the size or sizes that equal or exceed the minimum size. The possibility of drainage structure damage by others shall be considered in selecting a riprap size, especially if there is nearby water or a gully in which to toss the stones.
- Stone for riprap shall consist of field stone or quarry stone of approximately rectangular shape. The stone shall be hard and angular and of such quality that it will not disintegrate on exposure to water or weathering and it shall be suitable in all respects for the purpose intended. See Section 9-13 of WSDOT's *Standard Specifications for Road, Bridge, and Municipal Construction* ([WSDOT, 2016](#)).
- A lining of engineering filter fabric (geotextile) shall be placed between the riprap and the underlying soil surface to prevent soil movement into or through the riprap. The geotextile should be keyed in at the top of the bank.
- Filter fabric shall not be used on slopes greater than 1.5H:1V as slippage may occur. It should be used in conjunction with a layer of coarse aggregate (granular filter blanket) when the riprap to be placed is 12 inches and larger.

Maintenance Standards

Replace riprap as needed.

BMP C203: Water Bars

Purpose

A water bar is a small ditch or ridge of material that is constructed diagonally across a road or right-of-way to divert stormwater runoff from the road surface, wheel tracks, or a shallow road ditch. See [Figure II-3.12: Water Bar](#).

Conditions of Use

Clearing right-of-way and construction of access for power lines, pipelines, and other similar installations often require long narrow right-of-ways over sloping terrain. Disturbance and compaction promotes gully formation in these cleared strips by increasing the volume and velocity of runoff. Gully formation may be especially severe in tire tracks and ruts. To prevent gullying, runoff can often be diverted across the width of the right-of-way to undisturbed areas by using small predesigned diversions.

Give special consideration to each individual outlet area, as well as to the cumulative effect of added diversions. Use gravel to stabilize the diversion where significant vehicular traffic is anticipated.

Design and Installation Specifications

- Height: 8-inch minimum, measured from the channel bottom to the ridge top.
- Side slope of channel: 2H:1V maximum; 3H:1V or flatter when vehicles will cross.
- Top width of ridge: 6-inch minimum.
- Locate water bars to use natural drainage systems and to discharge into well vegetated stable areas.
- See [Table II-3.9: Water Bar Spacing Guidelines](#):

Table II-3.9: Water Bar Spacing Guidelines

Slope Along Road (%)	Spacing (ft)
< 5	125
5 - 10	100
10 - 20	75
20 - 35	50
> 35	Use rock lined ditch

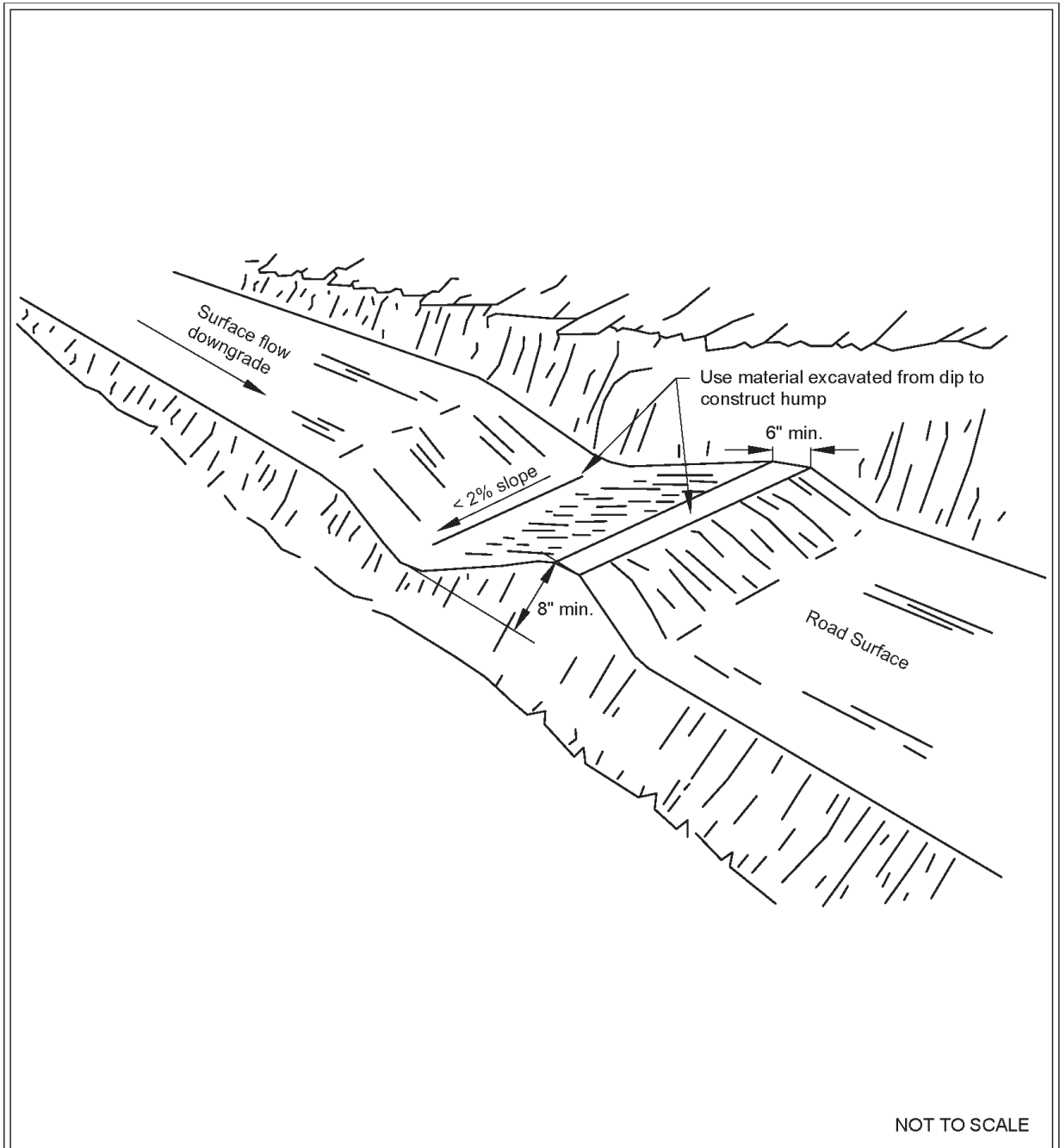
- Grade of water bar and angle: Select an angle that results in a ditch slope less than 2 percent.
- Install the water bar as soon as the clearing and grading is complete. When utilities are being installed, reconstruct the water bar as construction is complete in each section.
- Compact the water bar ridge.
- Stabilize, seed, and mulch the portions that are not subject to traffic. Gravel the areas crossed by vehicles.
- Note that [BMP C208: Triangular Silt Dike \(TSD\)](#) can be used to create the ridge for the water bar.

Maintenance Standards

Periodically inspect water bars after every heavy rainfall for wear and erosion damage.

- Immediately remove sediment from the flow area and repair the dike.
- Check outlet areas and make timely repairs as needed.
- When permanent road drainage is established and the area above the temporary water bar is permanently stabilized, remove the dikes and fill the channel to blend with the natural ground, and appropriately stabilize the disturbed area.

Figure II-3.12: Water Bar



Water Bar

Revised July 2017

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BMP C207: Check Dams

Purpose

Construction of check dams across a swale or ditch reduces the velocity of concentrated flow and dissipates energy at the check dam.

Conditions of Use

Use check dams where temporary or permanent channels are not yet vegetated, channel lining is infeasible, and/or velocity checks are required.

- Check dams may not be placed in streams unless approved by the State Department of Fish and Wildlife.
- Check dams may not be placed in wetlands without approval from a permitting agency.
- Do not place check dams below the expected backwater from any salmonid bearing water between October 1 and May 31 to ensure that there is no loss of high flow refuge habitat for overwintering juvenile salmonids and emergent salmonid fry.

Design and Installation Specifications

- Construct rock check dams from appropriately sized rock. The rock used must be large enough to stay in place given the expected design flow through the channel. The rock must be placed by hand or by mechanical means (do not dump the rock to form the dam) to achieve complete coverage of the ditch or swale and to ensure that the center of the dam is lower than the edges.
- Check dams may also be constructed of either rock or pea-gravel filled bags. Numerous new products are also available for this purpose. They tend to be re-usable, quick and easy to install, effective, and cost efficient.
- Place check dams perpendicular to the flow of water.
- The check dam should form a triangle when viewed from the side. This prevents undercutting as water flows over the face of the check dam rather than falling directly onto the ditch bottom.
- Before installing check dams, impound and bypass upstream water flow away from the work area. Options for bypassing include pumps, siphons, or temporary channels.
- Check dams combined with sumps work more effectively at slowing flow and retaining sediment than a check dam alone. A deep sump should be provided immediately upstream of the check dam.
- In some cases, if carefully located and designed, check dams can remain as permanent installations with very minor regrading. They may be left as either spillways, in which case accumulated sediment would be graded and seeded, or as check dams to prevent further sediment from leaving the site.
- The maximum spacing between check dams shall be such that the downstream toe of the

upstream dam is at the same elevation as the top of the downstream dam.

- Keep the maximum height at 2 feet at the center of the check dam.
- Keep the center of the check dam at least 12 inches lower than the outer edges at natural ground elevation.
- Keep the side slopes of the check dam at 2H:1V or flatter.
- Key the stone into the ditch banks and extend it beyond the abutments a minimum of 18 inches to avoid washouts from overflow around the dam.
- Use filter fabric foundation under a rock or sand bag check dam. If a blanket ditch liner is used, filter fabric is not necessary. A piece of organic or synthetic blanket cut to fit will also work for this purpose.
- In the case of grass-lined ditches and swales, all check dams and accumulated sediment shall be removed when the grass has matured sufficiently to protect the ditch or swale - unless the slope of the swale is greater than 4 percent. The area beneath the check dams shall be seeded and mulched immediately after dam removal.
- Ensure that channel appurtenances, such as culvert entrances below check dams, are not subject to damage or blockage from displaced stones.
- See [Figure II-3.16: Rock Check Dam](#).

Maintenance Standards

Check dams shall be monitored for performance and sediment accumulation during and after each rainfall that produces runoff. Sediment shall be removed when it reaches one half the sump depth.

- Anticipate submergence and deposition above the check dam and erosion from high flows around the edges of the dam.
- If significant erosion occurs between dams, install a protective riprap liner in that portion of the channel. See [BMP C202: Riprap Channel Lining](#).

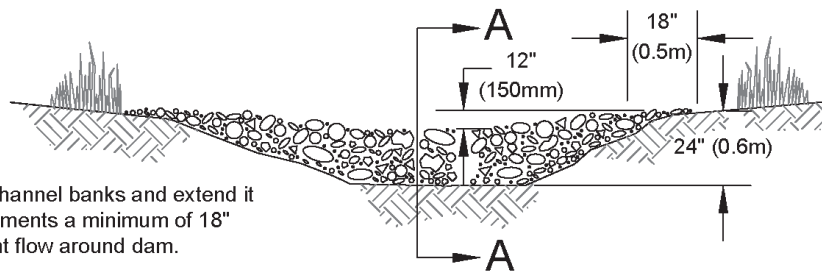
Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

<https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies>

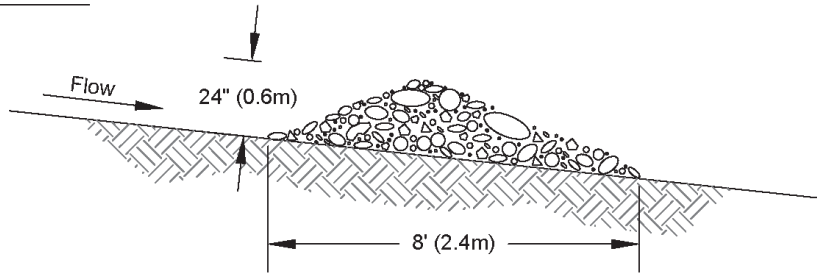
Figure II-3.16: Rock Check Dam

View Looking Upstream

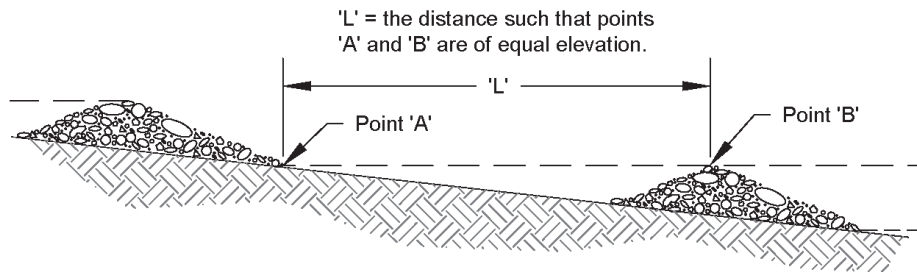


Note:
Key stone into channel banks and extend it beyond the abutments a minimum of 18" (0.5m) to prevent flow around dam.

Section A-A



Spacing Between Check Dams



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Rock Check Dam

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BMP C209: Outlet Protection

Purpose

Outlet protection prevents scour at conveyance outlets and minimizes the potential for downstream erosion by reducing the velocity of concentrated stormwater flows.

Conditions of Use

Use outlet protection at the outlets of all ponds, pipes, ditches, or other conveyances that discharge to a natural or manmade drainage feature such as a stream, wetland, lake, or ditch.

Design and Installation Specifications

- The receiving channel at the outlet of a pipe shall be protected from erosion by lining a minimum of 6 feet downstream and extending up the channel sides a minimum of 1-foot above the maximum tailwater elevation, or 1-foot above the crown, whichever is higher. For pipes larger than 18 inches in diameter, the outlet protection lining of the channel shall be four times the diameter of the outlet pipe.
- Standard wingwalls, tapered outlets, and paved channels should also be considered when appropriate for permanent culvert outlet protection ([WSDOT, 2015](#)).
- [BMP C122: Nets and Blankets](#) or [BMP C202: Riprap Channel Lining](#) provide suitable options for lining materials.
- With low flows, [BMP C201: Grass-Lined Channels](#) can be an effective alternative for lining material.
- The following guidelines shall be used for outlet protection with riprap:
 - If the discharge velocity at the outlet is less than 5 fps, use 2-inch to 8-inch riprap. Minimum thickness is 1-foot.
 - For 5 to 10 fps discharge velocity at the outlet, use 24-inch to 48-inch riprap. Minimum

thickness is 2 feet.

- For outlets at the base of steep slope pipes (pipe slope greater than 10 percent), use an engineered energy dissipator.
- Filter fabric or erosion control blankets should always be used under riprap to prevent scour and channel erosion. See [BMP C122: Nets and Blankets](#).
- Bank stabilization, bioengineering, and habitat features may be required for disturbed areas. This work may require a Hydraulic Project Approval (HPA) from the Washington State Department of Fish and Wildlife. See [I-2.11 Hydraulic Project Approvals](#).

Maintenance Standards

- Inspect and repair as needed.
- Add rock as needed to maintain the intended function.
- Clean energy dissipator if sediment builds up.

BMP C220: Inlet Protection

Purpose

Inlet protection prevents coarse sediment from entering drainage systems prior to permanent stabilization of the disturbed area.

Conditions of Use

Use inlet protection at inlets that are operational before permanent stabilization of the disturbed areas that contribute runoff to the inlet. Provide protection for all storm drain inlets downslope and within 500 feet of a disturbed or construction area, unless those inlets are preceded by a sediment trapping BMP.

Also consider inlet protection for lawn and yard drains on new home construction. These small and numerous drains coupled with lack of gutters can add significant amounts of sediment into the roof drain system. If possible, delay installing lawn and yard drains until just before landscaping, or cap these drains to prevent sediment from entering the system until completion of landscaping. Provide 18-inches of sod around each finished lawn and yard drain.

[Table II-3.10: Storm Drain Inlet Protection](#) lists several options for inlet protection. All of the methods for inlet protection tend to plug and require a high frequency of maintenance. Limit contributing drainage areas for an individual inlet to one acre or less. If possible, provide emergency overflows with additional end-of-pipe treatment where stormwater ponding would cause a hazard.

Table II-3.10: Storm Drain Inlet Protection

Type of Inlet Protection	Emergency Overflow	Applicable for Paved/ Earthen Surfaces	Conditions of Use
Drop Inlet Protection			
Excavated drop inlet protection	Yes, temporary flooding may occur	Earthen	Applicable for heavy flows. Easy to maintain. Large area requirement: 30'x30'/acre
Block and gravel drop inlet protection	Yes	Paved or Earthen	Applicable for heavy concentrated flows. Will not pond.
Gravel and wire drop inlet protection	No	Paved or Earthen	Applicable for heavy concentrated flows. Will pond. Can withstand traffic.
Catch basin filters	Yes	Paved or Earthen	Frequent maintenance required.
Curb Inlet Protection			
Curb inlet protection with wooden weir	Small capacity overflow	Paved	Used for sturdy, more compact installation.
Block and gravel curb inlet protection	Yes	Paved	Sturdy, but limited filtration.
Culvert Inlet Protection			
Culvert inlet sediment trap	N/A	N/A	18 month expected life.

Design and Installation Specifications

Excavated Drop Inlet Protection

Excavated drop inlet protection consists of an excavated impoundment around the storm drain inlet. Sediment settles out of the stormwater prior to entering the storm drain. Design and installation specifications for excavated drop inlet protection include:

- Provide a depth of 1-2 ft as measured from the crest of the inlet structure.
- Slope sides of excavation should be no steeper than 2H:1V.
- Minimum volume of excavation is 35 cubic yards.
- Shape the excavation to fit the site, with the longest dimension oriented toward the longest inflow area.
- Install provisions for draining to prevent standing water.
- Clear the area of all debris.

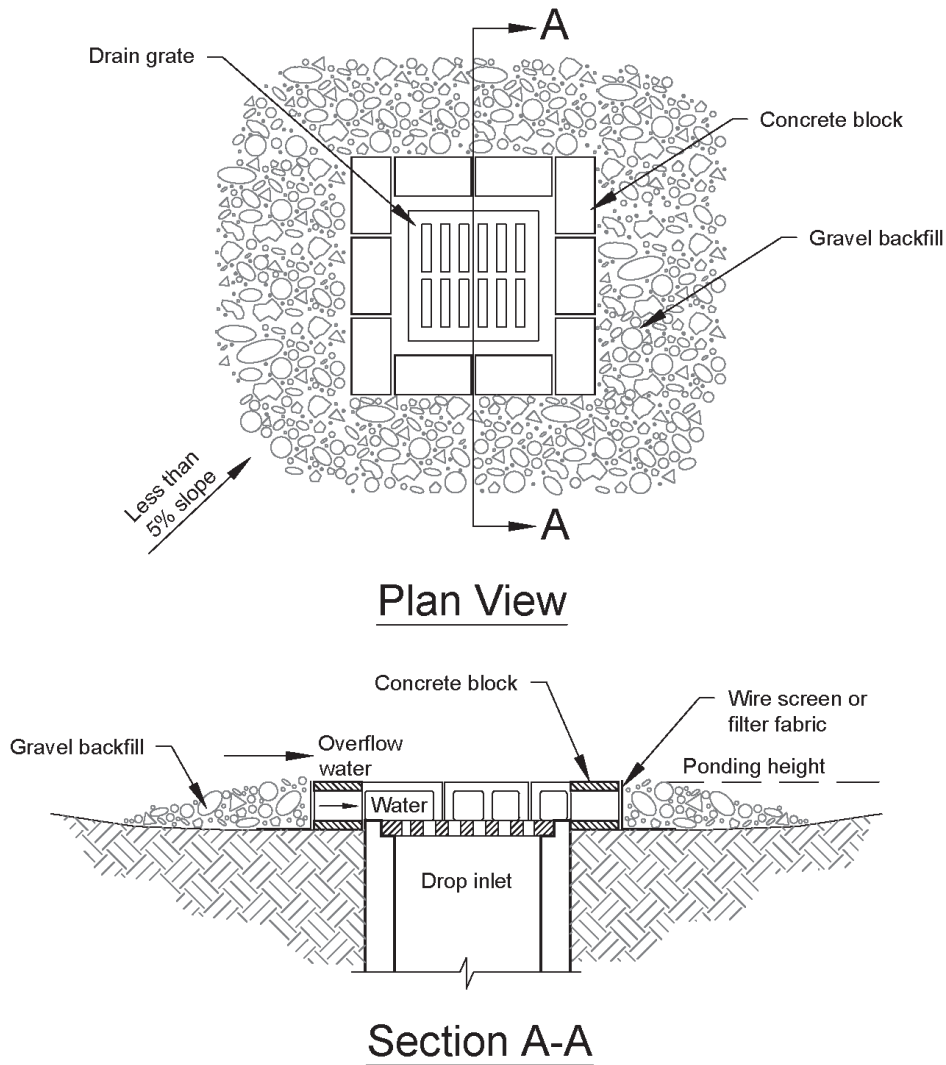
- Grade the approach to the inlet uniformly.
- Drill weep holes into the side of the inlet.
- Protect weep holes with screen wire and washed aggregate.
- Seal weep holes when removing structure and stabilizing area.
- Build a temporary dike, if necessary, to the down slope side of the structure to prevent bypass flow.

Block and Gravel Filter

A block and gravel filter is a barrier formed around the inlet with standard concrete blocks and gravel. See [Figure II-3.17: Block and Gravel Filter](#). Design and installation specifications for block gravel filters include:

- Provide a height of 1 to 2 feet above the inlet.
- Recess the first row of blocks 2-inches into the ground for stability.
- Support subsequent courses by placing a pressure treated wood 2x4 through the block opening.
- Do not use mortar.
- Lay some blocks in the bottom row on their side to allow for dewatering the pool.
- Place hardware cloth or comparable wire mesh with ½-inch openings over all block openings.
- Place gravel to just below the top of blocks on slopes of 2H:1V or flatter.
- An alternative design is a gravel berm surrounding the inlet, as follows:
 - Provide a slope of 3H:1V on the upstream side of the berm.
 - Provide a slope of 2H:1V on the downstream side of the berm.
 - Provide a 1-foot wide level stone area between the gravel berm and the inlet.
 - Use stones 3 inches in diameter or larger on the upstream slope of the berm.
 - Use gravel ½- to ¾-inch at a minimum thickness of 1-foot on the downstream slope of the berm.

Figure II-3.17: Block and Gravel Filter



Notes:

1. Drop inlet sediment barriers are to be used for small, nearly level drainage areas. (less than 5%)
2. Excavate a basin of sufficient size adjacent to the drop inlet.
3. The top of the structure (ponding height) must be well below the ground elevation downslope to prevent runoff from bypassing the inlet. A temporary dike may be necessary on the downslope side of the structure.

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Block and Gravel Filter

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Gravel and Wire Mesh Filter

Gravel and wire mesh filters are gravel barriers placed over the top of the inlet. This method does not provide an overflow. Design and installation specifications for gravel and wire mesh filters include:

- Use a hardware cloth or comparable wire mesh with ½-inch openings.
 - Place wire mesh over the drop inlet so that the wire extends a minimum of 1-foot beyond each side of the inlet structure.
 - Overlap the strips if more than one strip of mesh is necessary.
- Place coarse aggregate over the wire mesh.
 - Provide at least a 12-inch depth of aggregate over the entire inlet opening and extend at least 18-inches on all sides.

Catch Basin Filters

Catch basin filters are designed by manufacturers for construction sites. The limited sediment storage capacity increases the amount of inspection and maintenance required, which may be daily for heavy sediment loads. To reduce maintenance requirements, combine a catch basin filter with another type of inlet protection. This type of inlet protection provides flow bypass without overflow and therefore may be a better method for inlets located along active rights-of-way. Design and installation specifications for catch basin filters include:

- Provides 5 cubic feet of storage.
- Requires dewatering provisions.
- Provides a high-flow bypass that will not clog under normal use at a construction site.
- Insert the catch basin filter in the catch basin just below the grating.

Curb Inlet Protection with Wooden Weir

Curb inlet protection with wooden weir is an option that consists of a barrier formed around a curb inlet with a wooden frame and gravel. Design and installation specifications for curb inlet protection with wooden weirs include:

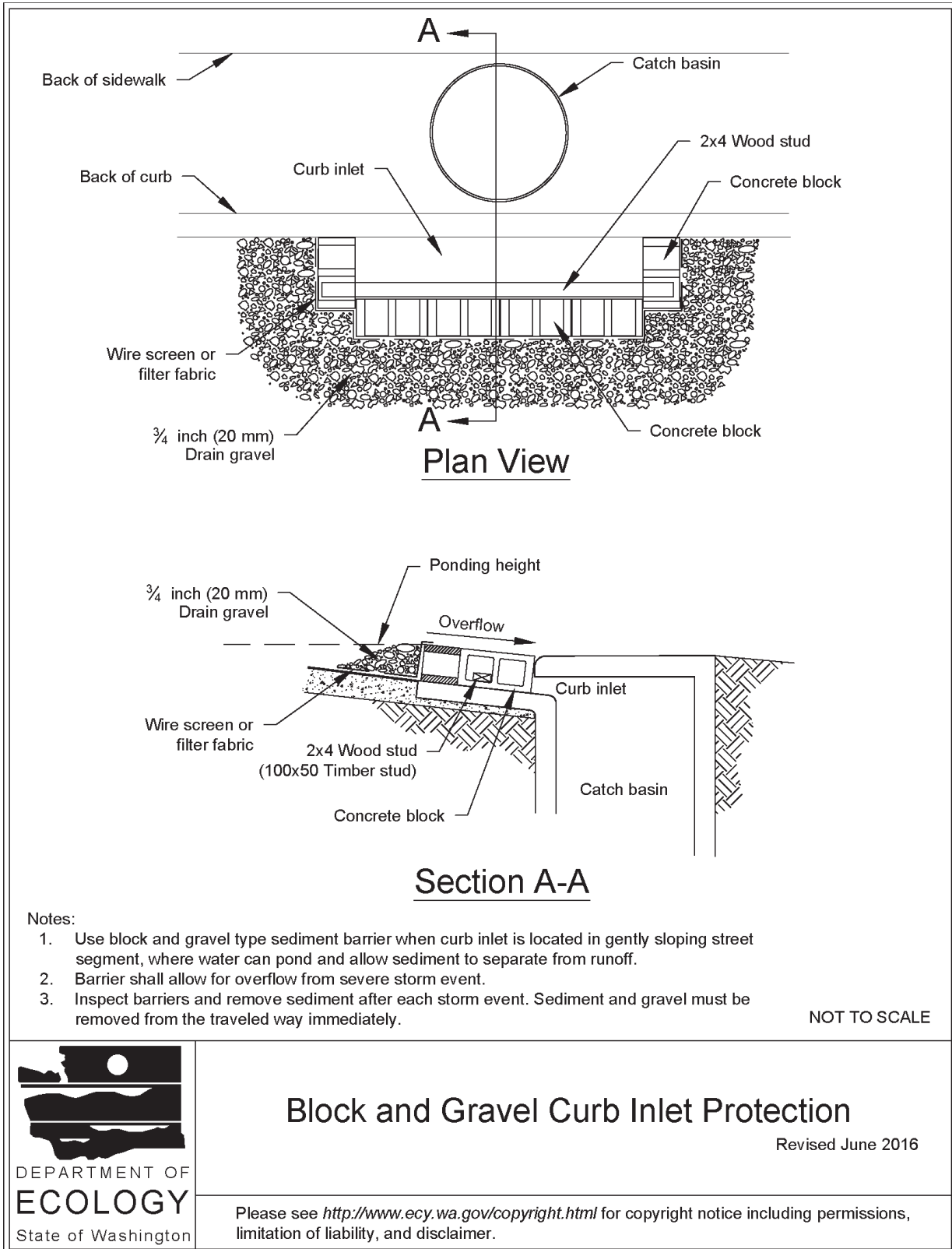
- Use wire mesh with ½-inch openings.
- Use extra strength filter cloth.
- Construct a frame.
- Attach the wire and filter fabric to the frame.
- Pile coarse washed aggregate against the wire and fabric.
- Place weight on the frame anchors.

