LOPERATION & MAINTENANCE MANUAL

Water Quality Biofiltration Swale

Manual prepared: August 2020

DFI No. D01148

Figure 1: DFI No. D01148, looking [note cardinal direction]

Identification

Drainage Facility ID (DFI):	D01148
Facility Type:	Water Quality Biofiltration Swale
Construction Drawings:	(V-File Numbers) 54V-010
Location:	District: 1
	Highway No.: 92
	Mile Post: 25.740 to 25.790, [Left]

1. Manual Purpose

The purpose of this manual is to outline inspection needs and summarize maintenance actions.

2. Facility Location

The location map below details the facility location. The highway, mile posts, side streets, access location, and stormwater flow directions are noted on the map.

Facility location type: Roadway shoulder

Flow direction: North and South (two halved swales)

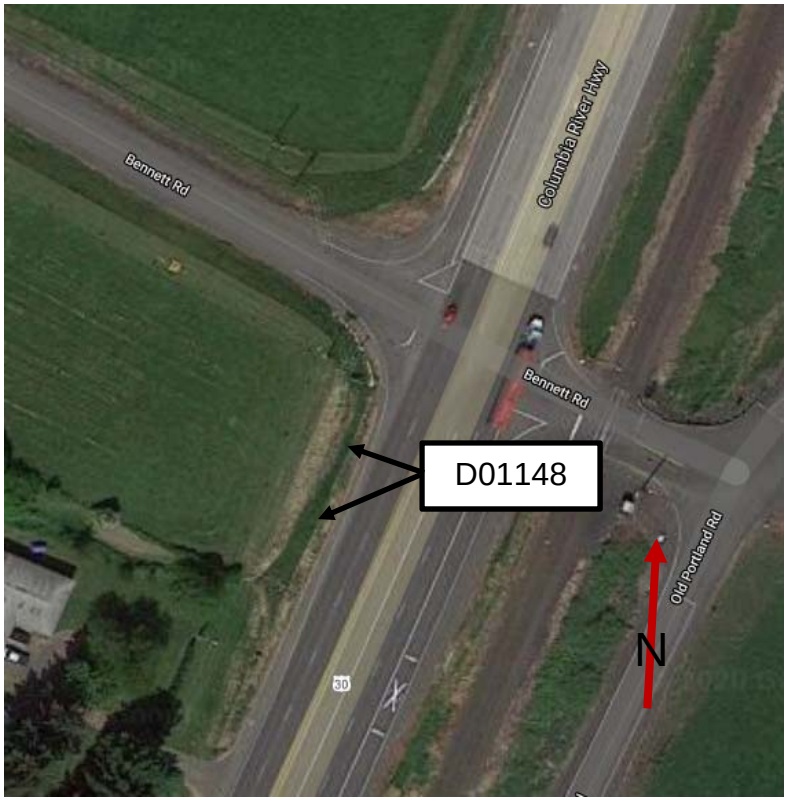


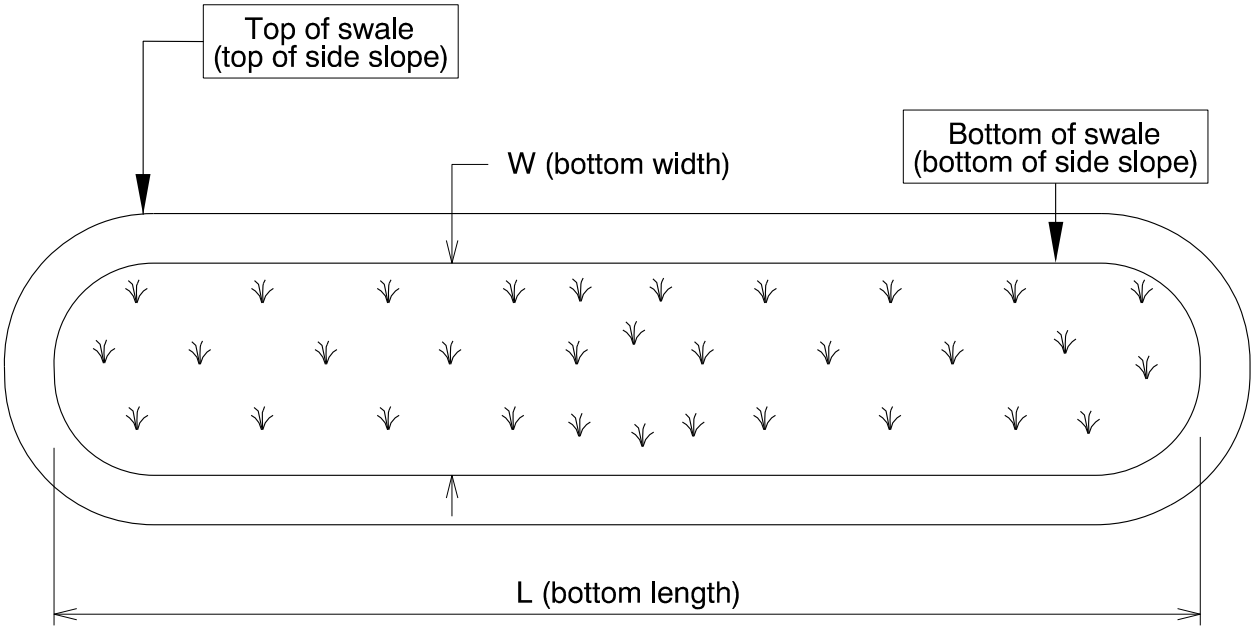
Figure 2: Facility location map

3. Facility Summary

The length and width of a swale is based on the bottom dimensions.

The bottom length and bottom width of the swale is:

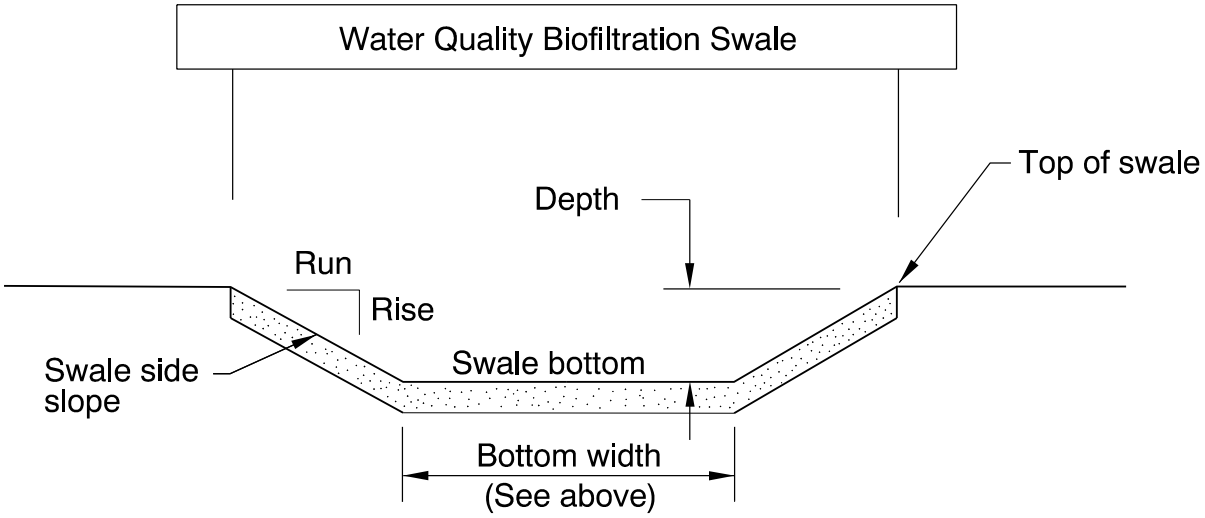
Bottom Length (feet)	Bottom Width (feet)
200	5 and 9



The depth of the swale is the vertical distance measured from the bottom of the swale to the top. The slope of the swale sides is presented by a vertical distance (rise) followed by the horizontal distance (run).

Depth and side slopes:

Depth (feet)	Rise (feet)	Run (feet)
Varies	**1**	**3 and 4**



Site Specific Information: D01148 are two separated swales (see construction plans 54V-010 in appendix). Stormwater enters the swale segments from the north and south and outlets via a 24" CMP. Both biofiltration swales has two sides slopes, a 3:1 (H:V) to meet existing grade at the top section then transitions to a 4:1 at the bottom.

4. Facility Access

Maintenance access to the facility:

☐Roadside pad	☒Roadside shoulder
☐Access road with Gate	☐Access road without Gate

Figure 3: Shoulder access

5. Operational Components / Maintenance Items

Classification

This facility is classified as an:

☒ On-line Swale	☐ Off-line Swale
A swale that does not include a high flow bypass component; flow drains into and through the facility	**A swale that treats low/small flows and diverts high flows using a bypass component**

Bypass Component

This facility includes a high flow bypass component:

☒ No	☐ Yes
There is no bypass component. High flows drains into and through the facility	**There is a bypass component. Only low/small flows drain into the swale. High flows are diverted around the swale using a bypass component**

Operational Components

A swale has many components that assist with treatment, conveyance, and reducing flow velocity to minimize erosion. The components in use can vary depending if the facility was designed to operate on-line or off-line. The facility components table (**Table 1**) has been provided to highlight the applicable components for this facility. The component is in use when the box contains an "x" (e.g. ☒).

The Standard Operation Manual for Water Quality Biofiltration Swales (implemented March 2017) outlines facility operation, typical footprint configuration, and component definitions and details. A link to the manual is attached to the feature marker in TransGIS.
https://gis.odot.state.or.us/TransGIS/

Operational Plan

The applicable standard operational plan for this facility is:

☒ Operational Plan A	☐ Operational Plan B	☐ Operational Plan C
An on-line swale with roadside ditches	**An on-line swale with piped inlets and outlets**	**An off-line swale with a piped high flow bypass**
A standard operational plan illustrates the general facility footprint configuration and explains the purpose of each facility component. Operational plans (A, B, C) are provided in the Standard Operation Manual.		

See Appendix A for the site specific operational plan.

Maintenance Items

Operational components marked in **Table 1** should be inspected and maintained according to Section 7. Each facility component is defined and detailed in the Standard Operation Manual using the associated ID number indicated below.

Table 1: Swale Components		ID #
Manholes/Structures		
Pre-treatment manhole	☐	**S1**
Weir type flow splitter/flow splitter manhole	☐	**S2**
Orifice type flow splitter/flow splitter manhole	☐	**S3**
Standard manhole	☐	**S4**
Swale Inlet		
Pavement sheet flow	☒	**S5**
Inlet Pipe (s)	☐	**S6**
Open channel inlet	☒	**S7**
Riprap pad	☒	**S8**
Ground Cover		
Grass bottom	☒	**S9**
Grass side slopes	☒	**S10**
Granular drain rock	☐	**S11**
Plantings	☐	**S12**
Underground Components		
Geotextile fabric	☐	**S13**
Water quality mix	☒	**S14**
Perforated pipe	☐	**S15**
Porous pavers (access grid)	☐	**S16**
Flow Spreader		
Rock basin (used at inlet)	☐	**S17**
Anchored board (midpoint of swale or every 50 feet along swale bottom)	☐	**S18**
Other: Riprap flow spreaders every 25’	☒	**S19**
Swale Outlet		
Catch basin with grate	☐	**S20**
Outlet Pipe (s)	☒	**S21**
Open channel outlet	☐	**S22**
Auxiliary Outlet:	☐	**S23**
Outfall Type		
Waterbody (**C**reek/**L**ake/**O**cean)	☐ **C** ☐ **L** ☐**O**	**S24**
Ditch	☐	**S25**
Storm drain system	☐	**S26**
Outfall Components		
Riprap pad	☒	**S27**
Riprap bank protection	☐	**S28**

6. Maintenance

Maintenance Frequency/Maintain Records

a. Inspect annually. Preferably prior to the rainy season.
b. Clean and maintain as necessary. Refer to Activity 125 for conditions when maintenance is needed.
c. Keep a record of inspections, maintenance, and repairs.