Block and Gravel Curb Inlet Protection

Block and gravel curb inlet protection is a barrier formed around a curb inlet with concrete blocks and gravel. See [Figure II-3.18: Block and Gravel Curb Inlet Protection](#). Design and installation specifications for block and gravel curb inlet protection include:

- Use wire mesh with ½-inch openings.
- Place two concrete blocks on their sides abutting the curb at either side of the inlet opening. These are spacer blocks.
- Place a 2x4 stud through the outer holes of each spacer block to align the front blocks.
- Place blocks on their sides across the front of the inlet and abutting the spacer blocks.
- Place wire mesh over the outside vertical face.
- Pile coarse aggregate against the wire to the top of the barrier.

Figure II-3.18: Block and Gravel Curb Inlet Protection

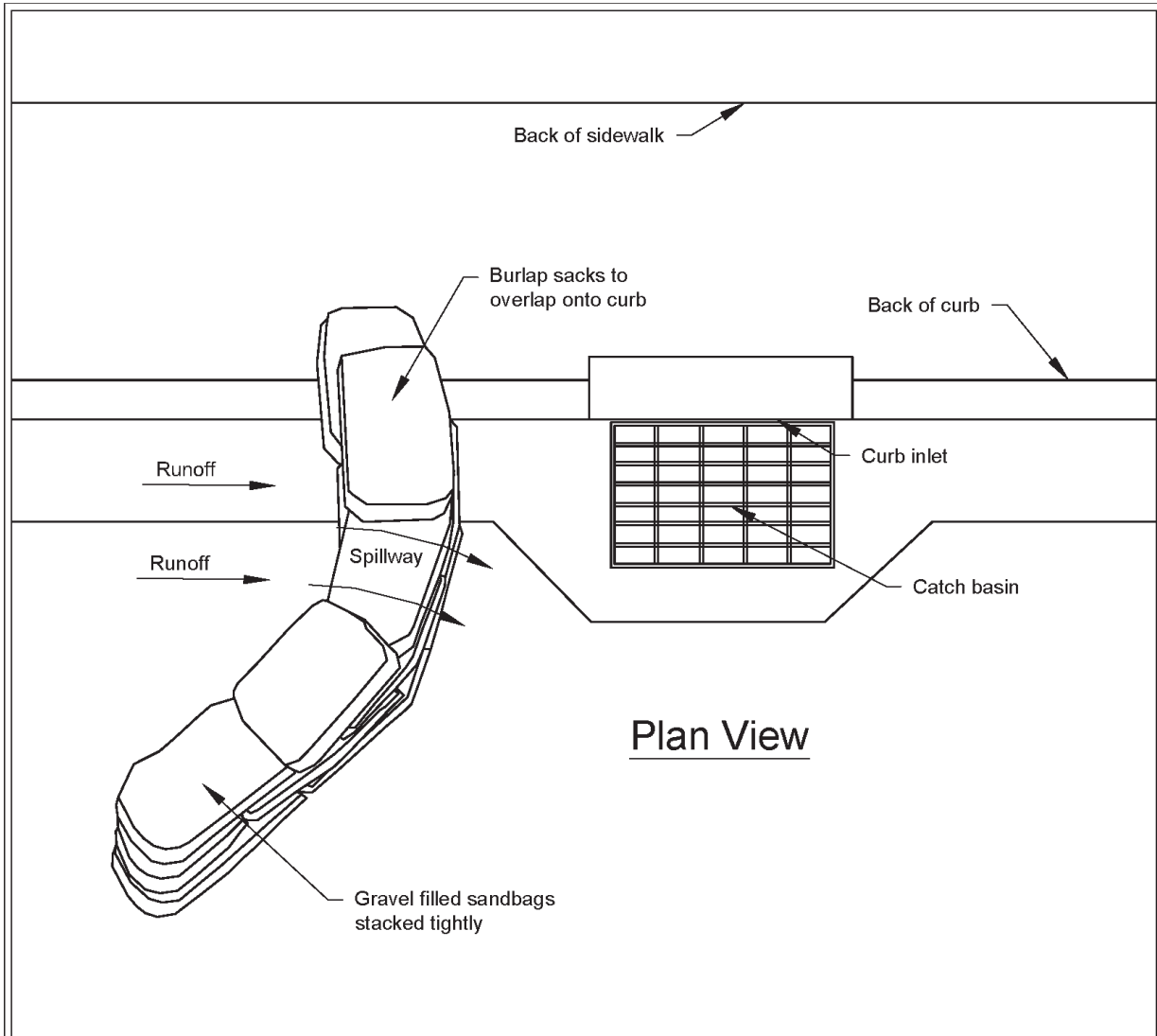


Curb and Gutter Sediment Barrier

Curb and gutter sediment barrier is a sandbag or rock berm (riprap and aggregate) 3 feet high and 3 feet wide in a horseshoe shape. See [Figure II-3.19: Curb and Gutter Barrier](#). Design and installation specifications for curb and gutter sediment barrier include:

- Construct a horseshoe shaped berm, faced with coarse aggregate if using riprap, 3 feet high and 3 feet wide, at least 2 feet from the inlet.
- Construct a horseshoe shaped sedimentation trap on the upstream side of the berm. Size the trap to sediment trap standards for protecting a culvert inlet.

Figure II-3.19: Curb and Gutter Barrier



Notes:

1. Place curb type sediment barriers on gently sloping street segments, where water can pond and allow sediment to separate from runoff.
2. Sandbags of either burlap or woven 'geotextile' fabric, are filled with gravel, layered and packed tightly.
3. Leave a one sandbag gap in the top row to provide a spillway for overflow.
4. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

NOT TO SCALE



Curb and Gutter Barrier

Revised June 2016

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Maintenance Standards

- Inspect all forms of inlet protection frequently, especially after storm events. Clean and replace clogged catch basin filters. For rock and gravel filters, pull away the rocks from the inlet and clean or replace. An alternative approach would be to use the clogged rock as fill and put fresh rock around the inlet.
- Do not wash sediment into storm drains while cleaning. Spread all excavated material evenly over the surrounding land area or stockpile and stabilize as appropriate.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

<https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies>

BMP C233: Silt Fence

Purpose

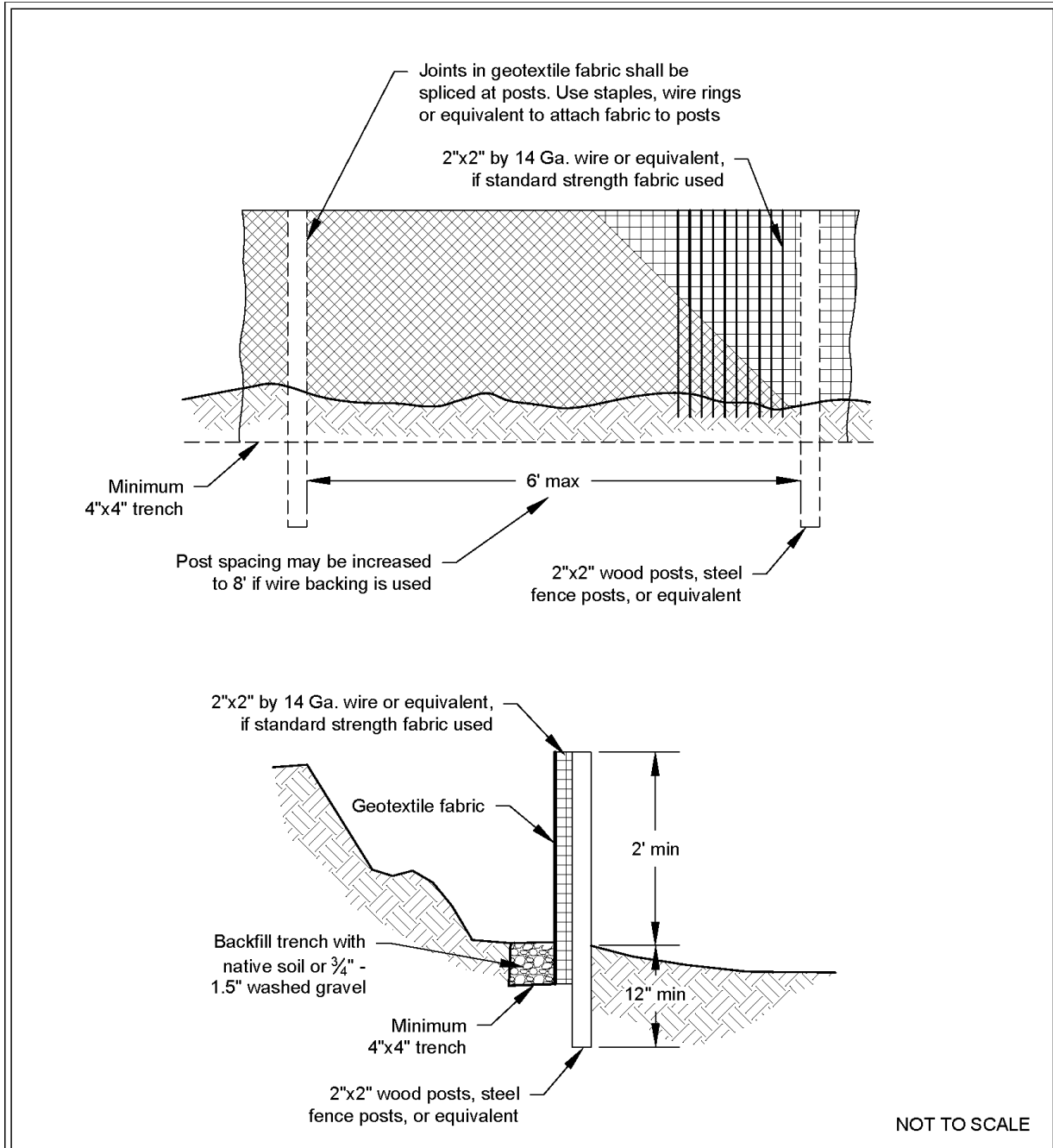
Silt fence reduces the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow.

Conditions of Use

Silt fence may be used downslope of all disturbed areas.

- Silt fence shall prevent sediment carried by runoff from going beneath, through, or over the top of the silt fence, but shall allow the water to pass through the fence.
- Silt fence is not intended to treat concentrated flows, nor is it intended to treat substantial amounts of overland flow. Convey any concentrated flows through the drainage system to a sediment trapping BMP.
- Do not construct silt fences in streams or use in V-shaped ditches. Silt fences do not provide an adequate method of silt control for anything deeper than sheet or overland flow.

Figure II-3.22: Silt Fence



Silt Fence

Revised July 2017

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Design and Installation Specifications

- Use in combination with other construction stormwater BMPs.
- Maximum slope steepness (perpendicular to the silt fence line) 1H:1V.
- Maximum sheet or overland flow path length to the silt fence of 100 feet.
- Do not allow flows greater than 0.5 cfs.
- Use geotextile fabric that meets the following standards. All geotextile properties listed below are minimum average roll values (i.e., the test result for any sampled roll in a lot shall meet or exceed the values shown in [Table II-3.11: Geotextile Fabric Standards for Silt Fence](#)):

Table II-3.11: Geotextile Fabric Standards for Silt Fence

Geotextile Property	Minimum Average Roll Value
Polymeric Mesh AOS (ASTM D4751)	0.60 mm maximum for slit film woven (#30 sieve). 0.30 mm maximum for all other geotextile types (#50 sieve). 0.15 mm minimum for all fabric types (#100 sieve).
Water Permittivity (ASTM D4491)	0.02 sec ⁻¹ minimum
Grab Tensile Strength (ASTM D4632)	180 lbs. Minimum for extra strength fabric. 100 lbs minimum for standard strength fabric.
Grab Tensile Strength (ASTM D4632)	30% maximum
Ultraviolet Resistance (ASTM D4355)	70% minimum

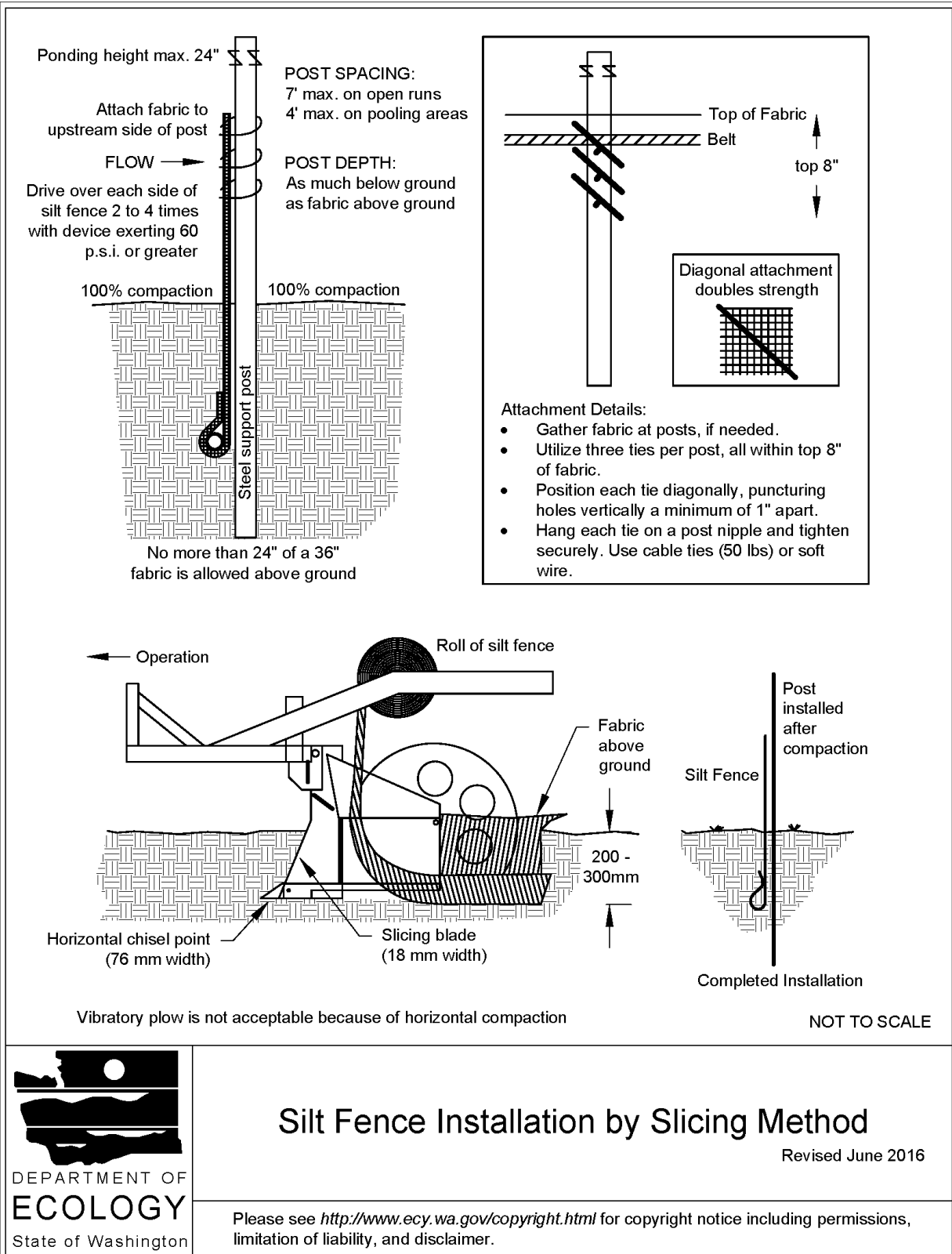
- Support standard strength geotextiles with wire mesh, chicken wire, 2-inch x 2-inch wire, safety fence, or jute mesh to increase the strength of the geotextile. Silt fence materials are available that have synthetic mesh backing attached.
- Silt fence material shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0°F to 120°F.
- One-hundred percent biodegradable silt fence is available that is strong, long lasting, and can be left in place after the project is completed, if permitted by the local jurisdiction.
- Refer to [Figure II-3.22: Silt Fence](#) for standard silt fence details. Include the following Standard Notes for silt fence on construction plans and specifications:
 1. The Contractor shall install and maintain temporary silt fences at the locations shown in the Plans.
 2. Construct silt fences in areas of clearing, grading, or drainage prior to starting those activities.

3. The silt fence shall have a 2-foot min. and a 2½-foot max. height above the original ground surface.
4. The geotextile fabric shall be sewn together at the point of manufacture to form fabric lengths as required. Locate all sewn seams at support posts. Alternatively, two sections of silt fence can be overlapped, provided that the overlap is long enough and that the adjacent silt fence sections are close enough together to prevent silt laden water from escaping through the fence at the overlap.
5. Attach the geotextile fabric on the up-slope side of the posts and secure with staples, wire, or in accordance with the manufacturer's recommendations. Attach the geotextile fabric to the posts in a manner that reduces the potential for tearing.
6. Support the geotextile fabric with wire or plastic mesh, dependent on the properties of the geotextile selected for use. If wire or plastic mesh is used, fasten the mesh securely to the up-slope side of the posts with the geotextile fabric up-slope of the mesh.
7. Mesh support, if used, shall consist of steel wire with a maximum mesh spacing of 2-inches, or a prefabricated polymeric mesh. The strength of the wire or polymeric mesh shall be equivalent to or greater than 180 lbs. grab tensile strength. The polymeric mesh must be as resistant to the same level of ultraviolet radiation as the geotextile fabric it supports.
8. Bury the bottom of the geotextile fabric 4-inches min. below the ground surface. Backfill and tamp soil in place over the buried portion of the geotextile fabric, so that no flow can pass beneath the silt fence and scouring cannot occur. When wire or polymeric back-up support mesh is used, the wire or polymeric mesh shall extend into the ground 3-inches min.
9. Drive or place the silt fence posts into the ground 18-inches min. A 12-inch min. depth is allowed if topsoil or other soft subgrade soil is not present and 18-inches cannot be reached. Increase fence post min. depths by 6 inches if the fence is located on slopes of 3H:1V or steeper and the slope is perpendicular to the fence. If required post depths cannot be obtained, the posts shall be adequately secured by bracing or guying to prevent overturning of the fence due to sediment loading.
10. Use wood, steel or equivalent posts. The spacing of the support posts shall be a maximum of 6-feet. Posts shall consist of either:
 - Wood with minimum dimensions of 2 inches by 2 inches by 3 feet. Wood shall be free of defects such as knots, splits, or gouges.
 - No. 6 steel rebar or larger.
 - ASTM A 120 steel pipe with a minimum diameter of 1-inch.
 - U, T, L, or C shape steel posts with a minimum weight of 1.35 lbs./ft.
 - Other steel posts having equivalent strength and bending resistance to the post sizes listed above.
11. Locate silt fences on contour as much as possible, except at the ends of the fence,

where the fence shall be turned uphill such that the silt fence captures the runoff water and prevents water from flowing around the end of the fence.

12. If the fence must cross contours, with the exception of the ends of the fence, place check dams perpendicular to the back of the fence to minimize concentrated flow and erosion. The slope of the fence line where contours must be crossed shall not be steeper than 3H:1V.
 - Check dams shall be approximately 1-foot deep at the back of the fence. Check dams shall be continued perpendicular to the fence at the same elevation until the top of the check dam intercepts the ground surface behind the fence.
 - Check dams shall consist of crushed surfacing base course, gravel backfill for walls, or shoulder ballast. Check dams shall be located every 10 feet along the fence where the fence must cross contours.
- Refer to [Figure II-3.23: Silt Fence Installation by Slicing Method](#) for slicing method details. The following are specifications for silt fence installation using the slicing method:
 1. The base of both end posts must be at least 2- to 4-inches above the top of the geotextile fabric on the middle posts for ditch checks to drain properly. Use a hand level or string level, if necessary, to mark base points before installation.
 2. Install posts 3- to 4-feet apart in critical retention areas and 6- to 7-feet apart in standard applications.
 3. Install posts 24-inches deep on the downstream side of the silt fence, and as close as possible to the geotextile fabric, enabling posts to support the geotextile fabric from upstream water pressure.
 4. Install posts with the nipples facing away from the geotextile fabric.
 5. Attach the geotextile fabric to each post with three ties, all spaced within the top 8-inches of the fabric. Attach each tie diagonally 45 degrees through the fabric, with each puncture at least 1-inch vertically apart. Each tie should be positioned to hang on a post nipple when tightening to prevent sagging.
 6. Wrap approximately 6-inches of the geotextile fabric around the end posts and secure with 3 ties.
 7. No more than 24-inches of a 36-inch geotextile fabric is allowed above ground level.
 8. Compact the soil immediately next to the geotextile fabric with the front wheel of the tractor, skid steer, or roller exerting at least 60 pounds per square inch. Compact the upstream side first and then each side twice for a total of four trips. Check and correct the silt fence installation for any deviation before compaction. Use a flat-bladed shovel to tuck the fabric deeper into the ground if necessary.

Figure II-3.23: Silt Fence Installation by Slicing Method



Maintenance Standards

- Repair any damage immediately.
- Intercept and convey all evident concentrated flows uphill of the silt fence to a sediment trapping BMP.
- Check the uphill side of the silt fence for signs of the fence clogging and acting as a barrier to flow and then causing channelization of flows parallel to the fence. If this occurs, replace the fence and remove the trapped sediment.
- Remove sediment deposits when the deposit reaches approximately one-third the height of the silt fence, or install a second silt fence.
- Replace geotextile fabric that has deteriorated due to ultraviolet breakdown.

BMP C240: Sediment Trap

Purpose

A sediment trap is a small temporary ponding area with a gravel outlet used to collect and store sediment from sites during construction. Sediment traps, along with other perimeter controls, shall be installed before any land disturbance takes place in the drainage area.

Conditions of Use

- Sediment traps are intended for use on sites where the tributary drainage area is less than 3 acres, with no unusual drainage features, and a projected build-out time of six months or less. The sediment trap is a temporary measure (with a design life of approximately 6 months) and shall be maintained until the tributary area is permanently protected against erosion by vegetation and/or structures.
- Sediment traps are only effective in removing sediment down to about the medium silt size fraction. Runoff with sediment of finer grades (fine silt and clay) will pass through untreated, emphasizing the need to control erosion to the maximum extent first.
- Projects that are constructing permanent Flow Control BMPs, or Runoff Treatment BMPs that use ponding for treatment, may use the rough-graded or final-graded permanent BMP footprint for the temporary sediment trap. When permanent BMP footprints are used as temporary sediment traps, the surface area requirement of the sediment trap must be met. If the surface area requirement of the sediment trap is larger than the surface area of the permanent BMP, then the sediment trap shall be enlarged beyond the permanent BMP footprint to comply with the surface area requirement.

- A floating pond skimmer may be used for the sediment trap outlet if approved by the Local Permitting Authority.
- Sediment traps may not be feasible on utility projects due to the limited work space or the short-term nature of the work. Portable tanks may be used in place of sediment traps for utility projects.

Design and Installation Specifications

- See [Figure II-3.26: Cross Section of Sediment Trap](#) and [Figure II-3.27: Sediment Trap Outlet](#) for details.
- To determine the sediment trap geometry, first calculate the design surface area (SA) of the trap, measured at the invert of the weir. Use the following equation:

$$SA = FS(Q_2/V_s)$$

where

$Q_2 =$

- Option 1 - Single Event Hydrograph Method:

Q_2 = Peak volumetric flow rate calculated using a 10-minute time step from a Type 1A, 2-year, 24-hour frequency storm for the developed condition. The 10-year peak volumetric flow rate shall be used if the project size, expected timing and duration of construction, or downstream conditions warrant a higher level of protection.

- Option 2 - For construction sites that are less than 1 acre, the Rational Method may be used to determine Q_2 .

V_s = The settling velocity of the soil particle of interest. The 0.02 mm (medium silt) particle with an assumed density of 2.65 g/cm³ has been selected as the particle of interest and has a settling velocity (V_s) of 0.00096 ft/sec.

FS = A safety factor of 2 to account for non-ideal settling.

Therefore, the equation for computing sediment trap surface area becomes:

$$SA = 2 \times Q_2 / 0.00096$$

or

2080 square feet per cfs of inflow

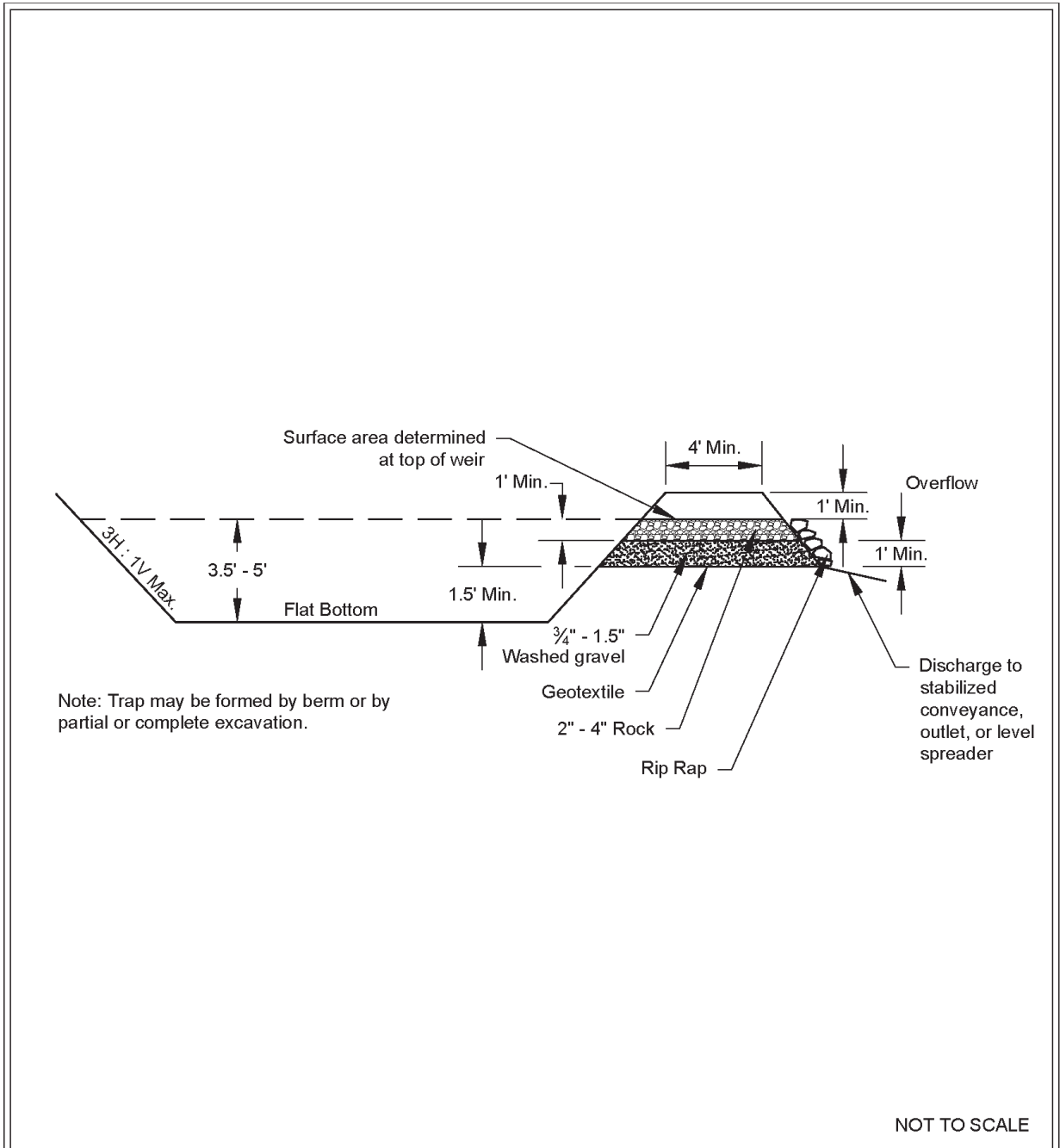
- Sediment trap depth shall be 3.5 feet minimum from the bottom of the trap to the top of the overflow weir.
- To aid in determining sediment depth, all sediment traps shall have a staff gauge with a prominent mark 1-foot above the bottom of the trap.

- Design the discharge from the sediment trap by using the guidance for discharge from temporary sediment ponds in [BMP C241: Sediment Pond \(Temporary\)](#).

Maintenance Standards

- Sediment shall be removed from the trap when it reaches 1-foot in depth.
- Any damage to the trap embankments or slopes shall be repaired.

Figure II-3.26: Cross Section of Sediment Trap

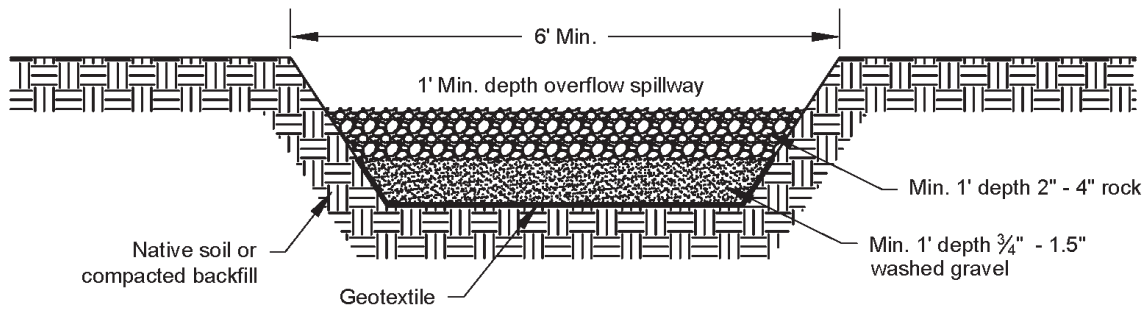


Cross Section of Sediment Trap

Revised June 2016

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Figure II-3.27: Sediment Trap Outlet



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Sediment Trap Outlet

Revised June 2016

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BMP C252: Treating and Disposing of High pH Water

Purpose

When pH levels in stormwater rise above 8.5, it is necessary to lower the pH levels to the acceptable range of 6.5 to 8.5 prior to discharge to surface or ground water. A pH level range of 6.5 to 8.5 is typical for most natural watercourses, and this neutral pH range is required for the survival of aquatic organisms. Should the pH rise or drop out of this range, fish and other aquatic organisms may become stressed and may die.

Conditions of Use

- The water quality standard for pH in Washington State is in the range of 6.5 to 8.5. Stormwater with pH levels exceeding water quality standards may be either neutralized on site or disposed of to a sanitary sewer or concrete batch plant with pH neutralization capabilities.
- Neutralized stormwater may be discharged to surface waters under the Construction Stormwater General permit.
- Neutralized process water such as concrete truck wash-out, hydro-demolition, or saw-cutting slurry must be managed to prevent discharge to surface waters. Any stormwater

contaminated during concrete work is considered process wastewater and must not be discharged to waters of the State or stormwater collection systems.

- The process used for neutralizing and/or disposing of high pH stormwater from the site must be documented in the Construction Stormwater Pollution Prevention Plan.

Causes of High pH

High pH at construction sites is most commonly caused by the contact of stormwater with poured or recycled concrete, cement, mortars, and other Portland cement or lime containing construction materials. (See [BMP C 151: Concrete Handling](#) for more information on concrete handling procedures). The principal caustic agent in cement is calcium hydroxide (free lime).

Calcium hardness can contribute to high pH values and cause toxicity that is associated with high pH conditions. A high level of calcium hardness in waters of the state is not allowed. Ground water standard for calcium and other dissolved solids in Washington State is less than 500 mg/l.

Treating High pH Stormwater by Carbon Dioxide Sparging

Advantages of Carbon Dioxide Sparging

- Rapidly neutralizes high pH water.
- Cost effective and safer to handle than acid compounds.
- CO₂ is self-buffering. It is difficult to overdose and create harmfully low pH levels.
- Material is readily available.

The Chemical Process of Carbon Dioxide Sparging

When carbon dioxide (CO₂) is added to water (H₂O), carbonic acid (H₂CO₃) is formed which can further dissociate into a proton (H⁺) and a bicarbonate anion (HCO₃⁻) as shown below:



The free proton is a weak acid that can lower the pH. Water temperature has an effect on the reaction as well. The colder the water temperature is, the slower the reaction occurs. The warmer the water temperature is, the quicker the reaction occurs. Most construction applications in Washington State have water temperatures in the 50°F or higher range so the reaction is almost simultaneous.

The Treatment Process of Carbon Dioxide Sparging

High pH water may be treated using continuous treatment, continuous discharge systems. These manufactured systems continuously monitor influent and effluent pH to ensure that pH values are within an acceptable range before being discharged. All systems must have fail safe automatic shut off switches in the event that pH is not within the acceptable discharge range. Only trained operators may operate manufactured systems. System manufacturers often provide trained operators or training on their devices.

The following procedure may be used when not using a continuous discharge system:

1. Prior to treatment, the appropriate jurisdiction should be notified in accordance with the regulations set by the jurisdiction.
2. Every effort should be made to isolate the potential high pH water in order to treat it separately from other stormwater on-site.
3. Water should be stored in an acceptable storage facility, detention pond, or containment cell prior to pH treatment.
4. Transfer water to be treated for pH to the pH treatment structure. Ensure that the pH treatment structure size is sufficient to hold the amount of water that is to be treated. Do not fill the pH treatment structure completely, allow at least 2 feet of freeboard.
5. The operator samples the water within the pH treatment structure for pH and notes the clarity of the water. As a rule of thumb, less CO₂ is necessary for clearer water. The results of the samples and water clarity observations should be recorded.
6. In the pH treatment structure, add CO₂ until the pH falls into the range of 6.9-7.1. Adjusting pH to within 0.2 pH units of receiving water (background pH) is recommended. It is unlikely that pH can be adjusted to within 0.2 pH units using dry ice. Compressed carbon dioxide gas should be introduced to the water using a carbon dioxide diffuser located near the bottom of the pH treatment structure, this will allow carbon dioxide to bubble up through the water and diffuse more evenly.
7. Slowly discharge the water, making sure water does not get stirred up in the process. Release about 80% of the water from the pH treatment structure leaving any sludge behind. If turbidity remains above the maximum allowable, consider adding filtration to the treatment train. See [BMP C251: Construction Stormwater Filtration](#).
8. Discharge treated water through a pond or drainage system.
9. Excess sludge needs to be disposed of properly as concrete waste. If several batches of water are undergoing pH treatment, sludge can be left in the treatment structure for the next batch treatment. Dispose of sludge when it fills 50% of the treatment structure volume.
10. Disposal must comply with applicable local, state, and federal regulations.

Treating High pH Stormwater by Food Grade Vinegar

Food grade vinegar that meets FDA standards may be used to neutralize high pH water. Food grade vinegar is only 4% to 18% acetic acid with the remainder being water. Food grade vinegar may be used if dosed just enough to lower pH sufficiently. Use a treatment process as described above for CO₂ sparging, but add food grade vinegar instead of CO₂.

This treatment option for high pH stormwater does not apply to anything but food grade vinegar. Acetic acid does not equal vinegar. Any other product or waste containing acetic acid must go through the evaluation process in Appendix G of *Whole Effluent Toxicity Testing Guidance and Test Review Criteria* ([Marshall, 2016](#)).

Disposal of High pH Stormwater

Sanitary Sewer Disposal

Local sewer authority approval is required prior to disposal via the sanitary sewer.

Concrete Batch Plant Disposal

- Only permitted facilities may accept high pH water.
- Contact the facility to ensure they can accept the high pH water.

Maintenance Standards

Safety and materials handling:

- All equipment should be handled in accordance with OSHA rules and regulations.
- Follow manufacturer guidelines for materials handling.

Each operator should provide:

- A diagram of the monitoring and treatment equipment.
- A description of the pumping rates and capacity the treatment equipment is capable of treating.

Each operator should keep a written record of the following:

- Client name and phone number.
- Date of treatment.
- Weather conditions.
- Project name and location.
- Volume of water treated.
- pH of untreated water.
- Amount of CO₂ or food grade vinegar needed to adjust water to a pH range of 6.9-7.1.
- pH of treated water.
- Discharge point location and description.

A copy of this record should be given to the client/contractor who should retain the record for three years.

**CSWPPP APPENDIX D -
SITE INSPECTION FORM**

SITE INSPECTION FORM

**Bangor-Keyport
Force Main**

Project Name: **Replacement** Permit # _____ Inspection Date _____ Time _____

Name of Certified Erosion Sediment Control Lead (CESCL) or qualified inspector if *less than one acre*

Print Name: _____

Approximate rainfall amount since the last inspection
(in inches): _____

Approximate rainfall amount in the last 24 hours (in
inches): _____

Current Weather Clear Cloudy Mist Rain Wind Fog

A. Type of inspection: Weekly Post Storm Event Other

B. Phase of Active Construction (*check all that apply*):

Pre Construction/installation of erosion/sediment controls	<input type="checkbox"/>	Clearing/Demo/Grading	<input type="checkbox"/>	Infrastructure/storm/roads	<input type="checkbox"/>
Concrete pours	<input type="checkbox"/>	Vertical Construction/buildings	<input type="checkbox"/>	Utilities	<input type="checkbox"/>
Offsite improvements	<input type="checkbox"/>	Site temporary stabilized	<input type="checkbox"/>	Final stabilization	<input type="checkbox"/>

C. Questions:

1. Were all areas of construction and discharge points inspected? Yes _____ No _____
2. Did you observe the presence of suspended sediment, turbidity, discoloration,
or oil sheen? Yes _____ No _____
3. Was a water quality sample taken during inspection? (*refer to permit
conditions S4 & S5*) Yes _____ No _____
4. Was there a turbid discharge 250 NTU or greater, or Transparency 6 cm or
less?* Yes _____ No _____
5. If yes to #4 was it reported to Ecology? Yes _____ No _____
6. Is pH sampling required? pH range required is 6.5 to 8.5. Yes _____ No _____

If answering yes to a discharge, describe the event. Include when, where, and why it happened; what action was taken, and when.

*If answering yes to # 4 record NTU/Transparency with continual sampling daily until turbidity is 25 NTU or less/ transparency is 33 cm or greater.

Sampling
Results:

Date:

Parameter	Method (circle one)	Result			Other/Note
		NTU	cm	pH	
<i>Turbidity</i>	tube, meter, laboratory				
<i>pH</i>	Paper, kit, meter				

D. Check the observed status of all items. Provide “Action Required “details and dates.

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
1 Clearing Limits	Before beginning land disturbing activities are all clearing limits, natural resource areas (streams, wetlands, buffers, trees) protected with barriers or similar BMPs? (high visibility recommended)						
2 Construction Access	Construction access is stabilized with quarry spalls or equivalent BMP to prevent sediment from being tracked onto roads?						
	Sediment tracked onto the road way was cleaned thoroughly at the end of the day or more frequent as necessary.						
3 Control Flow Rates	Are flow control measures installed to control stormwater volumes and velocity during construction and do they protect downstream properties and waterways from erosion?						
	If permanent infiltration ponds are used for flow control during construction, are they protected from siltation?						
4 Sediment Controls	All perimeter sediment controls (e.g. silt fence, wattles, compost socks, berms, etc.) installed, and maintained in accordance with the Stormwater Pollution Prevention Plan (SWPPP).						
	Sediment control BMPs (sediment ponds, traps, filters etc.) have been constructed and functional as the first step of grading.						
	Stormwater runoff from disturbed areas is directed to sediment removal BMP.						
5 Stabilize Soils	Have exposed un-worked soils been stabilized with effective BMP to prevent erosion and sediment deposition?						

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
5 Stabilize Soils Cont.	Are stockpiles stabilized from erosion, protected with sediment trapping measures and located away from drain inlet, waterways, and drainage channels?						
	Have soils been stabilized at the end of the shift, before a holiday or weekend if needed based on the weather forecast?						
6 Protect Slopes	Has stormwater and ground water been diverted away from slopes and disturbed areas with interceptor dikes, pipes and or swales?						
	Is off-site storm water managed separately from stormwater generated on the site?						
	Is excavated material placed on uphill side of trenches consistent with safety and space considerations?						
	Have check dams been placed at regular intervals within constructed channels that are cut down a slope?						
7 Drain Inlets	Storm drain inlets made operable during construction are protected.						
	Are existing storm drains within the influence of the project protected?						
8 Stabilize Channel and Outlets	Have all on-site conveyance channels been designed, constructed and stabilized to prevent erosion from expected peak flows?						
	Is stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes and downstream conveyance systems?						
9 Control Pollutants	Are waste materials and demolition debris handled and disposed of to prevent contamination of stormwater?						

	Has cover been provided for all chemicals, liquid products, petroleum products, and other material?						
	Has secondary containment been provided capable of containing 110% of the volume?						
	Were contaminated surfaces cleaned immediately after a spill incident?						
	Were BMPs used to prevent contamination of stormwater by a pH modifying sources?						
Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
9 Cont.	Wheel wash wastewater is handled and disposed of properly.						
10 Control Dewatering	Concrete washout in designated areas. No washout or excess concrete on the ground.						
	Dewatering has been done to an approved source and in compliance with the SWPPP.						
	Were there any clean non turbid dewatering discharges?						
11 Maintain BMP	Are all temporary and permanent erosion and sediment control BMPs maintained to perform as intended?						
12 Manage the Project	Has the project been phased to the maximum degree practicable?						
	Has regular inspection, monitoring and maintenance been performed as required by the permit?						
	Has the SWPPP been updated, implemented and records maintained?						
13 Protect LID	Is all Bioretention and Rain Garden Facilities protected from sedimentation with appropriate BMPs?						
	Is the Bioretention and Rain Garden protected against over compaction of construction equipment and foot traffic to retain its infiltration capabilities?						

	Permeable pavements are clean and free of sediment and sediment laden-water runoff. Muddy construction equipment has not been on the base material or pavement.						
	Have soiled permeable pavements been cleaned of sediments and pass infiltration test as required by stormwater manual methodology?						
	Heavy equipment has been kept off existing soils under LID facilities to retain infiltration rate.						

E. Check all areas that have been inspected. ✓

- All in place BMPs
 All disturbed soils
 All concrete wash out area
 All material storage areas
 All discharge locations
 All equipment storage areas
 All construction entrances/exits

F. Elements checked “Action Required” (section D) describe corrective action to be taken. List the element number; be specific on location and work needed. Document, initial, and date when the corrective action has been completed and inspected.

Element #	Description and Location	Action Required	Completion Date	Initials

Attach additional page if needed

Sign the following certification:

“I certify that this report is true, accurate, and complete, to the best of my knowledge and belief”

Inspected
by: (print)
Title/Qualification
of Inspector:

(Signature) _____ Date: _____

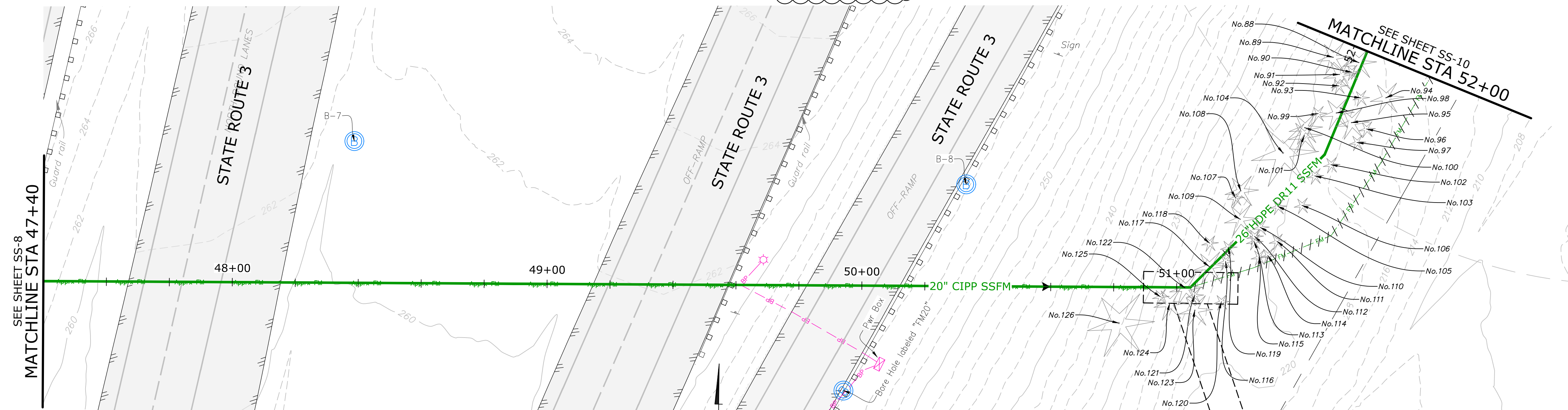


APPENDIX L
WSDOT ROADSIDE TREE SCHEDULE PLANS

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THIS SHEET IS NEW
IN ITS ENTIRETY



- NOTES:**
1. CONTRACTOR SHALL REMOVE TREES AS REQUIRED TO PERFORM THE WORK.
 2. CONTRACTOR SHALL RESTORE IMPACTED AREA PER WSDOT ROADSIDE POLICY REQUIREMENTS.

WSDOT ROADSIDE TREE SCHEDULE								
Tree ID #	Species	Diameter (In.)	Tree ID #	Species	Diameter (In.)	Tree ID #	Species	Diameter (In.)
1	FIR	18	43	ALDER	4	85	ALDER	6
2	MAPLE	7	44	ALDER	10	86	ALDER	10
3	ALDER	8	45	ALDER	8	87	ALDER	5
4	ALDER	8	46	ALDER	12	88	ALDER	8
5	ALDER	10	47	ALDER	6	89	ALDER	10
6	ALDER	8	48	ALDER	10	90	ALDER	6
7	FIR	10	49	ALDER	8	91	ALDER	8
8	FIR	8	50	ALDER	8	92	ALDER	4
9	FIR	10	51	ALDER	12	93	ALDER	5
10	FIR	10	52	ALDER	14	94	ALDER	10
11	FIR	8	53	ALDER	8	95	ALDER	8
12	FIR	6	54	ALDER	8	96	ALDER	7
13	FIR	10	55	ALDER	12	97	ALDER	6
14	FIR	4	56	ALDER	12	98	ALDER	8
15	FIR	12	57	ALDER	4	99	ALDER	6
16	FIR	14	58	ALDER	10	100	ALDER	8
17	FIR	14	59	ALDER	6	101	ALDER	9
18	FIR	8	60	ALDER	10	102	ALDER	5
19	FIR	12	61	ALDER	14	103	ALDER	6
20	FIR	12	62	ALDER	12	104	ALDER	14
21	FIR	10	63	ALDER	20	105	ALDER	7
22	FIR	18	64	ALDER	12	106	ALDER	4
23	FIR	14	65	ALDER	8	107	ALDER	5
24	PINE	14	66	ALDER	8	108	ALDER	12
25	WILLOW	6	67	ALDER	10	109	ALDER	9
26	PINE	12	68	ALDER	6	110	ALDER	6
27	PINE	12	69	ALDER	6	111	ALDER	6
28	ALDER	12	70	ALDER	10	112	ALDER	4
29	ALDER	12	71	ALDER	18	113	ALDER	5
30	LOCUST	12	72	ALDER	12	114	ALDER	7
31	ALDER	10	73	ALDER	6	115	ALDER	4
32	ALDER	12	74	ALDER	8	116	ALDER	6
33	ALDER	10	75	ALDER	12	117	ALDER	10
34	ALDER	8	76	ALDER	8	118	ALDER	7
35	ALDER	16	77	ALDER	6	119	ALDER	5
36	ALDER	16	78	ALDER	8	120	ALDER	4
37	ALDER	8	79	ALDER	18	121	ALDER	5
38	MAPLE	12	80	ALDER	10	122	ALDER	11
39	ALDER	8	81	ALDER	12	123	ALDER	8
40	ALDER	6	82	ALDER	14	124	ALDER	8
41	ALDER	14	83	ALDER	12	125	ALDER	7
42	ALDER	16	84	ALDER	10	126	ALDER	13

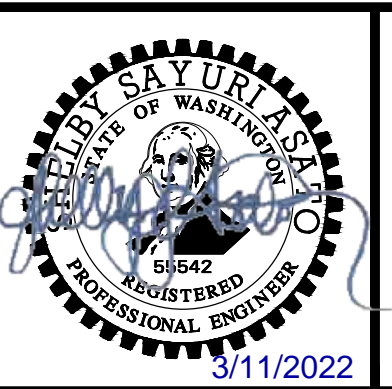
PLAN
SCALE: 1"=20'

NO.	DATE	BY	REVISION
1	03/07/2022	TMH	ADDENDUM #1

NOTICE

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

TMH DESIGNED
BAW DRAWN
EKS CHECKED



**BANGOR-KEYPORT
FORCE MAIN
REPLACEMENT**

**WSDOT ROADSIDE TREE SCHEDULE
& PLAN STA 47+40 TO STA 52+00
SCHEDULE A**

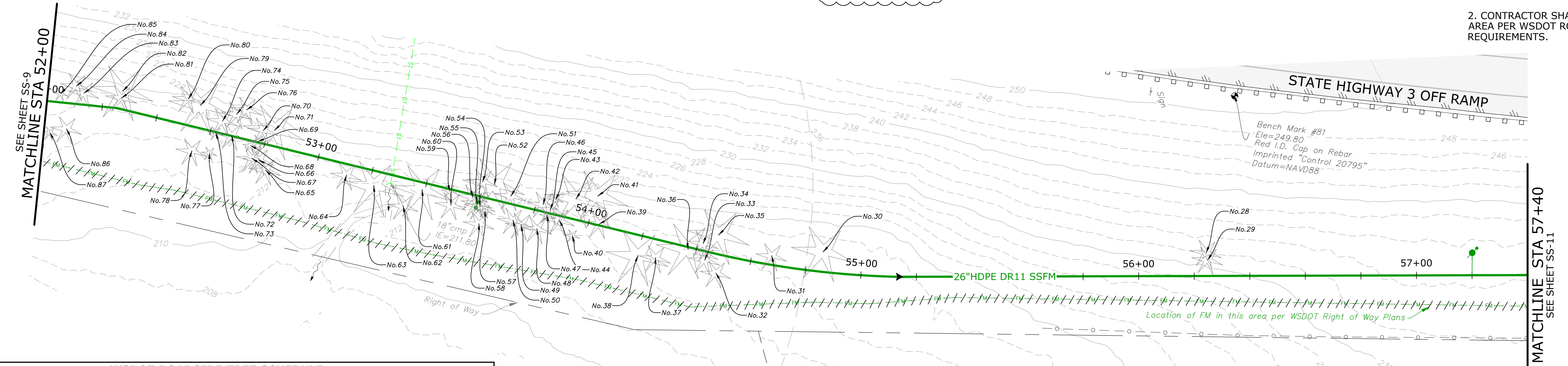
PROJECT NO.: 20-2815 SCALE: AS SHOWN DATE: FEBRUARY 2022

SHEET
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THIS SHEET IS NEW
IN ITS ENTIRETY

- NOTES:
1. CONTRACTOR SHALL REMOVE TREES AS REQUIRED TO PERFORM THE WORK.
 2. CONTRACTOR SHALL RESTORE IMPACTED AREA PER WSDOT ROADSIDE POLICY REQUIREMENTS.