Maintenance Guide/Maintenance Actions

The ODOT Routine Road Maintenance Water Quality and Habitat Guide (the *Blue Book*) outlines the standard maintenance actions for water quality facilities under Activity 125.

There are standard maintenance tables for standard ODOT designs. The maintenance tables describe the maintenance component, the defect or problem, the condition when maintenance is needed, and the recommended maintenance to correct the problem. Use the following tables to maintain ODOT swales:

- Table 1 (General Maintenance): Contains general maintenance and inspection guidelines that are applicable to all ODOT water quality facilities
- Table 3 (Maintenance of Water Quality or Biofiltration Swales): Contains maintenance information for swales

The *Blue Book* can be viewed at the following website:
http://www.oregon.gov/ODOT/Maintenance/Documents/blue_book.pdf

7. Limitations

Access grid installed:

☒ No	☐ Yes
There are no porous pavers installed in this swale	

Swales are designed to allow equipment access along the bottom. If an access grid is **NOT** installed, vehicles entering the swale can create depressions (tire ruts), damage vegetation, and damage structural components (e.g. flow spreaders). These conditions may result in poor treatment and drainage performance.

Equipment wheels should be kept on the tops and side slopes. Mower arms may be run along the swale bottom.

8. Waste Material Handling

Material removed from the facility is defined as waste by the Department of Environmental Quality (DEQ). Refer to the roadwaste section of the ODOT Maintenance Yard Environmental Management System (EMS) Policy and Procedures Manual for disposal options:

http://www.oregon.gov/ODOT/Maintenance/Documents/ems_manual.pdf

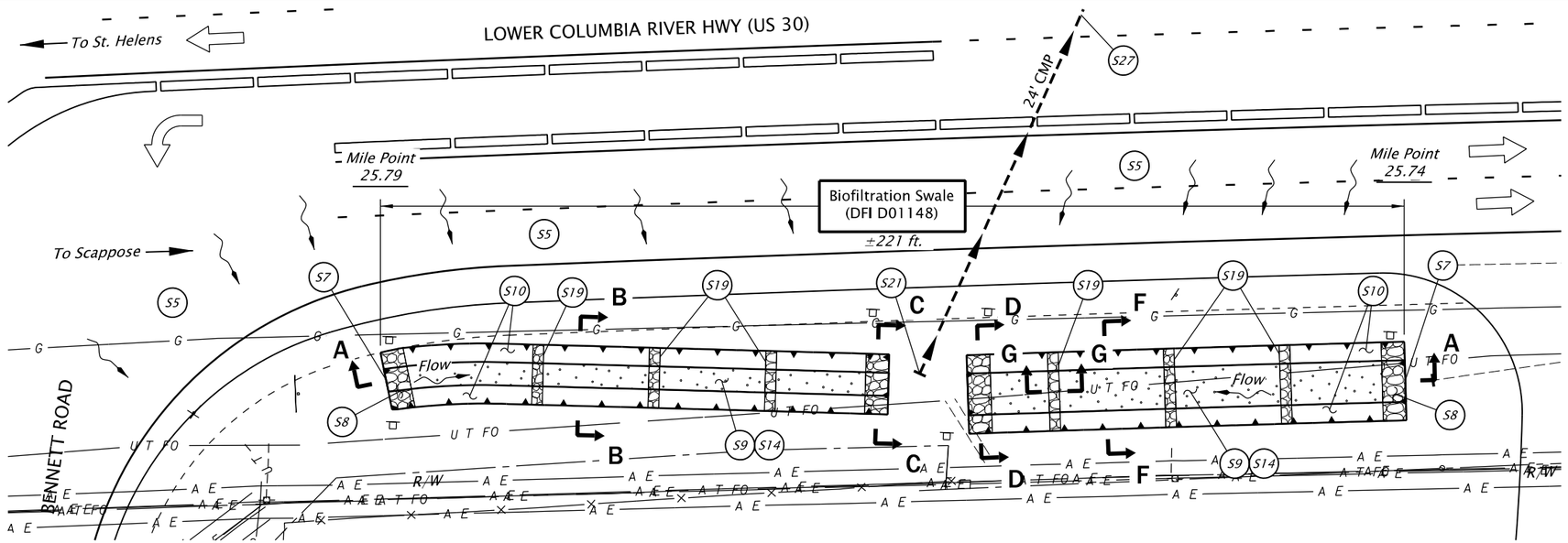
Contact any of the following for more detailed information about management of waste materials found on site:

ODOT Clean Water Unit	(503) 986-3008
ODOT Statewide Hazmat Coordinator	(503) 667-7442
ODOT Region 1 Hazmat Coordinator	(503) 731-8290
ODOT Region 2 Hazmat Coordinator	(503) 986-2647
ODOT Region 3 Hazmat Coordinator	(541) 957-3594
ODOT Region 4 Hazmat Coordinator	(541) 388-6186
ODOT Region 5 Hazmat Coordinator	(541) 963-1590
ODEQ Northwest Region Office	(503) 229-5263

A Appendix A – Site Specific Operational Plan

Contents:

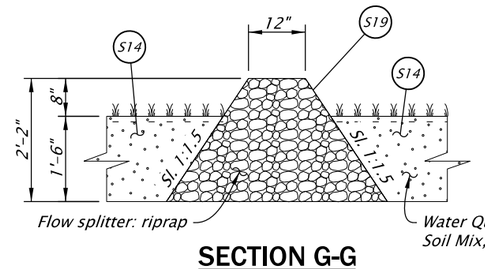
Operational Plan: DFI D01148



PLAN
No Scale

LEGEND:

- Photo Location / Direction
- S# — Facility component (see table 1 in O&M Manual)
- Boifilration swale bottom
- Adjacent system pipe
- Conveyance direction
- Pavement / facility flow path
- Traffic flow direction



SECTION G-G
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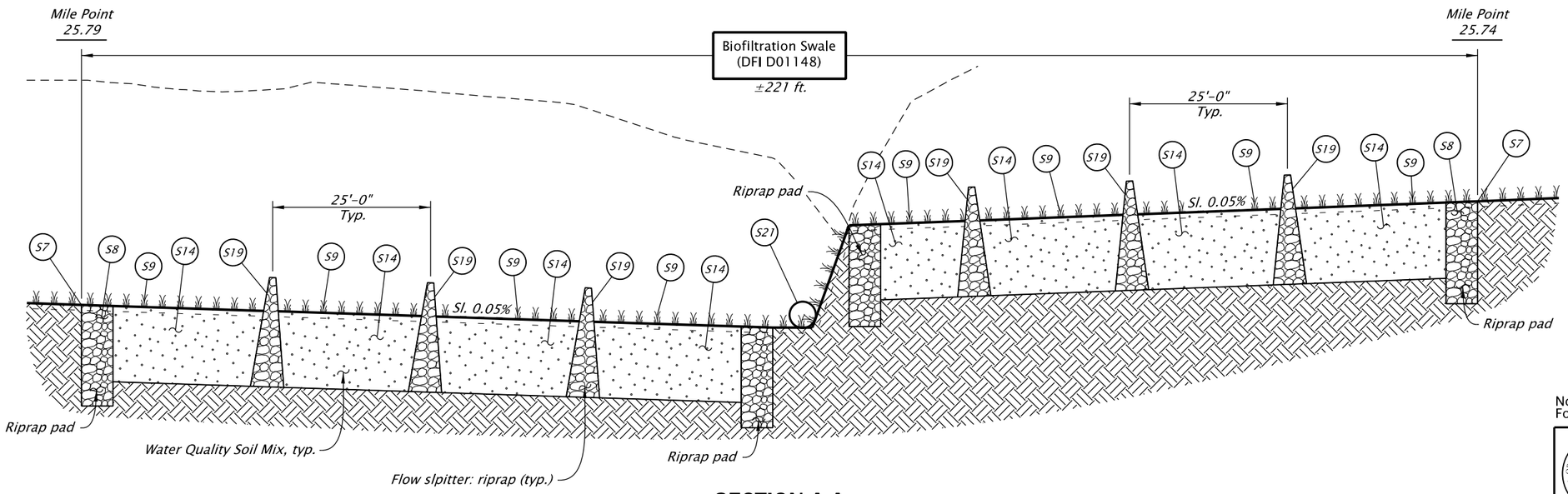