PLAN
SCALE: 1"=20'

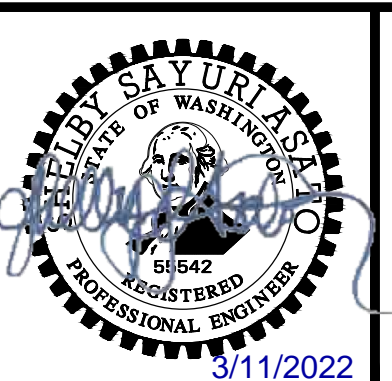
WSDOT ROADSIDE TREE SCHEDULE

Tree ID #	Species	Diameter (In.)	Tree ID #	Species	Diameter (In.)	Tree ID #	Species	Diameter (In.)
1	FIR	18	43	ALDER	4	85	ALDER	6
2	MAPLE	7	44	ALDER	10	86	ALDER	10
3	ALDER	8	45	ALDER	8	87	ALDER	5
4	ALDER	8	46	ALDER	12	88	ALDER	8
5	ALDER	10	47	ALDER	6	89	ALDER	10
6	ALDER	8	48	ALDER	10	90	ALDER	6
7	FIR	10	49	ALDER	8	91	ALDER	8
8	FIR	8	50	ALDER	8	92	ALDER	4
9	FIR	10	51	ALDER	12	93	ALDER	5
10	FIR	10	52	ALDER	14	94	ALDER	10
11	FIR	8	53	ALDER	8	95	ALDER	8
12	FIR	6	54	ALDER	8	96	ALDER	7
13	FIR	10	55	ALDER	12	97	ALDER	6
14	FIR	4	56	ALDER	12	98	ALDER	8
15	FIR	12	57	ALDER	4	99	ALDER	6
16	FIR	14	58	ALDER	10	100	ALDER	8
17	FIR	14	59	ALDER	6	101	ALDER	9
18	FIR	8	60	ALDER	10	102	ALDER	5
19	FIR	12	61	ALDER	14	103	ALDER	6
20	FIR	12	62	ALDER	12	104	ALDER	14
21	FIR	10	63	ALDER	20	105	ALDER	7
22	FIR	18	64	ALDER	12	106	ALDER	4
23	FIR	14	65	ALDER	8	107	ALDER	5
24	PINE	14	66	ALDER	8	108	ALDER	12
25	WILLOW	6	67	ALDER	10	109	ALDER	9
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30	LOCUST	12	72	ALDER	12	114	ALDER	7
31	ALDER	10	73	ALDER	6	115	ALDER	4
32	ALDER	12	74	ALDER	8	116	ALDER	6
33	ALDER	10	75	ALDER	12	117	ALDER	10
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35	ALDER	16	77	ALDER	6	119	ALDER	5
36	ALDER	16	78	ALDER	8	120	ALDER	4
37	ALDER	8	79	ALDER	18	121	ALDER	5
38	MAPLE	12	80	ALDER	10	122	ALDER	11
39	ALDER	8	81	ALDER	12	123	ALDER	8
40	ALDER	6	82	ALDER	14	124	ALDER	8
41	ALDER	14	83	ALDER	12	125	ALDER	7
42	ALDER	16	84	ALDER	10	126	ALDER	13

NO.	DATE	BY	REVISION
1	03/07/2022	TMH	ADDENDUM #1

NOTICE
0 1/2 1
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TMH DESIGNED
BAW DRAWN
EKS CHECKED



BANGOR-KEYPORT
FORCE MAIN
REPLACEMENT

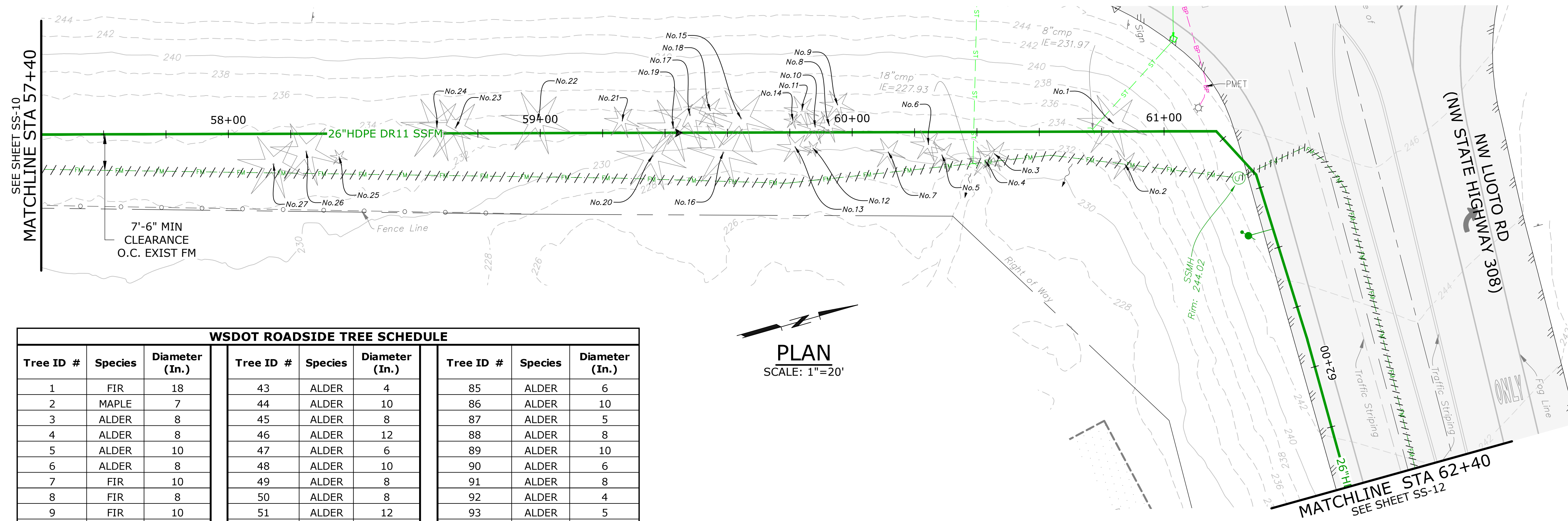
WSDOT ROADSIDE TREE SCHEDULE
& PLAN STA 52+00 TO STA 57+40
SCHEDULE A

PROJECT NO.: 20-2815 SCALE: AS SHOWN DATE: FEBRUARY 2022

SHEET
SS-10T
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THIS SHEET IS NEW
IN ITS ENTIRETY

- NOTES:
1. CONTRACTOR SHALL REMOVE TREES AS REQUIRED TO PERFORM THE WORK.
 2. CONTRACTOR SHALL RESTORE IMPACTED AREA PER WSDOT ROADSIDE POLICY REQUIREMENTS.



PLAN
SCALE: 1"=20'

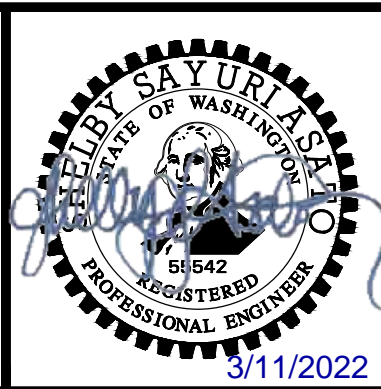
WSDOT ROADSIDE TREE SCHEDULE								
Tree ID #	Species	Diameter (In.)	Tree ID #	Species	Diameter (In.)	Tree ID #	Species	Diameter (In.)
1	FIR	18	43	ALDER	4	85	ALDER	6
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4	ALDER	8	46	ALDER	12	88	ALDER	8
5	ALDER	10	47	ALDER	6	89	ALDER	10
6	ALDER	8	48	ALDER	10	90	ALDER	6
7	FIR	10	49	ALDER	8	91	ALDER	8
8	FIR	8	50	ALDER	8	92	ALDER	4
9	FIR	10	51	ALDER	12	93	ALDER	5
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11	FIR	8	53	ALDER	8	95	ALDER	8
12	FIR	6	54	ALDER	8	96	ALDER	7
13	FIR	10	55	ALDER	12	97	ALDER	6
14	FIR	4	56	ALDER	12	98	ALDER	8
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16	FIR	14	58	ALDER	10	100	ALDER	8
17	FIR	14	59	ALDER	6	101	ALDER	9
18	FIR	8	60	ALDER	10	102	ALDER	5
19	FIR	12	61	ALDER	14	103	ALDER	6
20	FIR	12	62	ALDER	12	104	ALDER	14
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NO.	DATE	BY	REVISION
1	03/07/2022	TMH	ADDENDUM #1

NOTICE
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

TMH
DESIGNED
BAW
DRAWN
EKS
CHECKED



**BANGOR-KEYPORT
FORCE MAIN
REPLACEMENT**

**WSDOT ROADSIDE TREE SCHEDULE
& PLAN STA 57+40 TO STA 62+40
SCHEDULE A**

PROJECT NO.: 20-2815 SCALE: AS SHOWN DATE: FEBRUARY 2022

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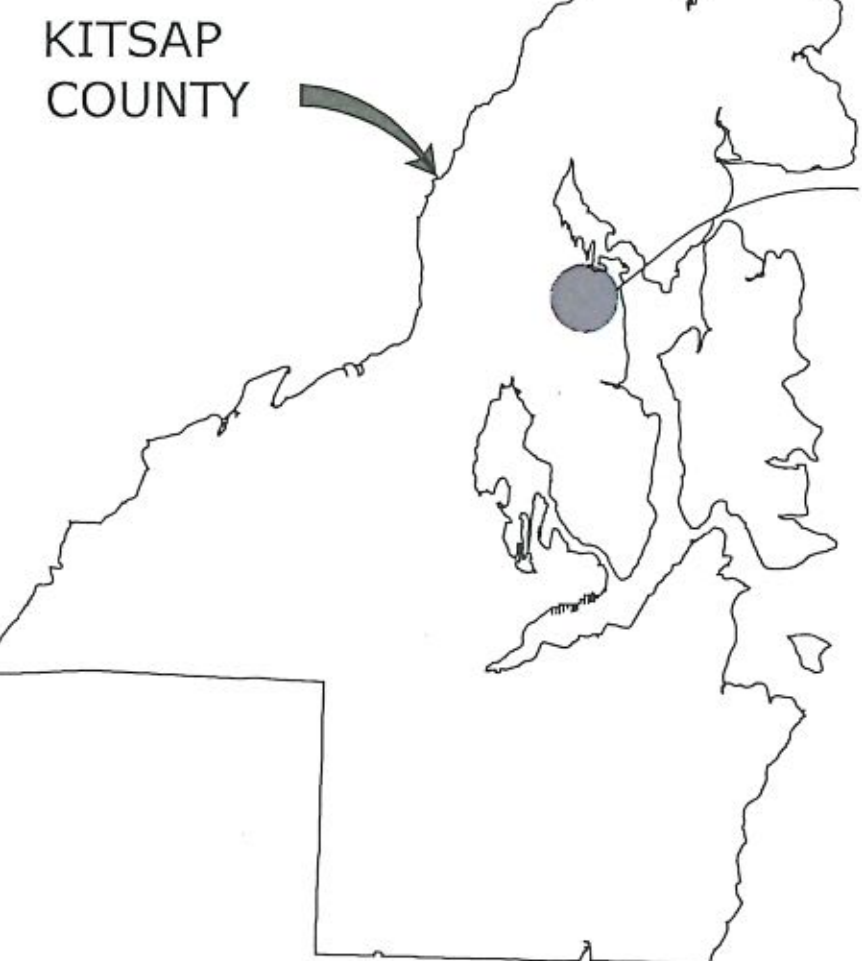
BANGOR-KEYPORT FORCE MAIN REPLACEMENT

FEBRUARY 2022

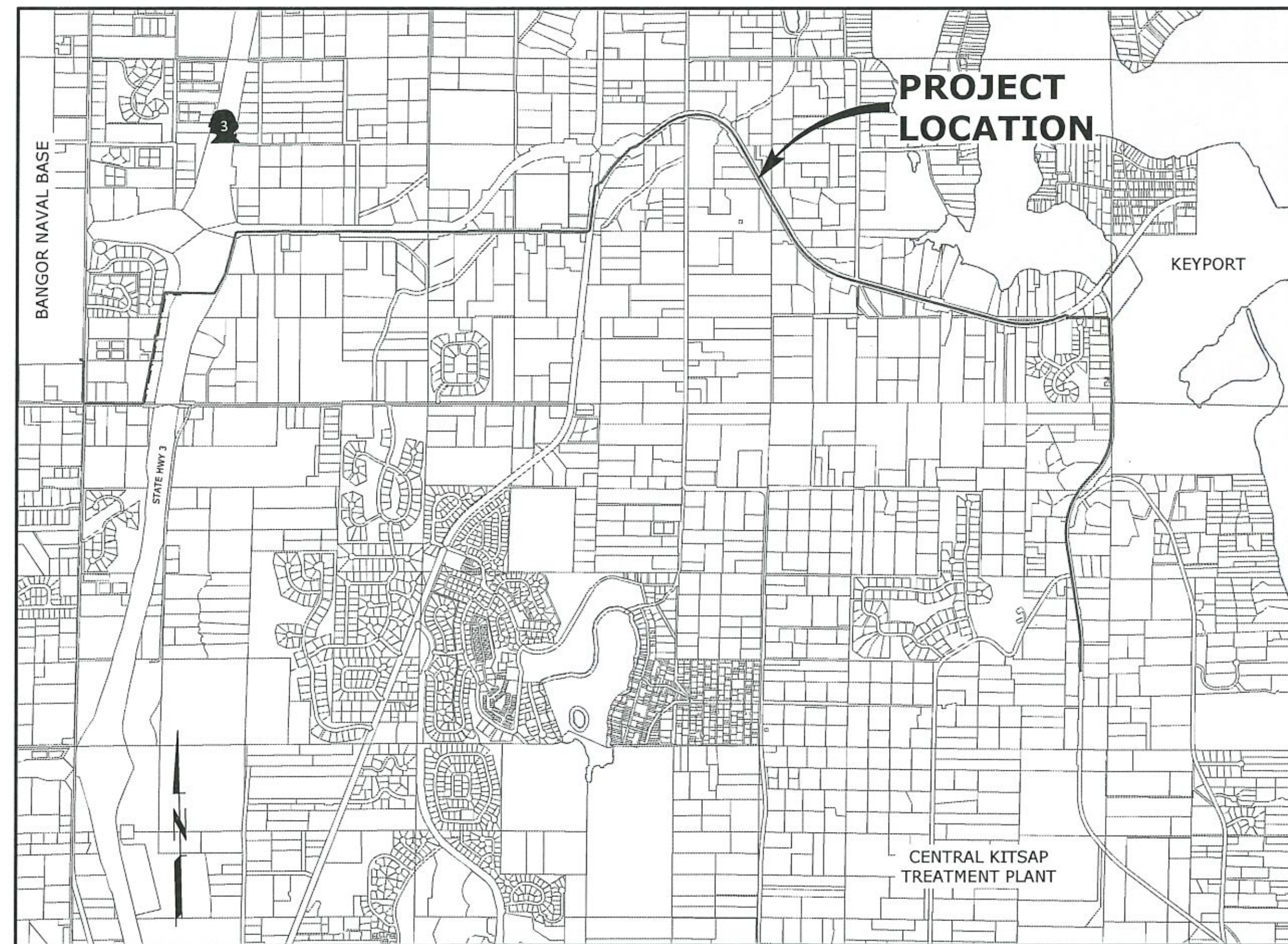
VOLUME 2 OF 2

LOCATION MAPS

NTS



PROJECT LOCATION



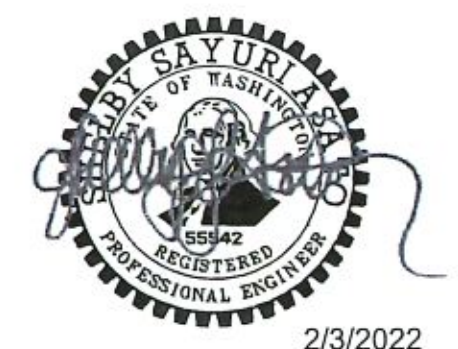
VICINITY MAP
SCALE: 1"=1500'

COUNTY COMMISSIONERS

- ROBERT GELDER - DISTRICT #1
- CHARLOTTE GARRIDO - DISTRICT #2
- EDWARD WOLFE - DISTRICT #3

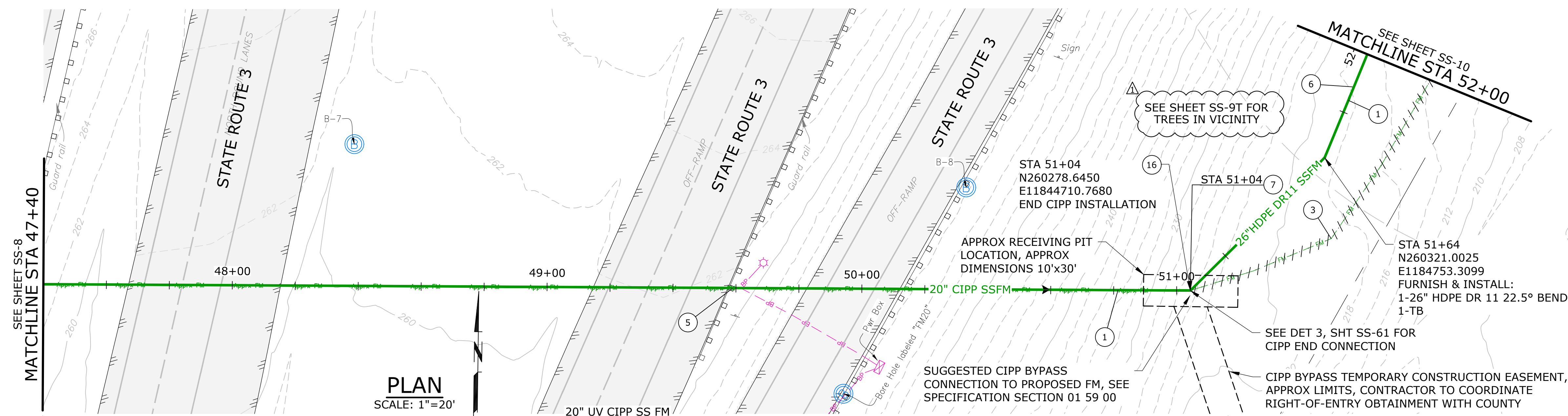
APPROVED BY

2-7-22 DATE	<i>David Tucker</i> DAVID TUCKER ASSISTANT DIRECTOR OF PUBLIC WORKS
2-7-22 DATE	<i>John H. ...</i> COUNTY ROAD ENGINEER



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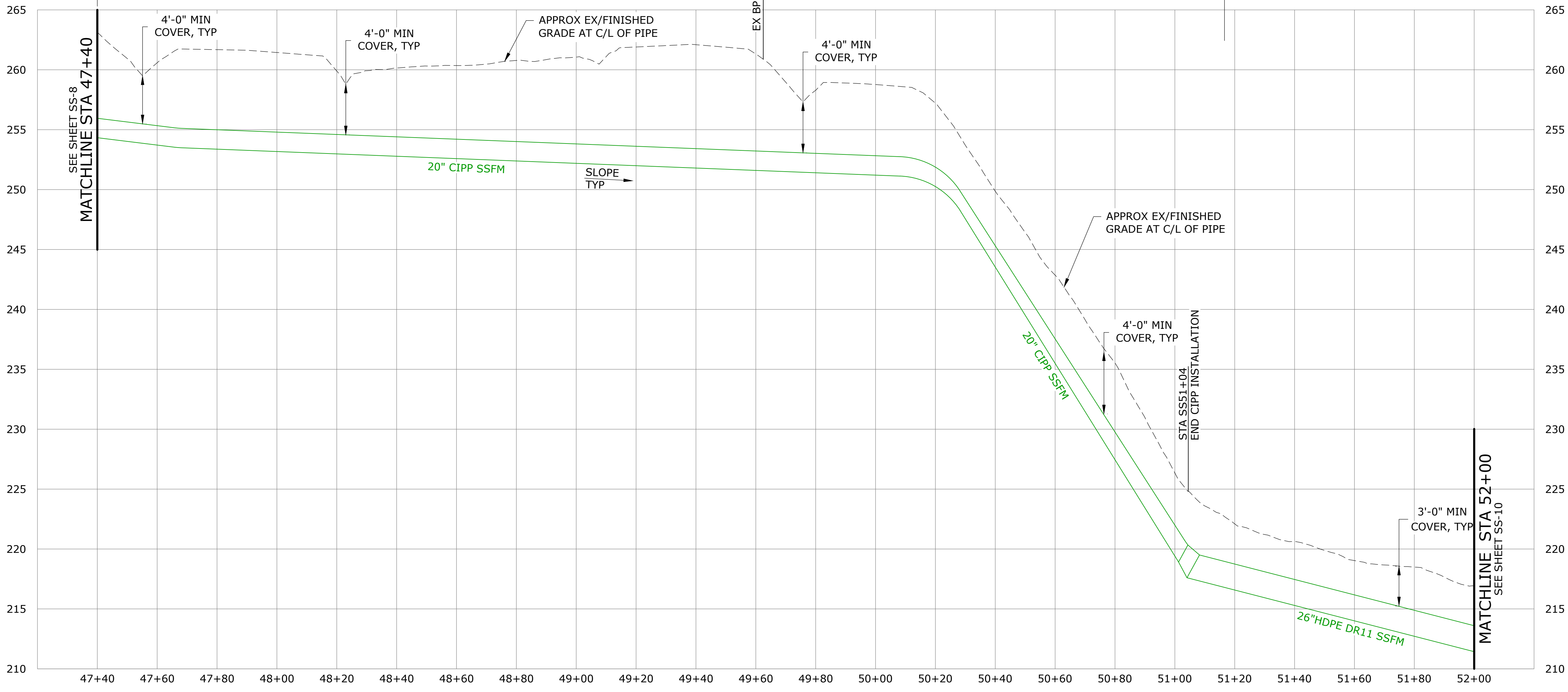
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PLAN
SCALE: 1"=20'

- NOTES:**
1. THE CONTRACTOR SHALL AVOID EXISTING UTILITIES (WATER, NATURAL GAS, ELECTRICITY, CABLE/COMMUNICATIONS, STORM, IRRIGATION, ETC.) AND ASSOCIATED STRUCTURES. IF THE WORK REQUIRES THAT EXISTING UTILITIES BE PERMANENTLY OR TEMPORARILY RELOCATED, THE CONTRACTOR SHALL COORDINATE WITH THE HOMEOWNER AND THE UTILITY.
 2. BEND PIPE TO ACHIEVE DESIRED ALIGNMENT AND NOT TO EXCEED MINIMUM ALLOWABLE BENDING RADIUS, PER MANUFACTURER RECOMMENDATIONS.

- CONSTRUCTION NOTES:**
- 1 CONSTRUCTION CL EQUALS PROPOSED PIPE CL, SEE SURVEY CONTROL PLAN, SHT G-5
 - 3 ABAND EXIST SS FM & APPURTENANCES IN ACCORDANCE W/ SPECS
 - 5 PROTECT EXIST UNDERGROUND POWER AND TELECOMMUNICATION, DURING CONSTRUCTION
 - 6 SS FM TRENCH SECTION PER DET 3, SHT SS-58
 - 7 FURNISH & INSTALL TRACER WIRE AND HANDHOLE PER DET 1, SHT SS-58
 - 16 TRANSITION FROM 20" DI TO 26" HDPE DR 11 PIPE, SEE DET 4, SHT SS-60

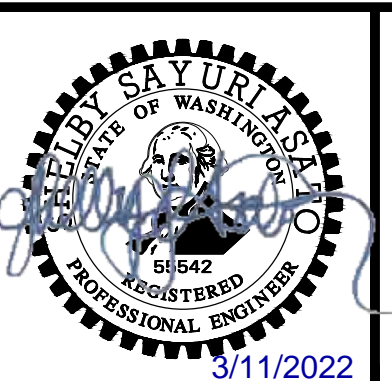


PROFILE
SCALE: 1"=20' HORIZ, 1"=5' VERT

NO.	DATE	BY	REVISION
1	03/07/2022	TMH	ADDENDUM #1

NOTICE
0 1/2 1
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TMH
DESIGNED
BAW
DRAWN
EKS
CHECKED



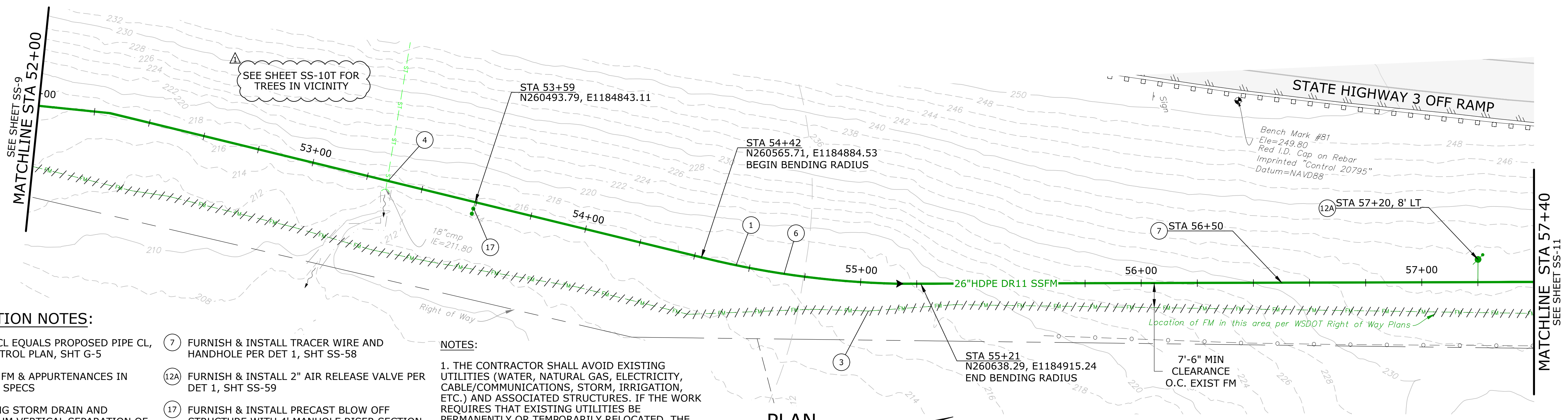
**BANGOR-KEYPORT
FORCE MAIN
REPLACEMENT**

**FORCE MAIN REPLACEMENT
PLAN & PROFILE STA 47+40
TO STA 52+00
SCHEDULE A**

PROJECT NO.: 20-2815 SCALE: AS SHOWN DATE: FEBRUARY 2022

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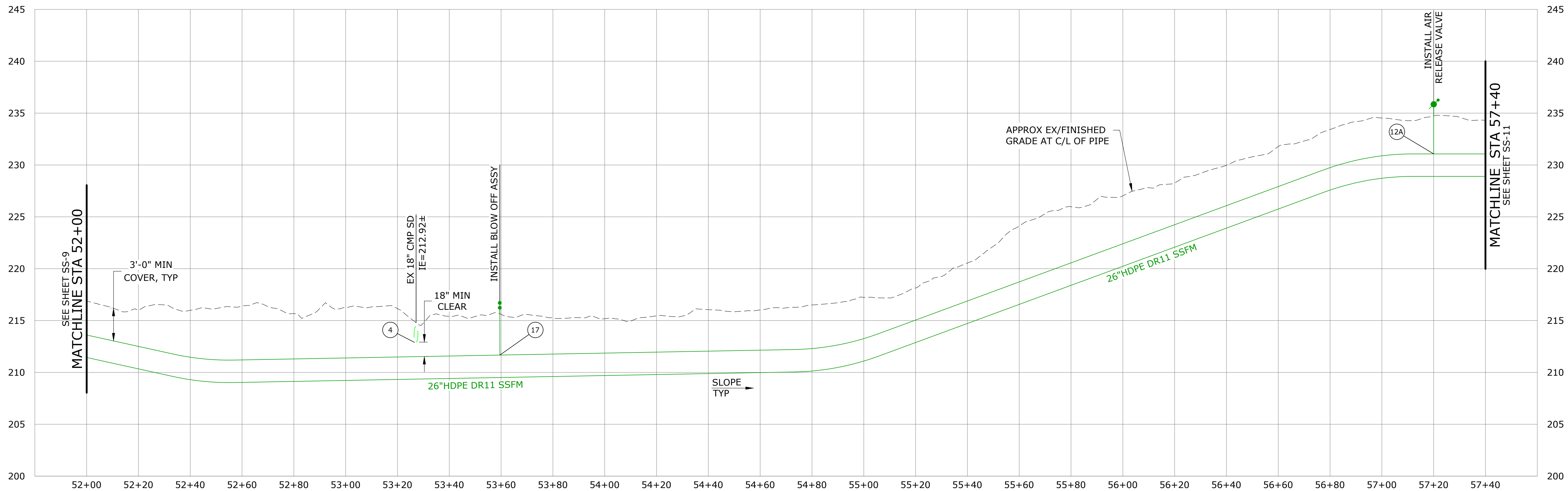
PLAN
SCALE: 1"=20'

CONSTRUCTION NOTES:

- 1. CONSTRUCTION CL EQUALS PROPOSED PIPE CL, SEE SURVEY CONTROL PLAN, SHT G-5
- 2. ABAND EXIST SS FM & APPURTENANCES IN ACCORDANCE W/ SPECS
- 3. PROTECT EXISTING STORM DRAIN AND MAINTAIN MINIMUM VERTICAL SEPARATION OF 18" FROM STORM DRAIN TO SSFM MEASURED EDGE-TO-EDGE, SEE DET 1, SHT SS-62 FOR PIPE SUPPORT
- 4. SS FM TRENCH SECTION PER DET 3, SHT SS-58
- 5. FURNISH & INSTALL TRACER WIRE AND HANDHOLE PER DET 1, SHT SS-58
- 6. FURNISH & INSTALL 2" AIR RELEASE VALVE PER DET 1, SHT SS-59
- 7. FURNISH & INSTALL PRECAST BLOW OFF STRUCTURE WITH 4' MANHOLE RISER SECTION AND SET TOP OF FLATTOP LID WITHOUT GRADE RINGS 12-14 INCHES ABOVE FINISHED GRADE. SET VALVE BOX AND CONCRETE COLLAR 3 - 6 INCHES ABOVE FINISHED GRADE.

NOTES:

1. THE CONTRACTOR SHALL AVOID EXISTING UTILITIES (WATER, NATURAL GAS, ELECTRICITY, CABLE/COMMUNICATIONS, STORM, IRRIGATION, ETC.) AND ASSOCIATED STRUCTURES. IF THE WORK REQUIRES THAT EXISTING UTILITIES BE PERMANENTLY OR TEMPORARILY RELOCATED, THE CONTRACTOR SHALL COORDINATE WITH THE HOMEOWNER AND THE UTILITY.
2. BEND PIPE TO ACHIEVE DESIRED ALIGNMENT AND NOT TO EXCEED MINIMUM ALLOWABLE BENDING RADIUS, PER MANUFACTURER RECOMMENDATIONS.

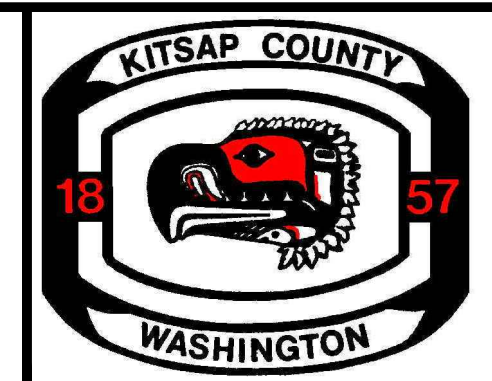
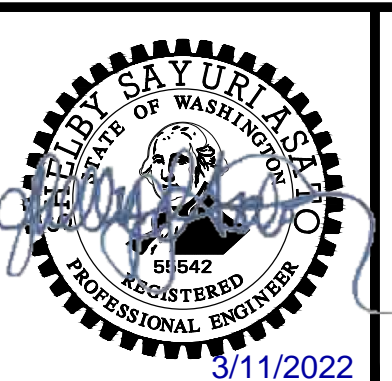


PROFILE
SCALE: 1"=20' HORIZ, 1"=5' VERT

NO.	DATE	BY	REVISION
1	03/07/2022	TMH	ADDENDUM #1

NOTICE
0 1/2 1
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BAW DRAWN
EKS CHECKED



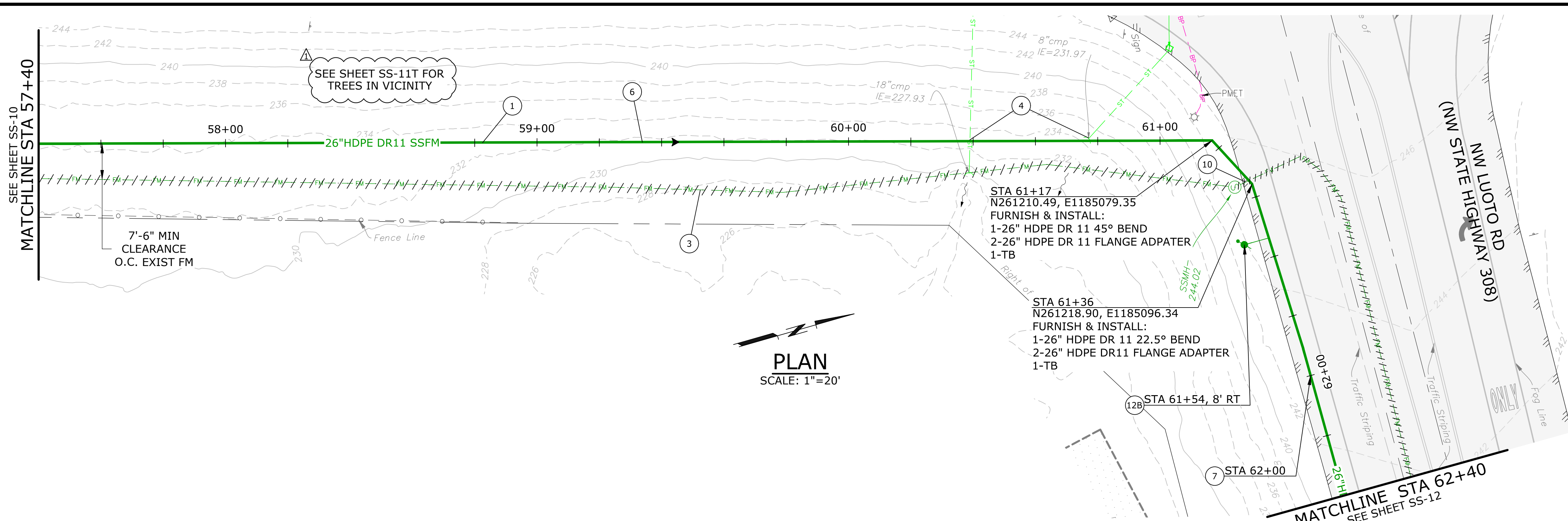
**BANGOR-KEYPORT
FORCE MAIN
REPLACEMENT**

**FORCE MAIN REPLACEMENT
PLAN & PROFILE STA 52+00
TO STA 57+40
SCHEDULE A**

PROJECT NO.: 20-2815 SCALE: AS SHOWN DATE: FEBRUARY 2022

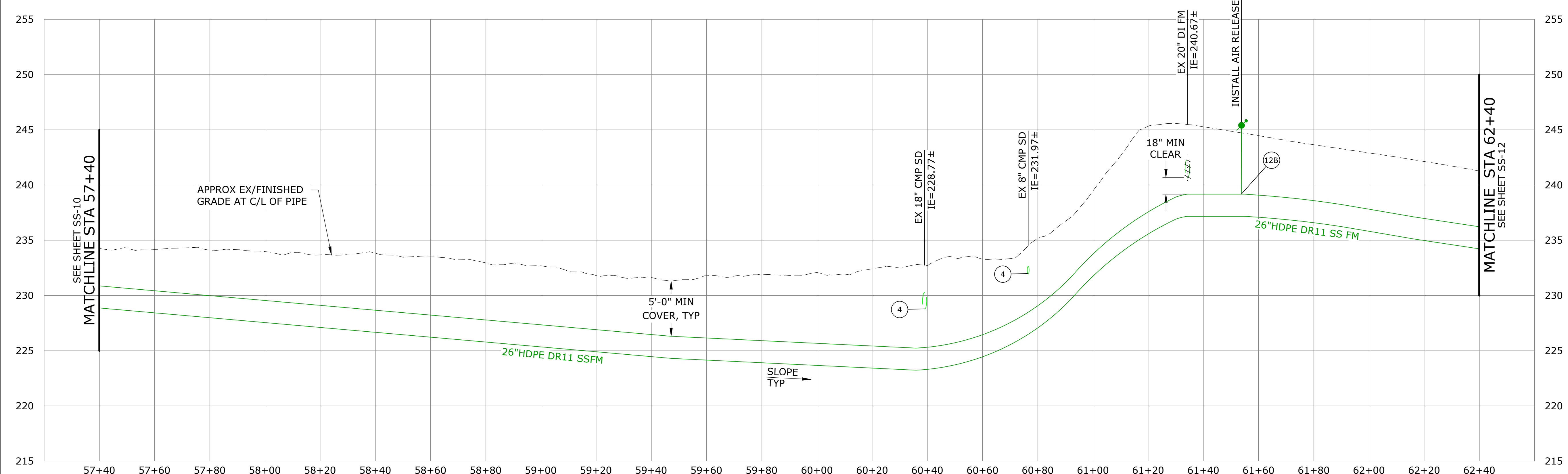
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PLAN
SCALE: 1"=20'

- NOTES:**
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 2. BEND PIPE TO ACHIEVE DESIRED ALIGNMENT AND NOT TO EXCEED MINIMUM ALLOWABLE BENDING RADIUS, PER MANUFACTURER RECOMMENDATIONS.
- CONSTRUCTION NOTES:**
- 1 CONSTRUCTION CL EQUALS PROPOSED PIPE CL, SEE SURVEY CONTROL PLAN, SHT G-5
 - 3 ABAND EXIST SS FM & APPURTENANCES IN ACCORDANCE W/ SPECS
 - 4 PROTECT EXISTING STORM DRAIN AND MAINTAIN MINIMUM VERTICAL SEPARATION OF 18" FROM STORM DRAIN TO SSFM MEASURED EDGE-TO-EDGE, SEE DET 1, SHT SS-62 FOR PIPE SUPPORT
 - 6 SS FM TRENCH SECTION PER DET 3, SHT SS-58
 - 7 FURNISH & INSTALL TRACER WIRE AND HANDHOLE PER DET 1, SHT SS-58
 - 10 PROTECT EXIST SSFM, MAINTAIN MINIMUM VERTICAL SEPARATION OF 18" MEASURED EDGE-TO-EDGE. SEE SPECS FOR ADDITIONAL REQUIREMENTS
 - 12B FURNISH & INSTALL 3" AIR RELEASE VALVE PER DET 2, SHT SS-59



PROFILE
SCALE: 1"=20' HORIZ, 1"=5' VERT

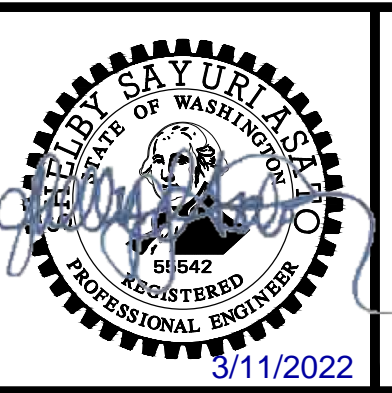
NO.	DATE	BY	REVISION
1	03/07/2022	TMH	ADDENDUM #1

NOTICE

0 1/2 1

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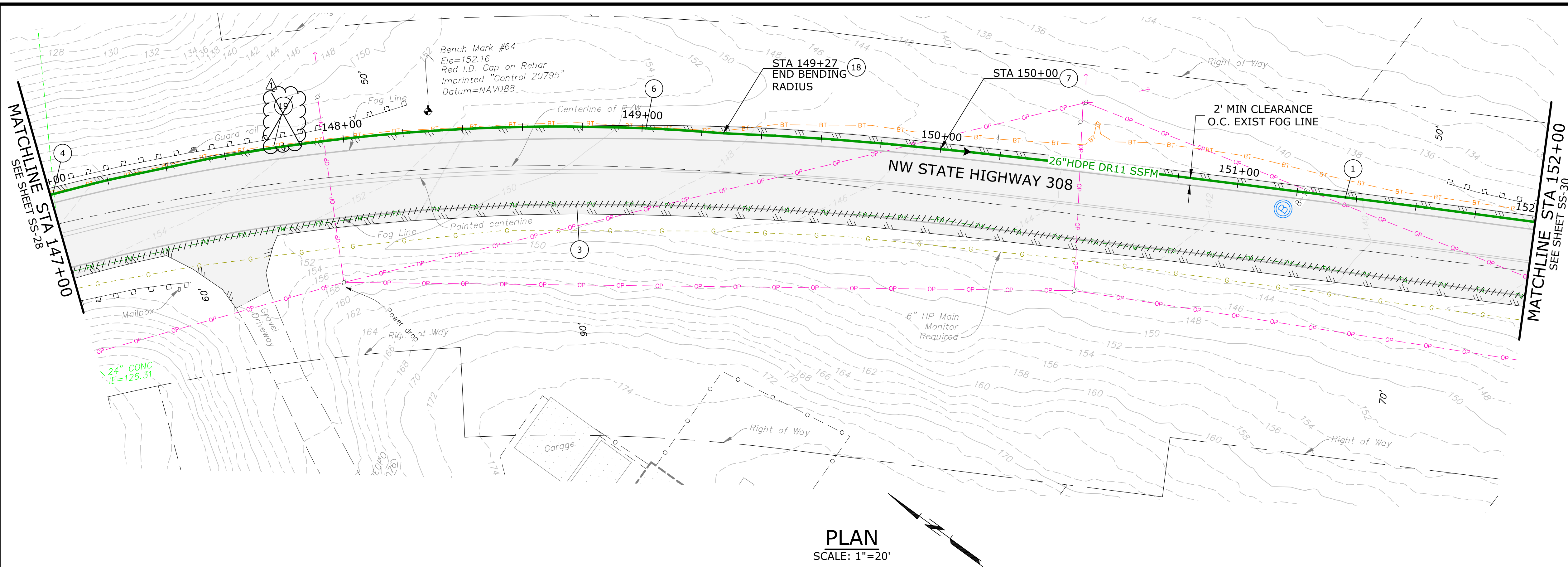
**BANGOR-KEYPORT
FORCE MAIN
REPLACEMENT**

**FORCE MAIN REPLACEMENT
PLAN & PROFILE STA 57+40
TO STA 62+40
SCHEDULE A**

PROJECT NO.: 20-2815 SCALE: AS SHOWN DATE: FEBRUARY 2022

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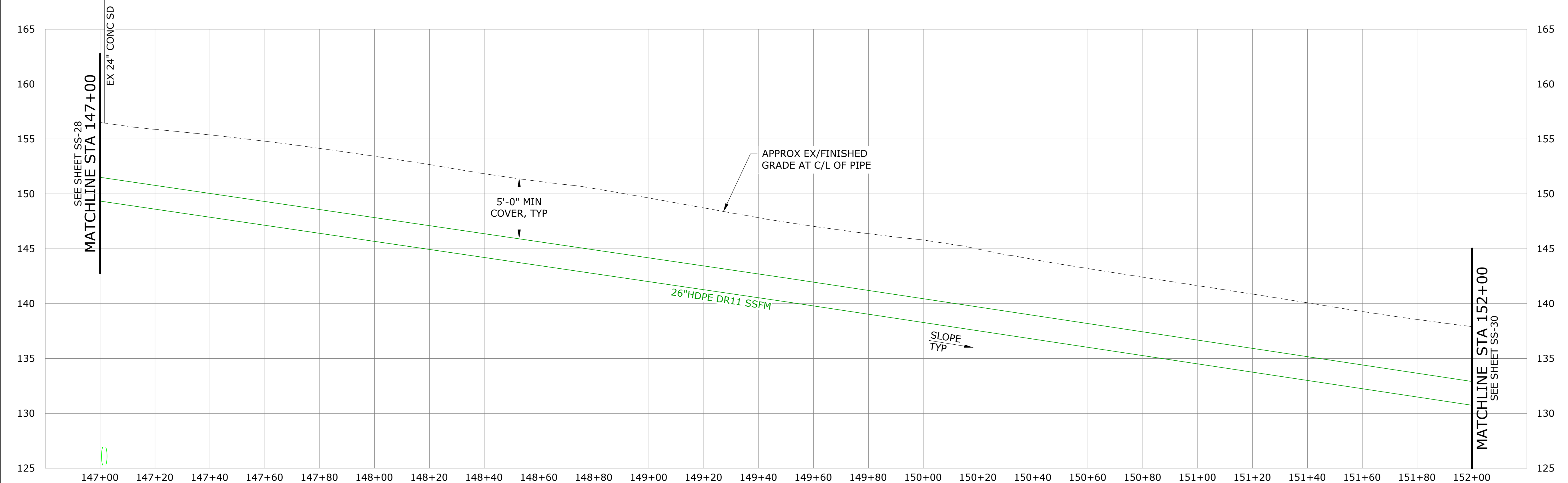
\\ad.msa-ep.com\everett\vt_projects\20\2815 - Kitsap County Bangor Keyport Fm Replacement\CAD\Sheets\20-2815-WA-CIVIL4.dwg SS-29 2/3/2022 12:59 PM JUSTIN.DEUEL 23.05 (LMS Tech)



PLAN
SCALE: 1"=20'

- NOTES:**
1. AVOID EXISTING UTILITIES (WATER, NATURAL GAS, ELECTRICITY, CABLE/COMMUNICATIONS, STORM, IRRIGATION, ETC.) AND ASSOCIATED STRUCTURES. IF THE WORK REQUIRES THAT EXISTING UTILITIES BE PERMANENTLY OR TEMPORARILY RELOCATED, THE CONTRACTOR SHALL COORDINATE WITH THE COUNTY AND THE UTILITY.
 2. BEND PIPE TO ACHIEVE DESIRED ALIGNMENT AND NOT TO EXCEED MINIMUM ALLOWABLE BENDING RADIUS, PER MANUFACTURER RECOMMENDATIONS.

- CONSTRUCTION NOTES:**
- 1 CONSTRUCTION CL EQUALS PROPOSED PIPE CL, SEE SURVEY CONTROL PLAN, SHT G-5
 - 3 ABANDON EXIST SS FM & APPURTENANCES IN ACCORDANCE W/ SPECS
 - 4 PROTECT EXISTING STORM DRAIN AND MAINTAIN MINIMUM VERTICAL SEPARATION OF 18" FROM STORM DRAIN TO SSFM MEASURED EDGE-TO-EDGE, SEE DET 1, SHT SS-62 FOR PIPE SUPPORT
 - 6 SS FM TRENCH SECTION PER DET 3, SHT SS-58
 - 7 FURNISH & INSTALL TRACER WIRE AND HANDHOLE PER DET 1, SHT SS-58
 - 18 BURIED TELEPHONE TO BE RELOCATED BY UTILITY
- 19 CONNECT TO EXIST 16" DI SS FM, SEE DET-3, SHT SS-60

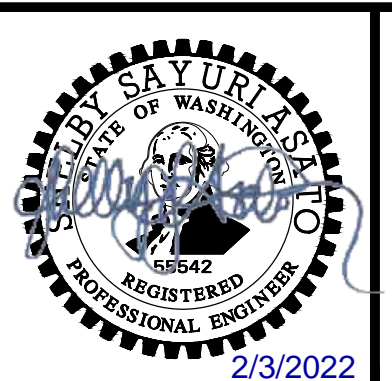


PROFILE
SCALE: 1"=20' HORIZ, 1"=5' VERT

NO.	DATE	BY	REVISION
1	03/07/2022	TMH	ADDENDUM #1

NOTICE
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IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

TMH
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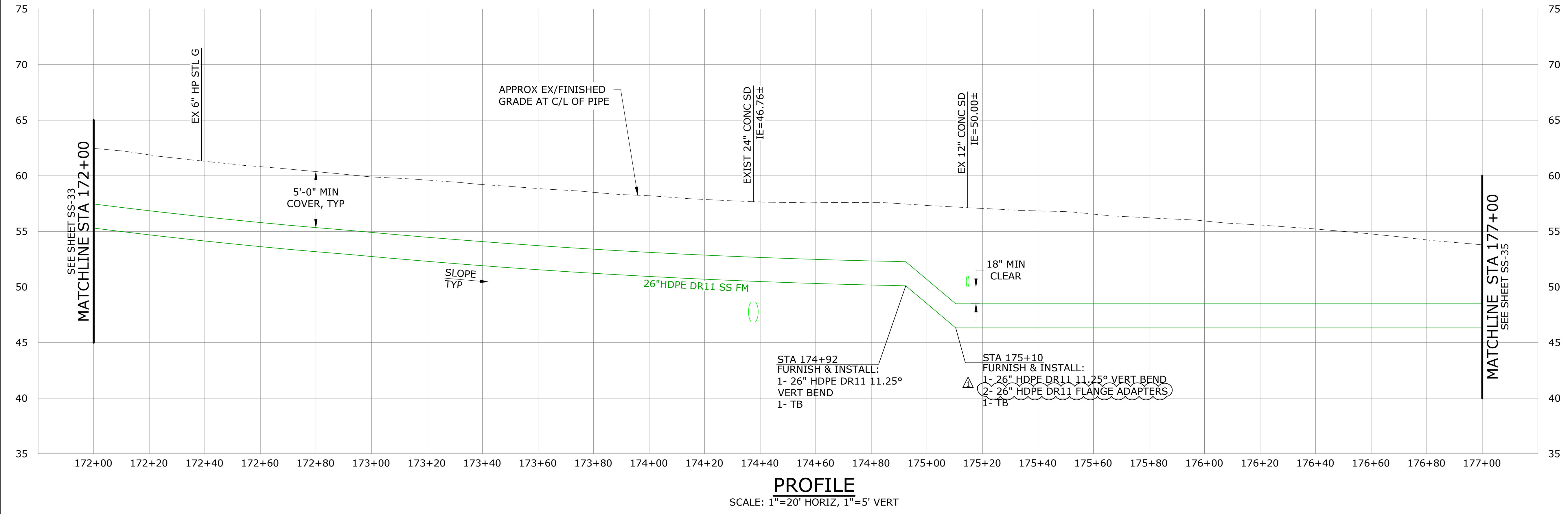
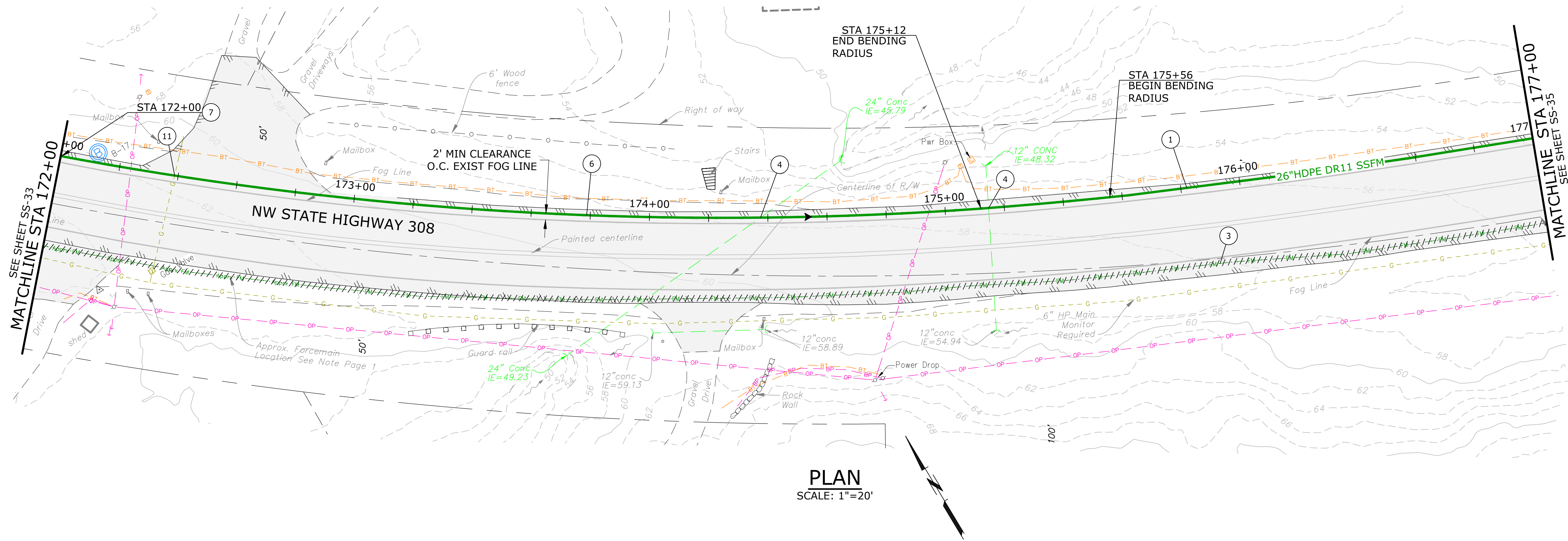
**BANGOR-KEYPORT
FORCE MAIN
REPLACEMENT**

**FORCE MAIN REPLACEMENT
PLAN & PROFILE STA 147+00
TO STA 152+00
SCHEDULE A**

PROJECT NO.: 20-2815 SCALE: AS SHOWN DATE: FEBRUARY 2022

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\\ad.msa-ep.com\everett\vt_projects\20\2815 - Kitsap County Bangor_keyport Fm Replacement\CAD\Sheets\20-2815-WA-CIVIL4.dwg SS-34 3/3/2022 11:42 AM MATT. ESTEP 23.05 (LMS Tech)



- NOTES:**
1. AVOID EXISTING UTILITIES (WATER, NATURAL GAS, ELECTRICITY, CABLE/COMMUNICATIONS, STORM, IRRIGATION, ETC.) AND ASSOCIATED STRUCTURES. IF THE WORK REQUIRES THAT EXISTING UTILITIES BE PERMANENTLY OR TEMPORARILY RELOCATED, THE CONTRACTOR SHALL COORDINATE WITH THE HOMEOWNER AND THE UTILITY.
 2. BEND PIPE TO ACHIEVE DESIRED ALIGNMENT AND NOT TO EXCEED MINIMUM ALLOWABLE BENDING RADIUS, PER MANUFACTURER RECOMMENDATIONS.
 3. SEE SPEC SECTION 31 23 33 FOR CDF REQUIREMENTS.
- CONSTRUCTION NOTES:**
1. CONSTRUCTION CL EQUALS PROPOSED PIPE CL, SEE SURVEY CONTROL PLAN, SHT G-5
 3. ABAND EXIST SS FM & APPURTENANCES IN ACCORDANCE W/ SPECS
 4. PROTECT EXISTING STORM DRAIN AND MAINTAIN MINIMUM VERTICAL SEPARATION OF 18" FROM STORM DRAIN TO SSFM MEASURED EDGE-TO-EDGE, SEE DET 1, SHT SS-62 FOR PIPE SUPPORT
 6. SS FM TRENCH SECTION PER DET 3, SHT SS-58
 7. FURNISH & INSTALL TRACER WIRE AND HANDHOLE PER DET 1, SHT SS-58
 11. PROTECT EXIST GAS, MAINTAIN MINIMUM VERTICAL SEPARATION OF 12" MEASURED EDGE-TO-EDGE. MONITORING BY GAS UTILITY IS REQUIRED AT ALL TIMES DURING EXCAVATION AND BACKFILL OPERATIONS. WHEN GAS LINE IS EXPOSED RESTORE PIPE BY PACKING 6" OF SAND AROUND THE PIPE.