SECTION A-A
No Scale

Note:
For Sections B-B, C-C, D-D and F-F see Sheet 2.

OREGON DEPARTMENT OF TRANSPORTATION

Sheet 1 to 2

Prepared By: Ramiro Perez

Drafted By: Michael Skelton

DFI D01148
MAINTENANCE DISTRICT 1 HWY 092
BOIFILTRATION SWALE
HIGHWAY MP 25.74
COLUMBIA COUNTY

H_K21459_SwOMP_03 :: D01148-1 10/1/2020 10:53:01 AM hwye93l

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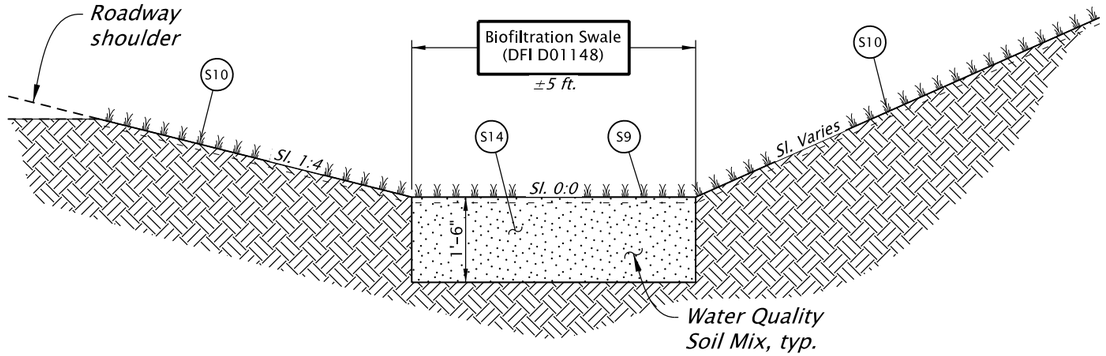

SECTION B-B
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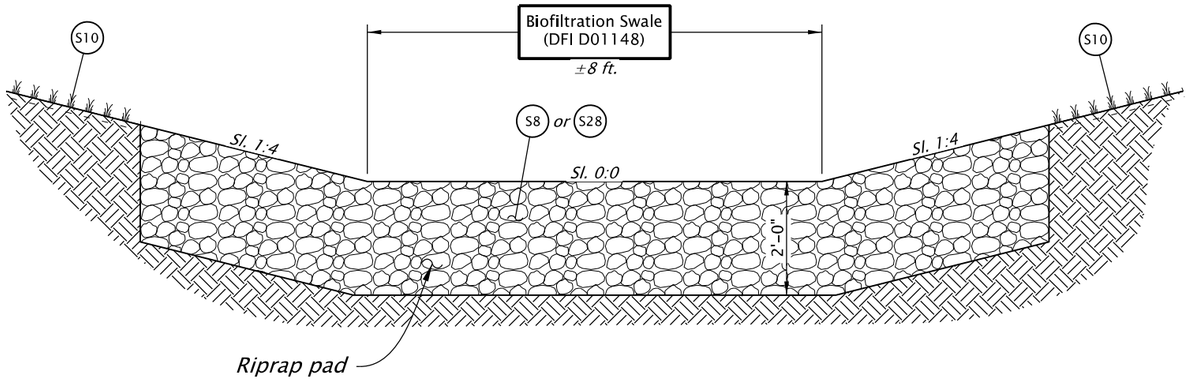