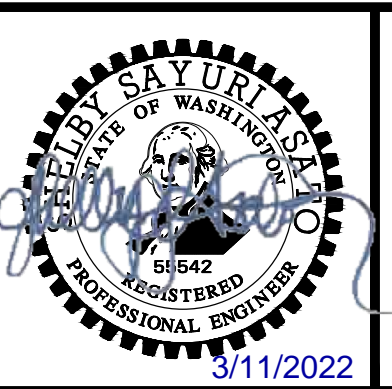
NO.	DATE	BY	REVISION
1	03/07/2022	TMH	ADDENDUM #1

NOTICE

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IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

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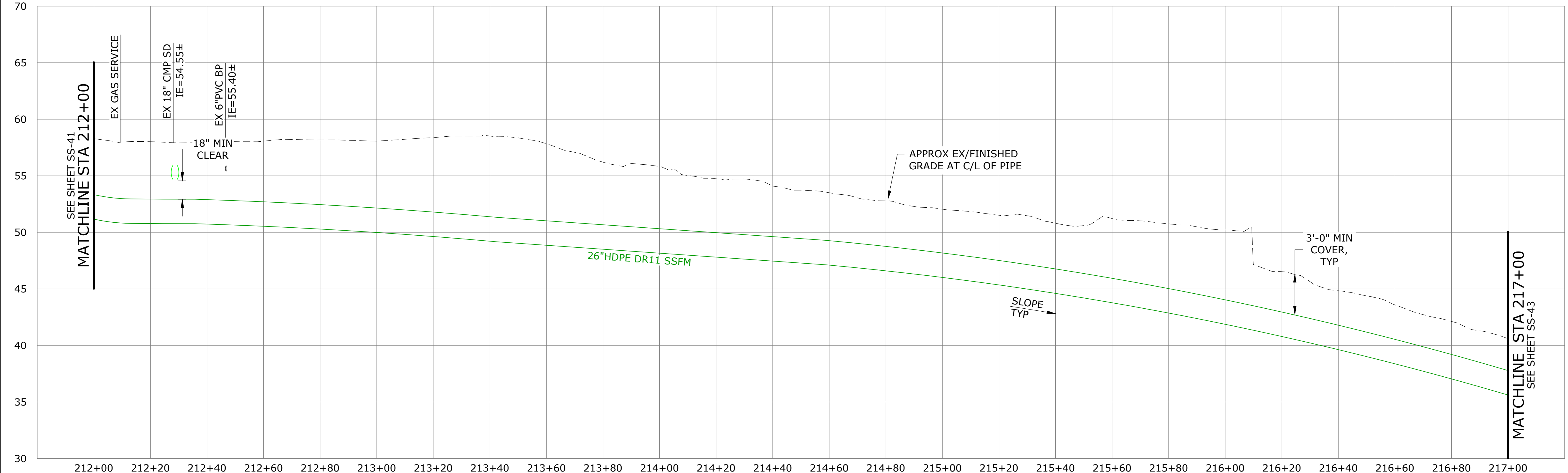
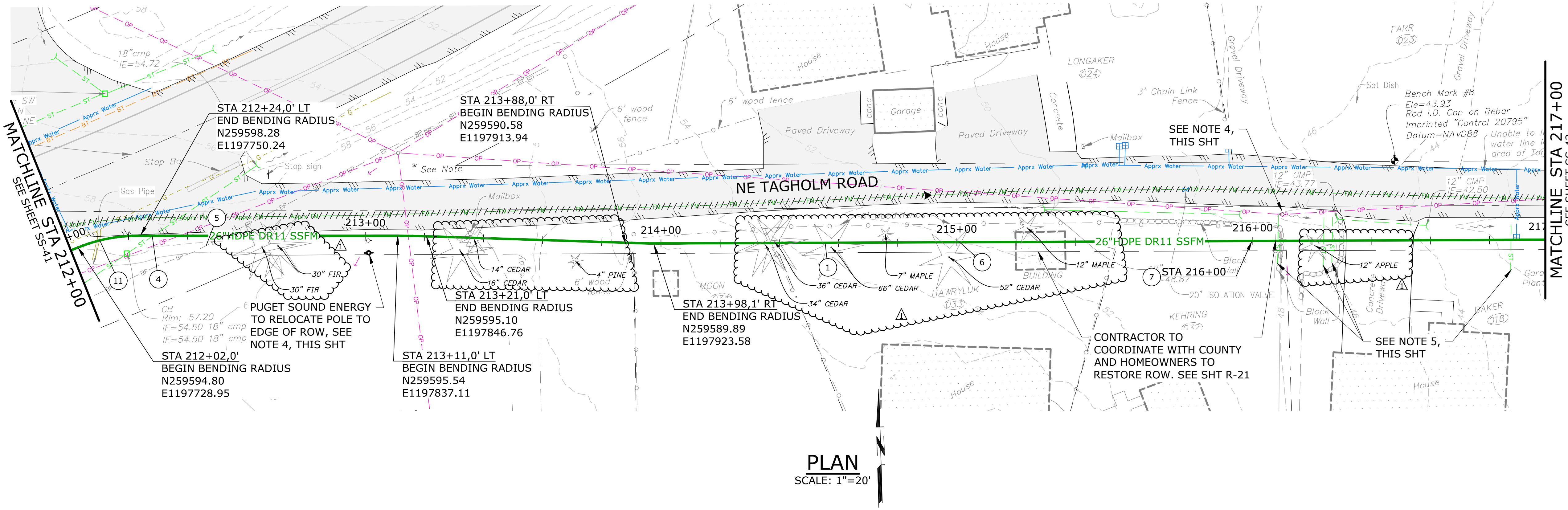
**BANGOR-KEYPORT
FORCE MAIN
REPLACEMENT**

**FORCE MAIN REPLACEMENT
PLAN & PROFILE STA 172+00
TO STA 177+00
SCHEDULE A**

PROJECT NO.: 20-2815 SCALE: AS SHOWN DATE: FEBRUARY 2022

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\\ad.msa-ep.com\everett\vt_projects\20\2815 - Kitsap County Bangor - Keyport Fm Replacement\CAD\Sheets\20-2815-WA-CIVIL5.dwg SS-42 3/3/2022 11:25 AM MATT. ESTEP 23.0s (LMS Tech)



PROFILE
SCALE: 1"=20' HORIZ, 1"=5' VERT

CONSTRUCTION NOTES:

- 1 CONSTRUCTION CL EQUALS PROPOSED PIPE CL, SEE SURVEY CONTROL PLAN, SHT G-5
- 4 PROTECT EXISTING STORM DRAIN AND MAINTAIN MINIMUM VERTICAL SEPARATION OF 18" FROM STORM DRAIN TO SSFM MEASURED EDGE-TO-EDGE, SEE DET 1, SHT SS-62 FOR PIPE SUPPORT
- 5 PROTECT EXIST UNDERGROUND POWER AND TELECOMMUNICATION, DURING CONSTRUCTION
- 6 SS FM TRENCH SECTION PER DET 3, SHT SS-58
- 7 FURNISH & INSTALL TRACER WIRE AND HANDHOLE PER DET 1, SHT SS-58
- 11 PROTECT EXIST GAS, MAINTAIN MINIMUM VERTICAL SEPARATION OF 12" MEASURED EDGE-TO-EDGE. MONITORING BY GAS UTILITY IS REQUIRED AT ALL TIMES DURING EXCAVATION AND BACKFILL OPERATIONS. WHEN GAS LINE IS EXPOSED RESTORE PIPE BY PACKING 6" OF SAND AROUND THE PIPE.

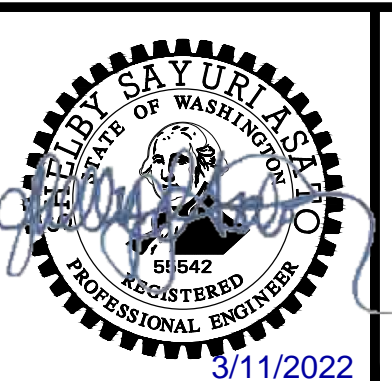
NOTES:

1. AVOID EXISTING UTILITIES (WATER, NATURAL GAS, ELECTRICITY, CABLE/ COMMUNICATIONS, STORM, IRRIGATION, ETC.) AND ASSOCIATED STRUCTURES. IF THE WORK REQUIRES THAT EXISTING UTILITIES BE PERMANENTLY OR TEMPORARILY RELOCATED, THE CONTRACTOR SHALL COORDINATE WITH THE COUNTY AND THE UTILITY.
2. BEND PIPE TO ACHIEVE DESIRED ALIGNMENT AND NOT TO EXCEED MINIMUM ALLOWABLE BENDING RADIUS, PER MANUFACTURER RECOMMENDATIONS.
3. CONTRACTOR TO COORDINATE WITH FITTING FABRICATOR TO ACHIEVE NON-STANDARD HDPE FITTING ANGLES.
4. CONTRACTOR TO COORDINATE POWER POLE STABILIZATION DURING TRENCHING AND PIPE PLACEMENT OPERATIONS WITH PUGET SOUND ENERGY.
5. APPROX LOCATION EXIST YARD DRAIN, CONTRACTOR TO FIELD VERIFY LOCATION & QUANTITY ALONG TAGHOLM RD. RESTORE CONNECTIONS TO STORM SYSTEM, SEE SHT R-22.
6. IMPACTED TREES WITHIN ROW SHALL BE FULLY REMOVED.
- 6A. TREES IMPACTED BUT OUTSIDE OF ROW SHALL BE EVALUATED ONCE ACCESS AND SURVEY ARE ESTABLISHED.
- 6B. SHOULD A TREE, REGARDLESS OF LOCATION, BE IMPACTED SUCH THAT IT IS DEEMED A HAZARD, IT SHALL BE REMOVED AND ITS STUMP SHALL UNDERGO FURTHER EVALUATION AND BE SUBJECT TO FULL REMOVAL OR GRINDING.
- 6C. IMPACTS TO EXISTING STRUCTURES SHALL BE CONSIDERED DURING EVALUATION OF STUMP REMOVAL/GRINDING.

NO.	DATE	BY	REVISION
1	03/07/2022	TMH	ADDENDUM #1

NOTICE
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IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

TMH DESIGNED
BAW DRAWN
EKS CHECKED



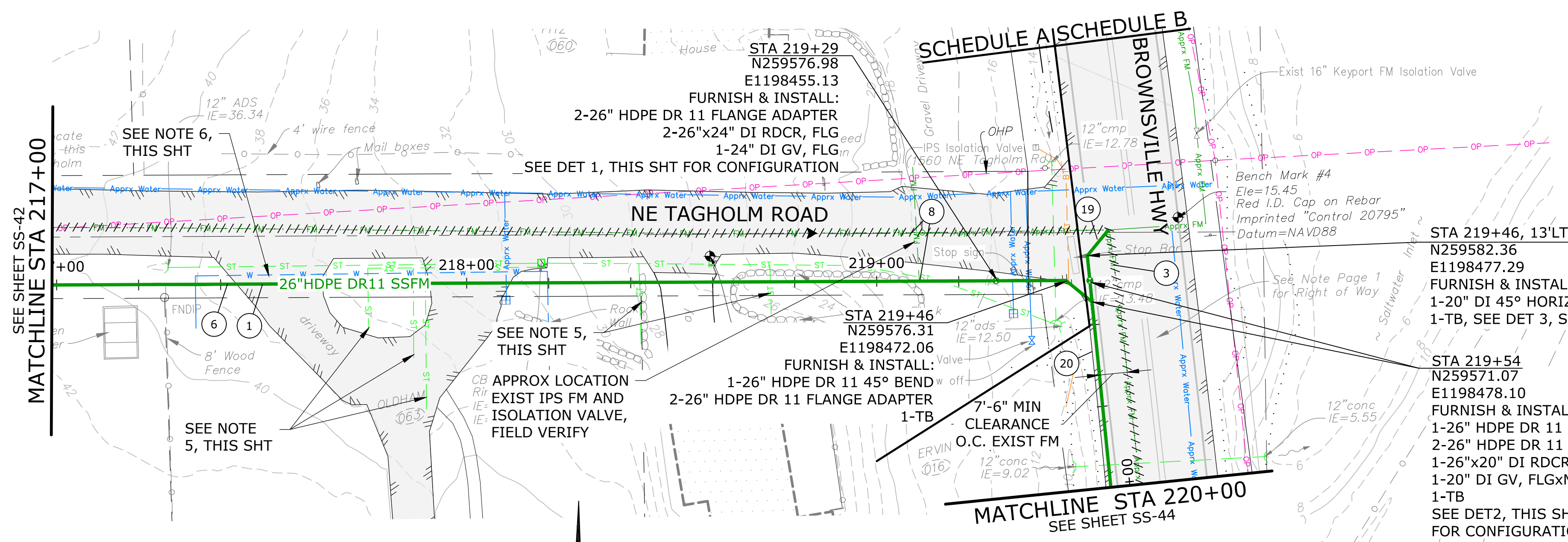
**BANGOR-KEYPORT
FORCE MAIN
REPLACEMENT**

**FORCE MAIN REPLACEMENT
PLAN & PROFILE STA 212+00
TO STA 217+00
SCHEDULE A**

PROJECT NO.: 20-2815 SCALE: AS SHOWN DATE: FEBRUARY 2022

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PLAN
SCALE: 1"=20'

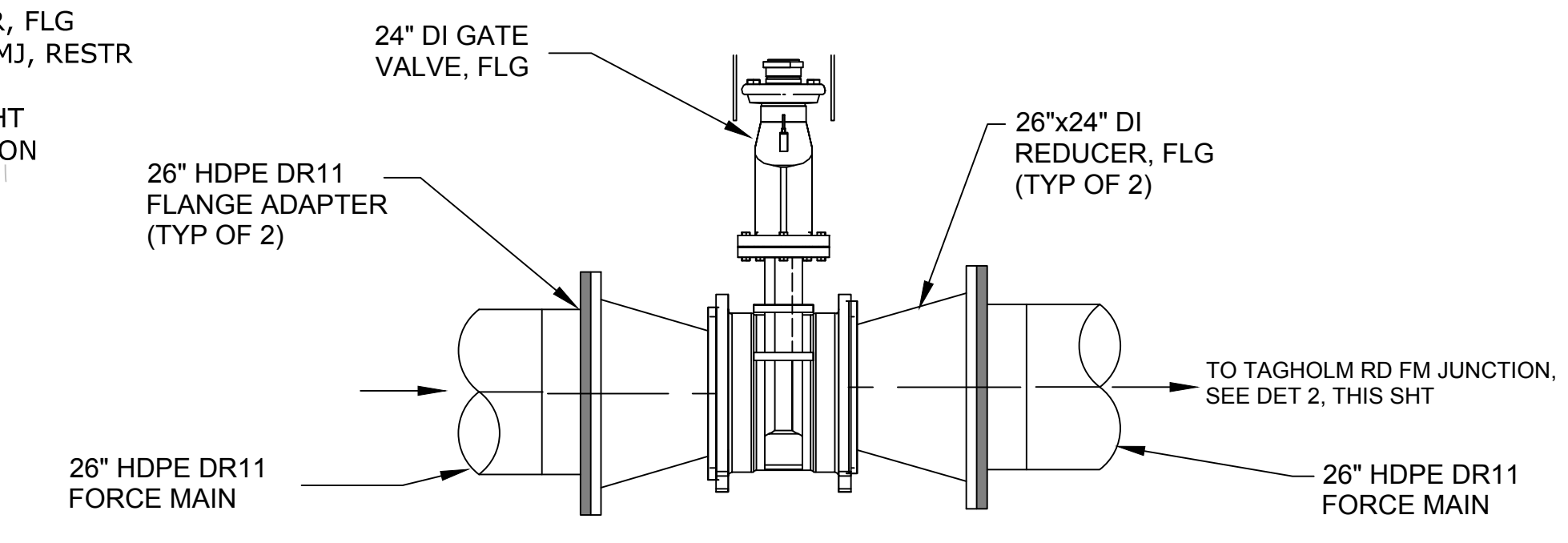
7. TIDALLY INFLUENCED GROUNDWATER MAY BE PRESENT BELOW ANTICIPATED EXCAVATION DEPTHS BETWEEN APPROXIMATE STATIONS 218+80 TO 222+00.

NOTES:

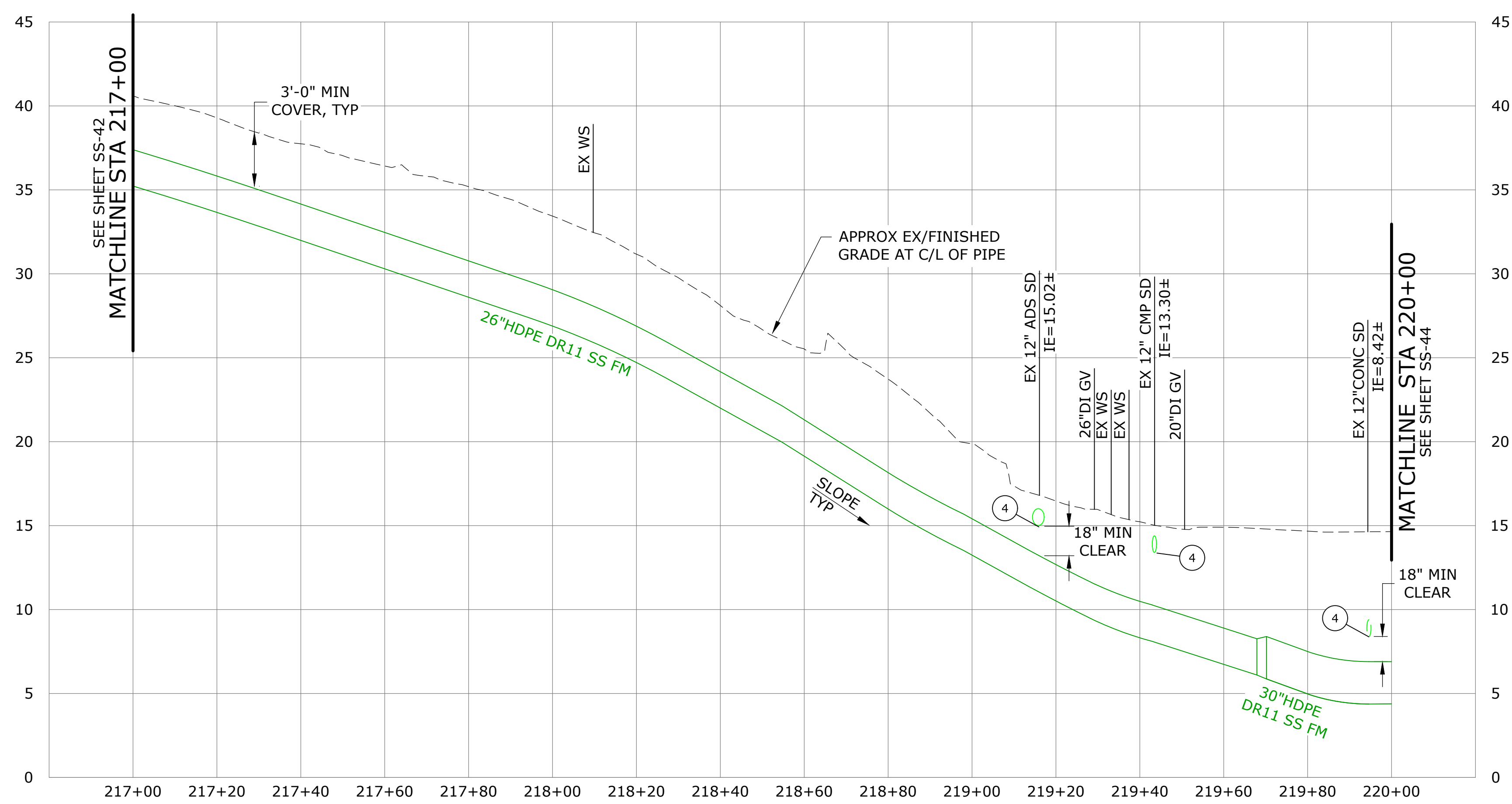
1. AVOID EXISTING UTILITIES (WATER, NATURAL GAS, ELECTRICITY, CABLE/COMMUNICATIONS, STORM, IRRIGATION, ETC.) AND ASSOCIATED STRUCTURES. IF THE WORK REQUIRES THAT EXISTING UTILITIES BE PERMANENTLY OR TEMPORARILY RELOCATED, THE CONTRACTOR SHALL COORDINATE WITH THE COUNTY AND THE UTILITY.
2. BEND PIPE TO ACHIEVE DESIRED ALIGNMENT AND NOT TO EXCEED MINIMUM ALLOWABLE BENDING RADIUS, PER MANUFACTURER RECOMMENDATIONS.
3. CONTRACTOR TO COORDINATE WITH FITTING FABRICATOR TO ACHIEVE NON-STANDARD HDPE FITTING ANGLES.
4. TEMPORARY BYPASS SSSFM FOR REPLACEMENT IN PLACE. SEE SPEC SECTION 01 59 00.1.
5. APPROX LOCATION EXIST YARD DRAIN, CONTRACTOR TO FIELD VERIFY LOCATION & QUANTITY ALONG TAGHOLM RD. RESTORE CONNECTIONS TO STORM SYSTEM, SEE SHT R-22.
6. APPROX LOCATION EXIST SPRINKLER SYSTEM, CONTRACTOR TO FIELD VERIFY LOCATION & CONFIGURATION. RESTORE SYSTEM TO EDGE OF ROW, SEE SHT R-22.

CONSTRUCTION NOTES:

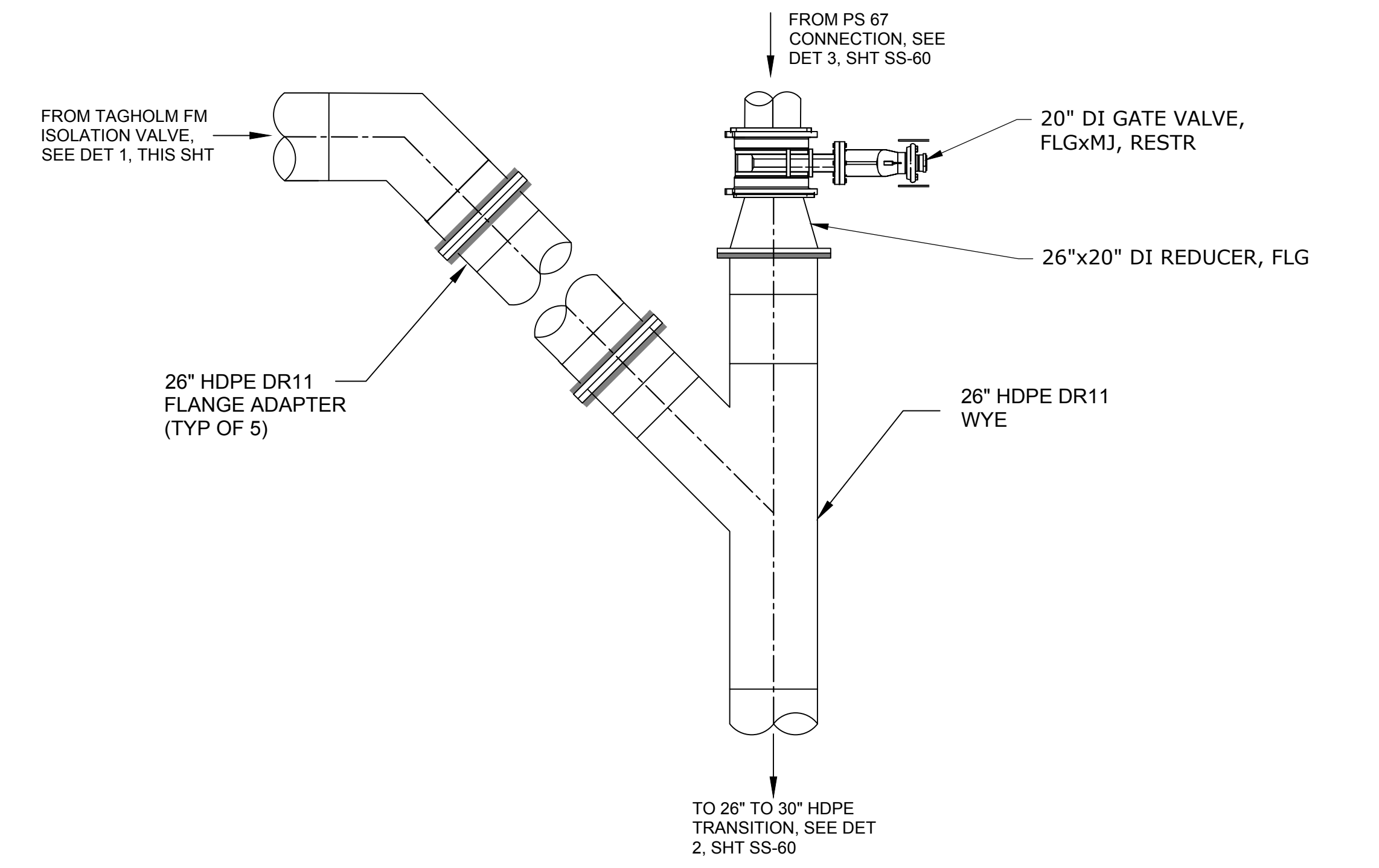
1. CONSTRUCTION CL EQUALS PROPOSED PIPE CL, SEE SURVEY CONTROL PLAN, SHT G-5
3. ABAND EXIST SS FM & APPURTENANCES IN ACCORDANCE W/ SPECS
4. PROTECT EXISTING STORM DRAIN AND MAINTAIN MINIMUM VERTICAL SEPARATION OF 18" FROM STORM DRAIN TO SSSFM MEASURED EDGE-TO-EDGE, SEE DET 1, SHT SS-62 FOR PIPE SUPPORT
6. SS FM TRENCH SECTION PER DET 3, SHT SS-58
8. CONNECT EXIST IPS PER DET 1, SHT SS-57
19. CONNECT TO EXIST 16" DI SS FM, SEE DET 3, SHT SS-60
20. TRANSITION FROM 26" TO 30" HDPE, SEE DET 2, SHT SS-60



TAGHOLM RD FORCE MAIN ISOLATION VALVE
SCALE: NTS



PROFILE
SCALE: 1"=20' HORIZ, 1"=5' VERT

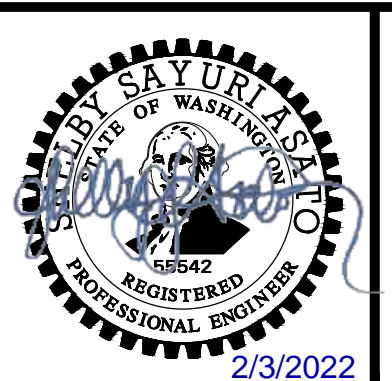


TAGHOLM RD FORCE MAIN JUNCTION
SCALE: NTS

NO.	DATE	BY	REVISION
1	03/07/2022	TMH	ADDENDUM #1

NOTICE
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TMH DESIGNED
BAW DRAWN
EKS CHECKED



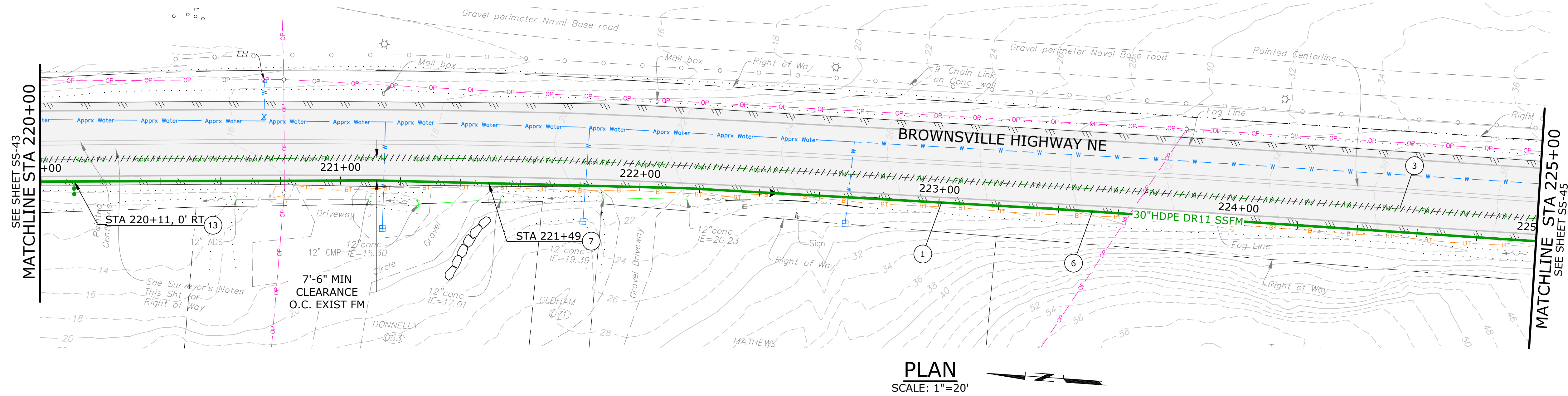
BANGOR-KEYPORT FORCE MAIN REPLACEMENT

FORCE MAIN REPLACEMENT PLAN & PROFILE STA 217+00 TO STA 220+00 SCHEDULE A & SCHEDULE B

PROJECT NO.: 20-2815 SCALE: AS SHOWN DATE: FEBRUARY 2022

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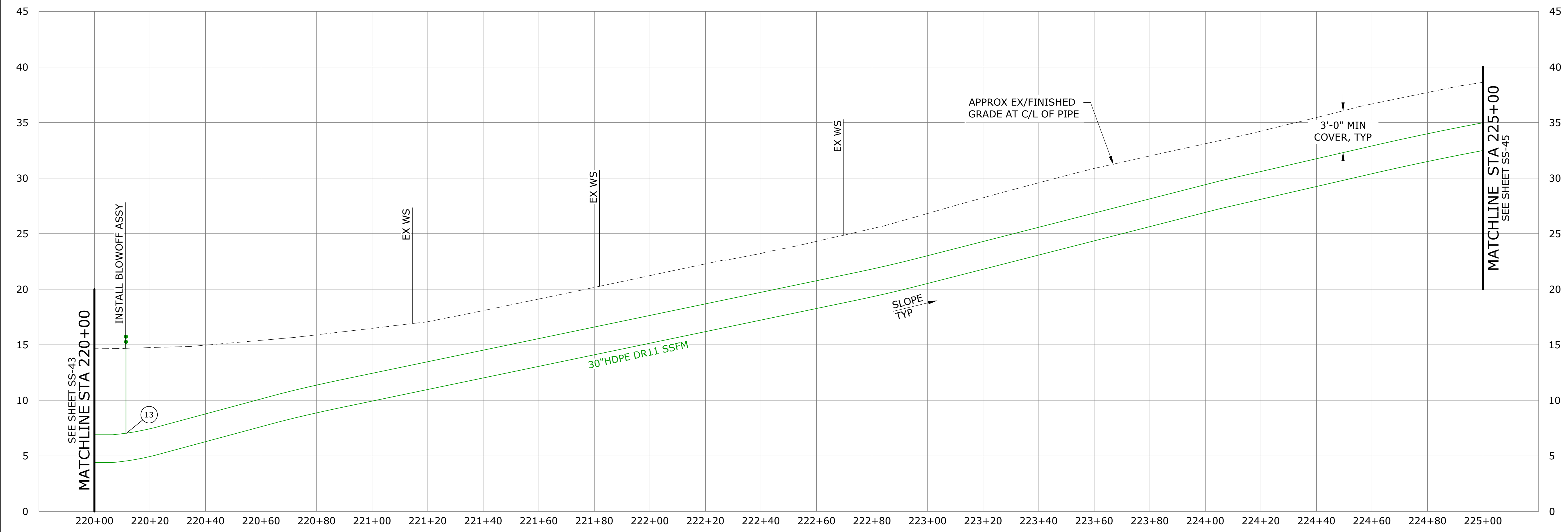
\\ad.msa-ep.com\Everett\vt_projects\20\2815 - Kitsap County Bangor_keyport_fm Replacement\CAD\Sheets\20-2815-WA-CIVIL5.dwg SS-44 2/3/2022 1:06 PM JUSTIN.DEUEL 23.0s (LMS Tech)



PLAN
SCALE: 1"=20'

- NOTES:**
1. AVOID EXISTING UTILITIES (WATER, NATURAL GAS, ELECTRICITY, CABLE/COMMUNICATIONS, STORM, IRRIGATION, ETC.) AND ASSOCIATED STRUCTURES. IF THE WORK REQUIRES THAT EXISTING UTILITIES BE PERMANENTLY OR TEMPORARILY RELOCATED, THE CONTRACTOR SHALL COORDINATE WITH THE COUNTY AND THE UTILITY.
 2. BEND PIPE TO ACHIEVE DESIRED ALIGNMENT AND NOT TO EXCEED MINIMUM ALLOWABLE BENDING RADIUS, PER MANUFACTURER RECOMMENDATIONS.
 3. TIDALLY INFLUENCED GROUNDWATER MAY BE PRESENT BELOW ANTICIPATED EXCAVATION DEPTHS BETWEEN APPROXIMATE STATIONS 218+80 TO 222+00.

- CONSTRUCTION NOTES:**
1. CONSTRUCTION CL EQUALS PROPOSED PIPE CL, SEE SURVEY CONTROL PLAN, SHT G-5
 3. ABAND EXIST SS FM & APPURTENANCES IN ACCORDANCE W/ SPECS
 6. SS FM TRENCH SECTION PER DET 3, SHT SS-58
 7. FURNISH & INSTALL TRACER WIRE AND HANDHOLE PER DET 1, SHT SS-58
 13. FURNISH & INSTALL BLOW OFF ASSY PER DET 2, SHT SS-58



PROFILE
SCALE: 1"=20' HORIZ, 1"=5' VERT

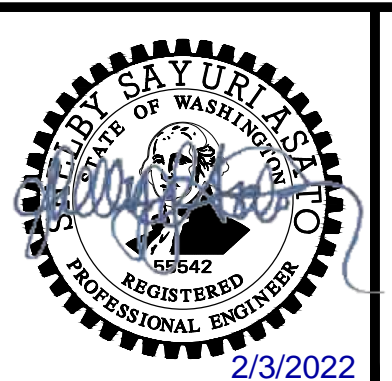
NO.	DATE	BY	REVISION
1	03/07/2022	TMH	ADDENDUM #1

NOTICE

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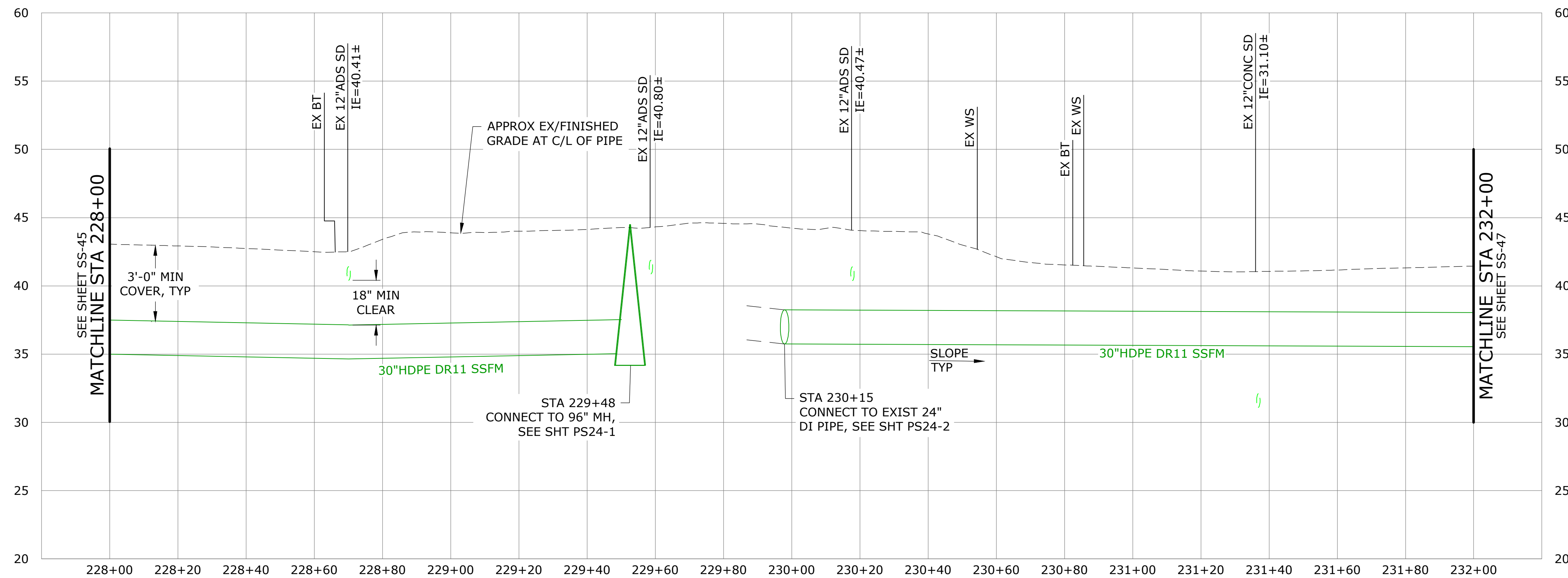
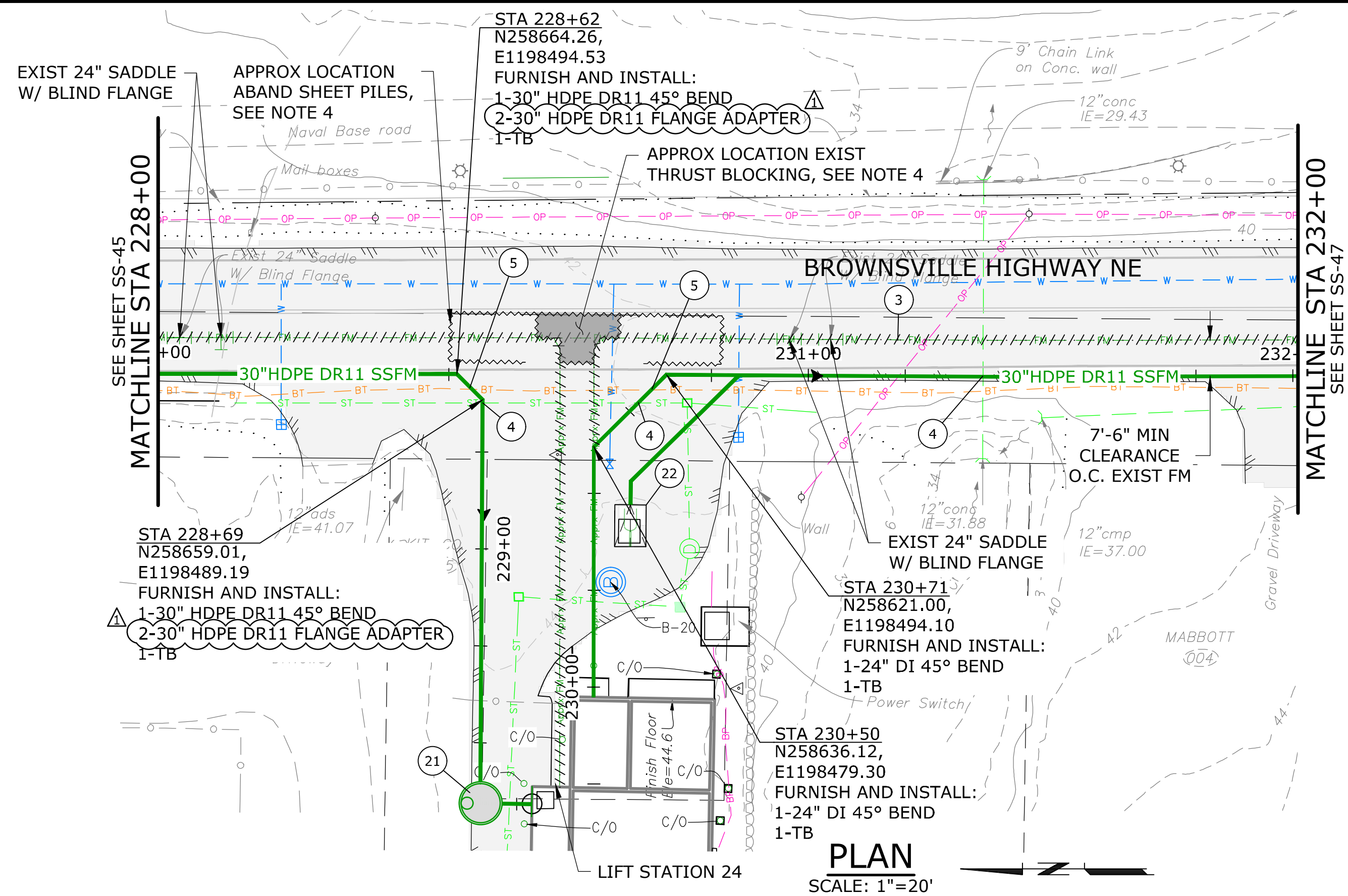
**BANGOR-KEYPORT
FORCE MAIN
REPLACEMENT**

**FORCE MAIN REPLACEMENT
PLAN & PROFILE STA 220+00
TO STA 225+00
SCHEDULE B**

PROJECT NO.: 20-2815 SCALE: AS SHOWN DATE: FEBRUARY 2022

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PROFILE
SCALE: 1"=20' HORIZ, 1"=5' VERT

NOTES:

1. AVOID EXISTING UTILITIES (WATER, NATURAL GAS, ELECTRICITY, CABLE/COMMUNICATIONS, STORM, IRRIGATION, ETC.) AND ASSOCIATED STRUCTURES. IF THE WORK REQUIRES THAT EXISTING UTILITIES BE PERMANENTLY OR TEMPORARILY RELOCATED, THE CONTRACTOR SHALL COORDINATE WITH THE COUNTY AND THE UTILITY
2. BEND PIPE TO ACHIEVE DESIRED ALIGNMENT AND NOT TO EXCEED MINIMUM ALLOWABLE BENDING RADIUS, PER MANUFACTURER RECOMMENDATIONS.
3. PROTECT EXISTING LANDSCAPING
4. CONTRACTOR TO REMOVE ANY EXISTING SHEET PILES AND THRUST BLOCKS FOUND TO BE IN CONFLICT WITH NEW WORK
5. TEMPORARY BYPASS PS 24 FOR WET WELL REHABILITATION AND FINAL CONNECTIONS, SEE SPEC SECTION 01 59 00.
6. RECOAT WET WELL WITH RAVEN 405 EPOXY COATING SYSTEM, SEE SPEC SECTION 09 96 00
7. CONTRACTOR SHALL PROTECT EXISTING LANDSCAPING AT ENTIRE PS 24 SITE. CONTRACTOR SHALL COORDINATE WITH THE COUNTY FOR SELECTIVE REMOVAL OF EXISTING LANDSCAPING AS IS REQUIRED TO COMPLETE THE WORK.

CONSTRUCTION NOTES:

- ① CONSTRUCTION CL EQUALS PROPOSED PIPE CL, SEE SURVEY CONTROL PLAN, SHT G-5
- ③ ABAND EXIST SS FM & APPURTENANCES IN ACCORDANCE W/ SPECS
- ④ PROTECT EXISTING STORM DRAIN AND MAINTAIN MINIMUM VERTICAL SEPARATION OF 18" FROM STORM DRAIN TO SSFM MEASURED EDGE-TO-EDGE, SEE DET 1, SHT SS-62 FOR PIPE SUPPORT
- ⑤ PROTECT EXIST UNDERGROUND POWER AND TELECOMMUNICATION, DURING CONSTRUCTION
- ⑥ SS FM TRENCH SECTION PER DET 3, SHT SS-58
- ②1 CONNECT TO 96" MANHOLE & WETWELL AT PS 24, SEE SHT PS 24-1
- ②2 CONNECT TO EXIST PIG LAUNCH VAULT PER DET 2, SHT PS 24-3

NO.	DATE	BY	REVISION
1	03/07/2022	TMH	ADDENDUM #1

NOTICE

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IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

TMH DESIGNED
BAW DRAWN
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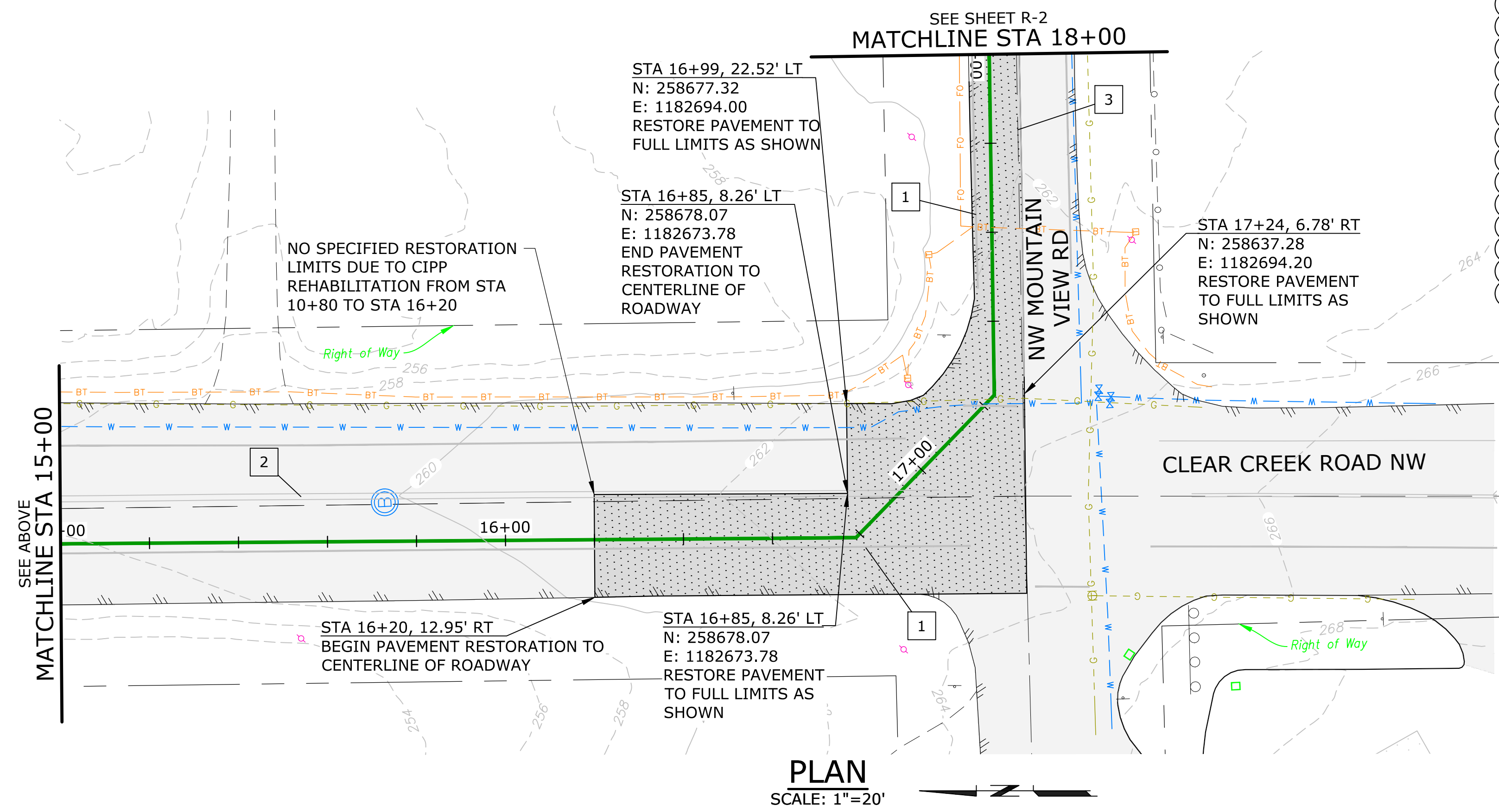
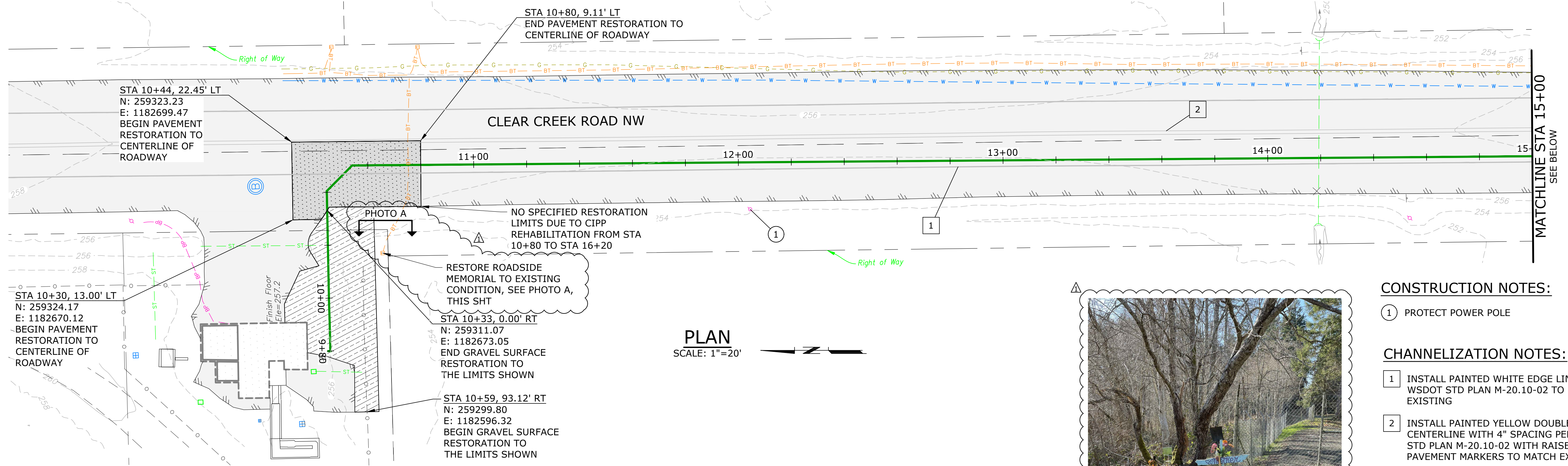
**BANGOR-KEYPORT
FORCE MAIN
REPLACEMENT**

**FORCE MAIN REPLACEMENT
PLAN & PROFILE STA 228+00 TO
STA 232+00
SCHEDULE B**

PROJECT NO.: 20-2815 SCALE: AS SHOWN DATE: FEBRUARY 2022

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CONSTRUCTION NOTES:

- 1 PROTECT POWER POLE

CHANNELIZATION NOTES:

- 1 INSTALL PAINTED WHITE EDGE LINE PER WSDOT STD PLAN M-20.10-02 TO MATCH EXISTING
- 2 INSTALL PAINTED YELLOW DOUBLE CENTERLINE WITH 4" SPACING PER WSDOT STD PLAN M-20.10-02 WITH RAISED PAVEMENT MARKERS TO MATCH EXISTING
- 3 INSTALL PAINTED YELLOW DOTTED CENTERLINE PER WSDOT STD PLAN M-20.10-02 WITH RAISED PAVEMENT MARKERS TO MATCH EXISTING

NOTES:

- 1. ALL NECESSARY RESTORATION MAY NOT BE IDENTIFIED ON THE DRAWINGS. RESTORE ALL DISTURBED AREAS TO PRE-CONSTRUCTION CONDITIONS OR BETTER WITH LIKE MATERIAL.
- 2. NATIVE VEGETATION WILL BE RESTORED IN KIND IN CONSTRUCTION AREA. DO NOT DISTURB NATIVE VEGETATION OUTSIDE THE CONSTRUCTION LIMITS.
- 3. PROVIDE ALL THERMOPLASTIC MARKINGS PAINT STRIPING, AND SIGNAGE.
- 4. REMOVE ALL EXISTING PAVEMENT MARKINGS IN CONFLICT WITH PROPOSED MARKINGS.
- 5. ALL PAVEMENT MARKINGS SHALL CONFORM TO THE LATEST EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, UNLESS OTHERWISE NOTED.
- 6. CONTACT COUNTY WORKS TRAFFIC DIVISION PRIOR TO INSTALLING PAVEMENT MARKINGS OR OTHER TRAFFIC DELINEATORS ON COUNTY RIGHTS OF WAY TO ENSURE COMPLIANCE WITH KITSAP COUNTY ROAD STANDARDS SECTION 6.2.5.

LEGEND:

- GRAVEL SURFACING, SEE DETAIL 2, DRAWING R-29
- HMA PAVEMENT, SEE DETAIL 3, DRAWING R-29

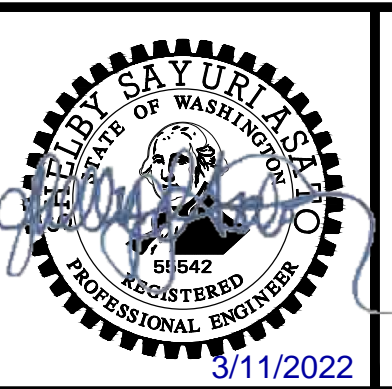
NO.	DATE	BY	REVISION
1	03/07/2022	TMH	ADDENDUM #1

NOTICE

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IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

TMH DESIGNED
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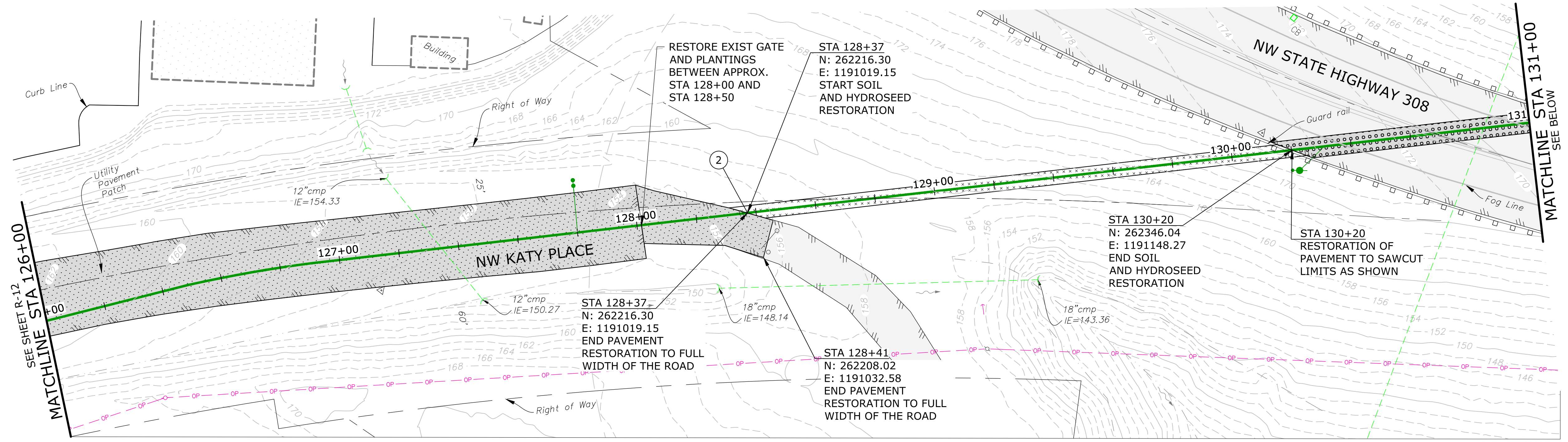
**BANGOR-KEYPORT
FORCE MAIN
REPLACEMENT**

**RESTORATION PLAN
STA 10+00 TO 18+00
SCHEDULE A**

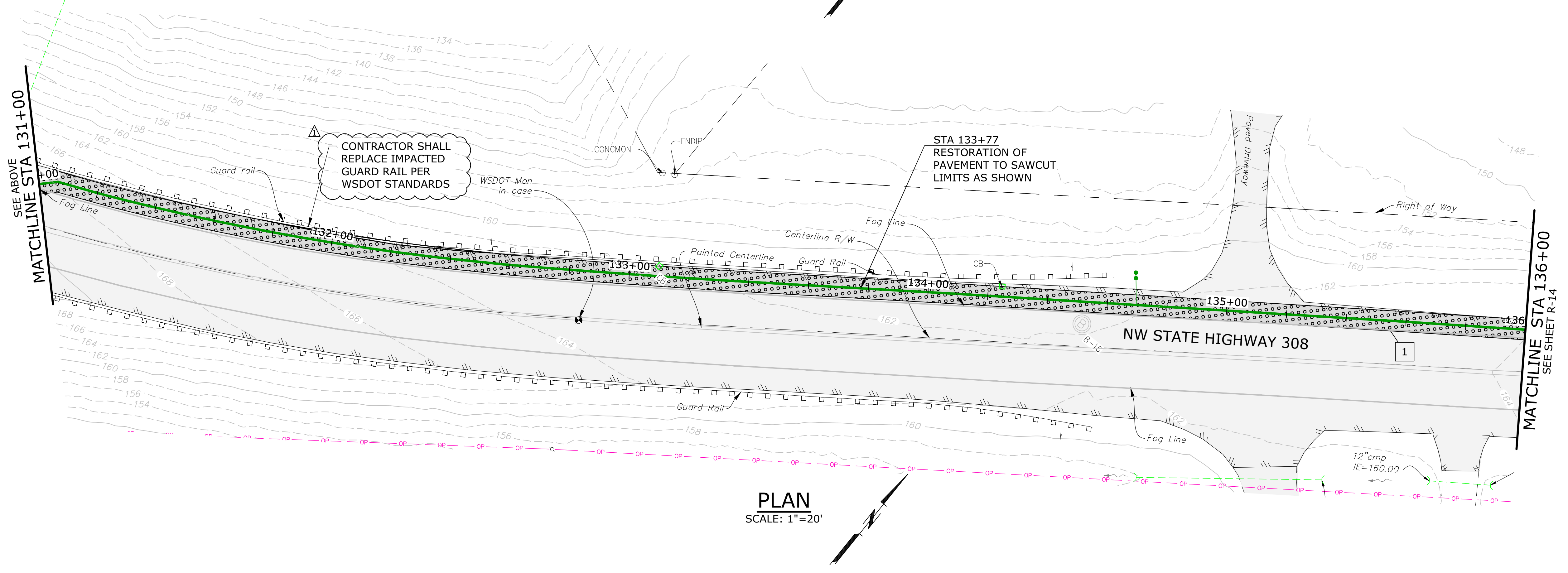
PROJECT NO.: 20-2815 SCALE: AS SHOWN DATE: FEBRUARY 2022

SHEET
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PLAN
SCALE: 1"=20'



PLAN
SCALE: 1"=20'

CONSTRUCTION NOTES

- ② PROTECT/ RESTORE EXIST GATE AND PLANTINGS

CHANNELIZATION NOTES:

- ① PAINTED WHITE EDGE LINE PER WSDOT STD PLAN M-20.10-02 TO MATCH EXISTING.

NOTES:

1. ALL NECESSARY RESTORATION MAY NOT BE IDENTIFIED ON THE DRAWINGS. RESTORE ALL DISTURBED AREAS TO PRE-CONSTRUCTION CONDITIONS OR BETTER WITH LIKE MATERIAL.
2. NATIVE VEGETATION WILL BE RESTORED IN KIND IN CONSTRUCTION AREA. DO NOT DISTURB NATIVE VEGETATION OUTSIDE THE CONSTRUCTION LIMITS.
3. PROVIDE ALL THERMOPLASTIC MARKINGS PAINT STRIPING, AND SIGNAGE.
4. REMOVE ALL EXISTING PAVEMENT MARKINGS IN CONFLICT WITH PROPOSED MARKINGS.
5. ALL PAVEMENT MARKINGS SHALL CONFORM TO THE LATEST EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, UNLESS OTHERWISE NOTED.

LEGEND:

- RESTORE SURFACE WITH SOIL AND HYDROSEED, SEE DETAIL 2, DRAWING R-29
- HMA PAVEMENT, SEE DETAIL 3, DRAWING R-29
- HMA PAVEMENT ON WSDOT ROADWAY, SEE DETAIL 2, DRAWING R-30

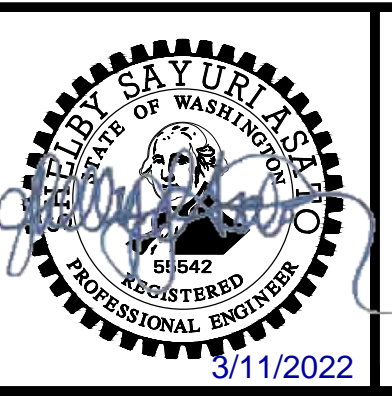
NO.	DATE	BY	REVISION
1	03/07/2022	TMH	ADDENDUM #1

NOTICE

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HCM
DRAWN
EKS
CHECKED



**BANGOR-KEYPORT
FORCE MAIN
REPLACEMENT**

**RESTORATION PLAN
STA 126+00 TO 136+00
SCHEDULE A**

PROJECT NO.: 20-2815 SCALE: AS SHOWN DATE: FEBRUARY 2022

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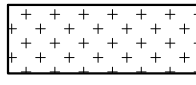
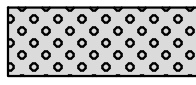
CHANNELIZATION NOTES:

- 1. INSTALL PAINTED WHITE EDGE LINE PER WSDOT STD PLAN M-20.10-02 TO MATCH EXISTING

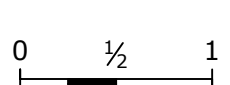
NOTES:

1. ALL NECESSARY RESTORATION MAY NOT BE IDENTIFIED ON THE DRAWINGS. RESTORE ALL DISTURBED AREAS TO PRE-CONSTRUCTION CONDITIONS OR BETTER WITH LIKE MATERIAL.
2. NATIVE VEGETATION WILL BE RESTORED IN KIND IN CONSTRUCTION AREA. DO NOT DISTURB NATIVE VEGETATION OUTSIDE THE CONSTRUCTION LIMITS.
3. PROVIDE ALL THERMOPLASTIC MARKINGS PAINT STRIPING, AND SIGNAGE.
4. REMOVE ALL EXISTING PAVEMENT MARKINGS IN CONFLICT WITH PROPOSED MARKINGS.
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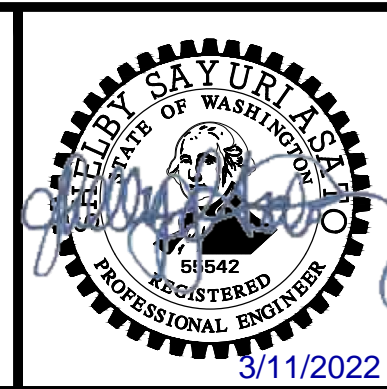
LEGEND:

-  RESTORE SURFACE WITH SOIL AND HYDROSEED, SEE DETAIL 2, DRAWING R-29
-  HMA PAVEMENT ON WSDOT ROADWAY, SEE DETAIL 2, DRAWING R-30

NO.	DATE	BY	REVISION
1	03/07/2022	TMH	ADDENDUM #1

NOTICE

 IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

TMH DESIGNED
 HCM DRAWN
 EKS CHECKED



**BANGOR-KEYPORT
 FORCE MAIN
 REPLACEMENT**

**RESTORATION PLAN
 STA 146+00 TO 156+00
 SCHEDULE A**

PROJECT NO.: 20-2815 SCALE: AS SHOWN DATE: FEBRUARY 2022

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PLAN
SCALE: 1"=20'

PLAN
SCALE: 1"=20'

CHANNELIZATION NOTES:

- 1. INSTALL PAINTED WHITE EDGE LINE PER WSDOT STD PLAN M-20.10-02 TO MATCH EXISTING

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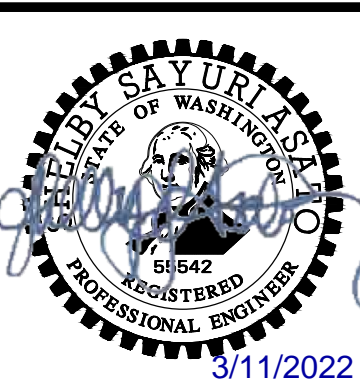
LEGEND:

- RESTORE SURFACE WITH SOIL AND HYDROSEED, SEE DETAIL 2, DRAWING R-29
- HMA PAVEMENT ON WSDOT ROADWAY, SEE DETAIL 2, DRAWING R-30

NO.	DATE	BY	ADDENDUM #1	REVISION
1	03/07/2022	TMH		

NOTICE
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

TMH
DESIGNED
HCM
DRAWN
EKS
CHECKED



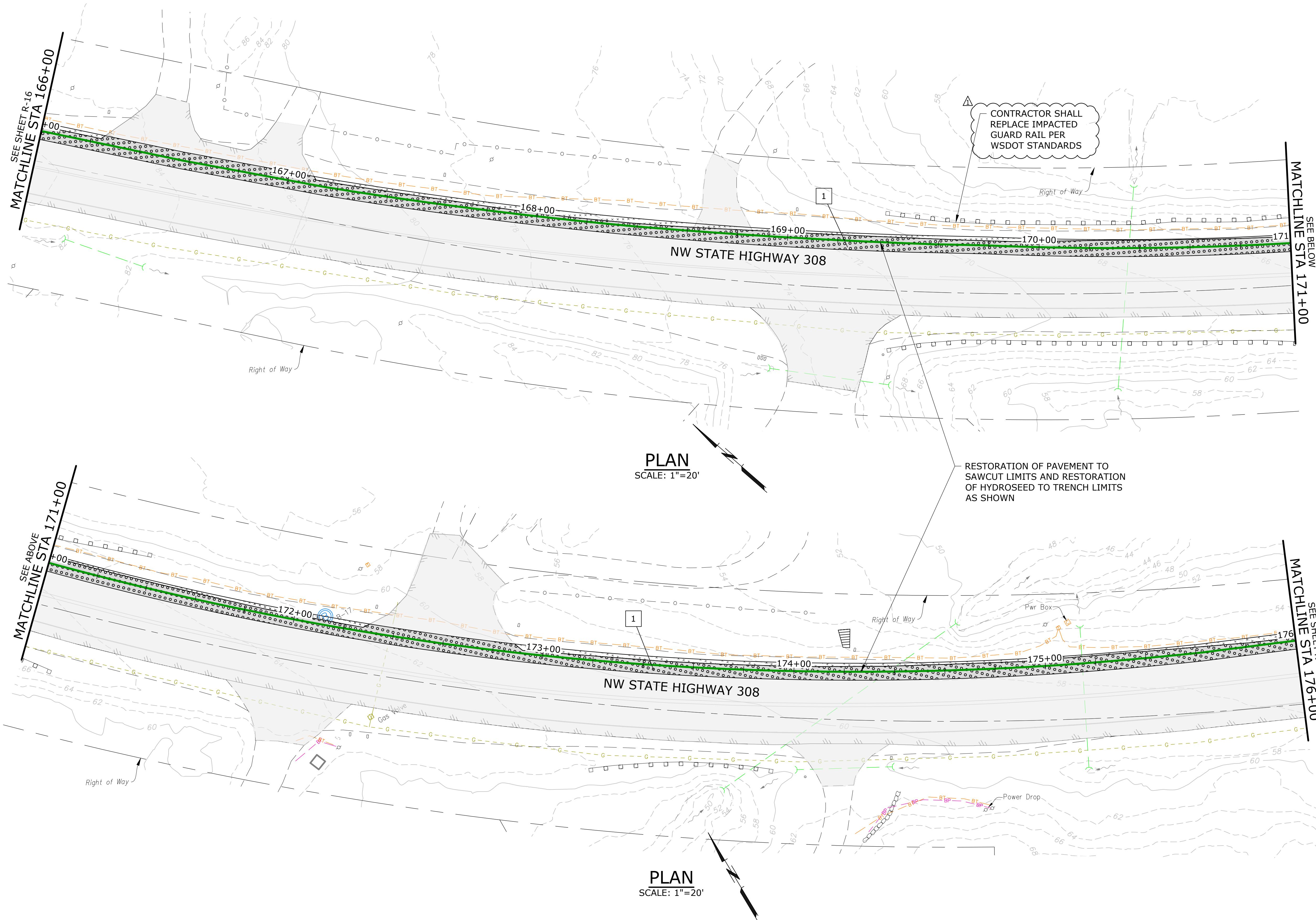
**BANGOR-KEYPORT
FORCE MAIN
REPLACEMENT**

**RESTORATION PLAN
STA 156+00 TO 166+00
SCHEDULE A**

PROJECT NO.: 20-2815 SCALE: AS SHOWN DATE: FEBRUARY 2022

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CHANNELIZATION NOTES:

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PLAN
SCALE: 1"=20'

PLAN
SCALE: 1"=20'

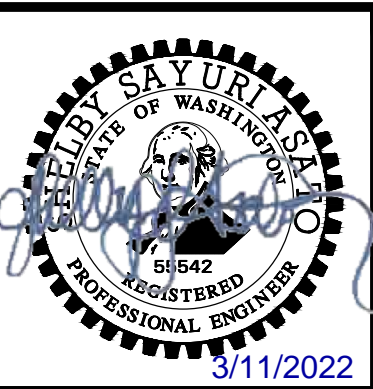
LEGEND:

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- HMA PAVEMENT ON WSDOT ROADWAY, SEE DETAIL 2, DRAWING R-30

NO.	DATE	BY	REVISION
1	03/07/2022	TMH	ADDENDUM #1

NOTICE
0 1/2 1
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TMH DESIGNED
HCM DRAWN
EKS CHECKED



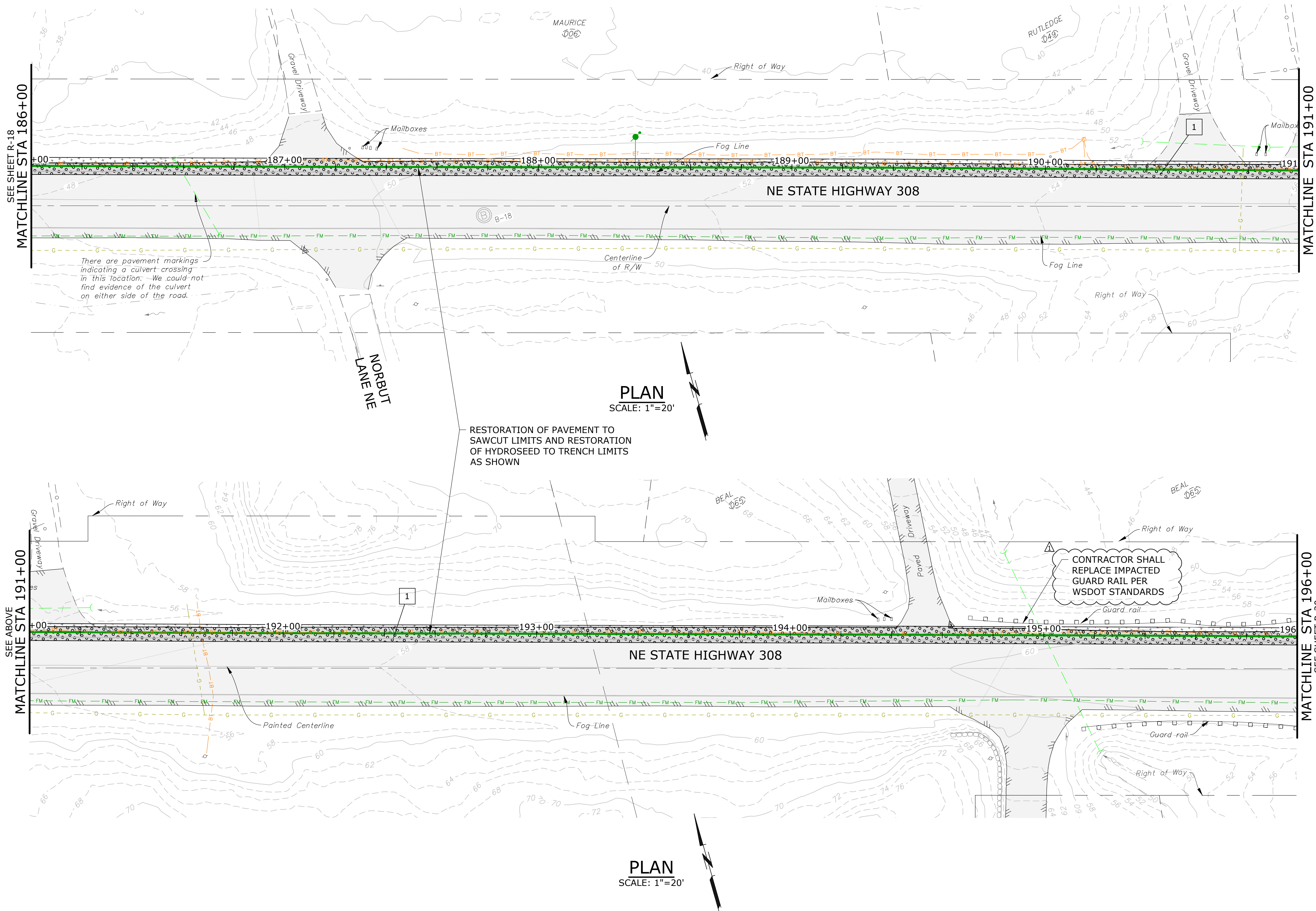
**BANGOR-KEYPORT
FORCE MAIN
REPLACEMENT**

**RESTORATION PLAN
STA 166+00 TO 176+00
SCHEDULE A**

PROJECT NO.: 20-2815 SCALE: AS SHOWN DATE: FEBRUARY 2022

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CHANNELIZATION NOTES:

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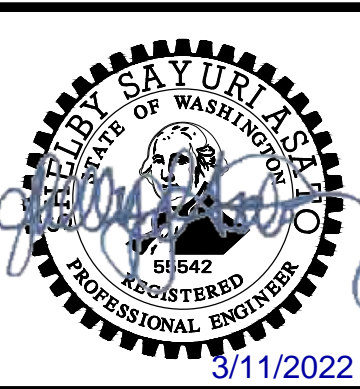
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- HMA PAVEMENT ON WSDOT ROADWAY, SEE DETAIL 2, DRAWING R-30

NO.	DATE	BY	REVISION
1	03/07/2022	TMH	ADDENDUM #1

NOTICE

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TMH
DESIGNED
 HCM
DRAWN
 EKS
CHECKED



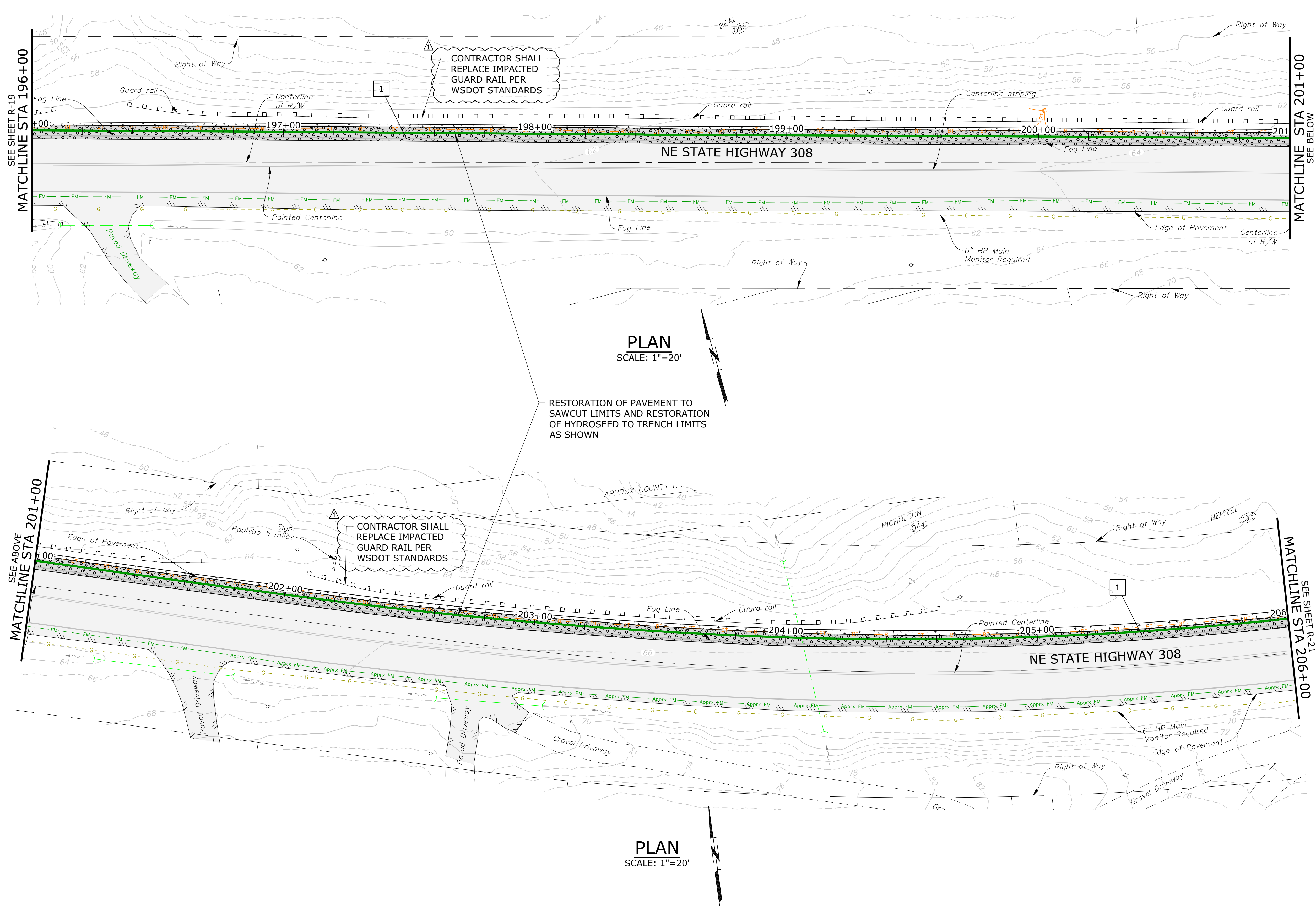
**BANGOR-KEYPORT
 FORCE MAIN
 REPLACEMENT**

**RESTORATION PLAN
 STA 186+00 TO 196+00
 SCHEDULE A**

PROJECT NO.: 20-2815 SCALE: AS SHOWN DATE: FEBRUARY 2022

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CHANNELIZATION NOTES:

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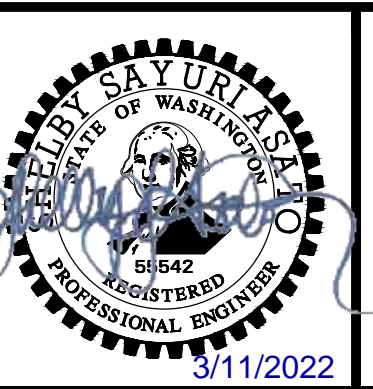
NO.	DATE	BY	REVISION
1	03/07/2022	TMH	ADDENDUM #1

NOTICE

0 1/2 1

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EKS CHECKED



**BANGOR-KEYPORT
FORCE MAIN
REPLACEMENT**

**RESTORATION PLAN
STA 196+00 TO 206+00
SCHEDULE A**

PROJECT NO.: 20-2815 | SCALE: AS SHOWN | DATE: FEBRUARY 2022

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