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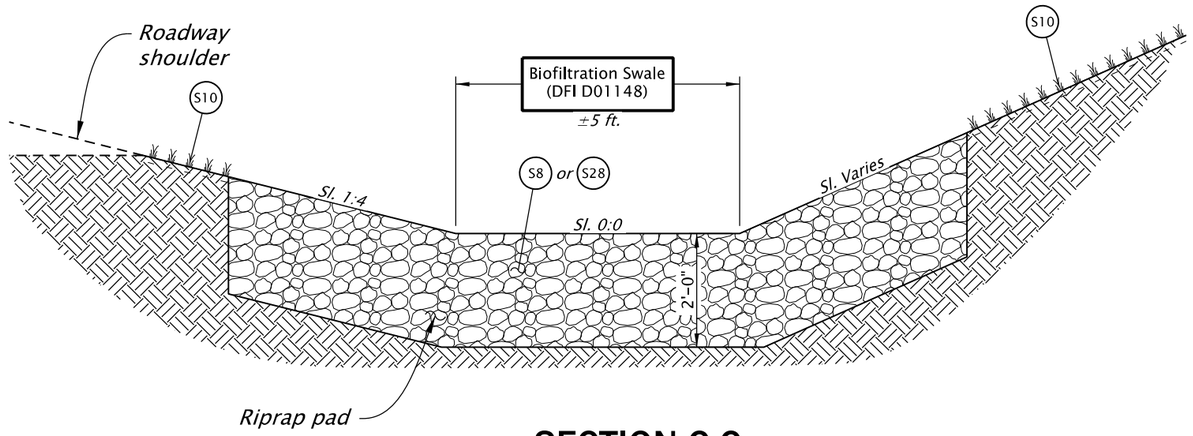

SECTION C-C
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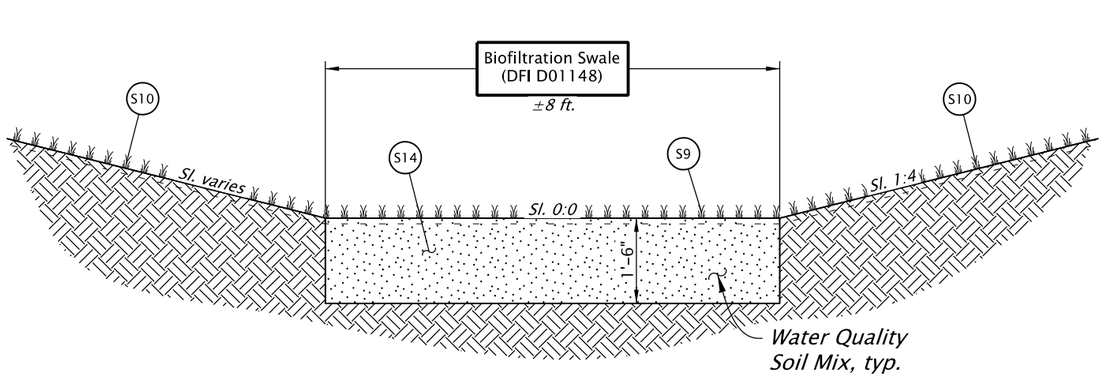


SECTION F-F
No Scale

OREGON DEPARTMENT OF TRANSPORTATION

Sheet 2 to 2

Prepared By: Ramiro Perez

Drafted By: Michael Skelton

DFI D01148
MAINTENANCE DISTRICT 1 HWY 092
BOIFILTRATION SWALE
HIGHWAY MP 25.74
COLUMBIA COUNTY

B Appendix B – Project Contract Plans

Contents:

Site Specific Subset of Project Contract Plan 54V-010

54V-010

INDEX OF SHEETS	
SHEET NO.	DESCRIPTION
A01	*Title Sheet*
A02	*Index Of Sheets Cont.*
A03	*Std. Dwg. Nos.*

STATE OF OREGON

DEPARTMENT OF TRANSPORTATION

PLANS FOR PROPOSED PROJECT

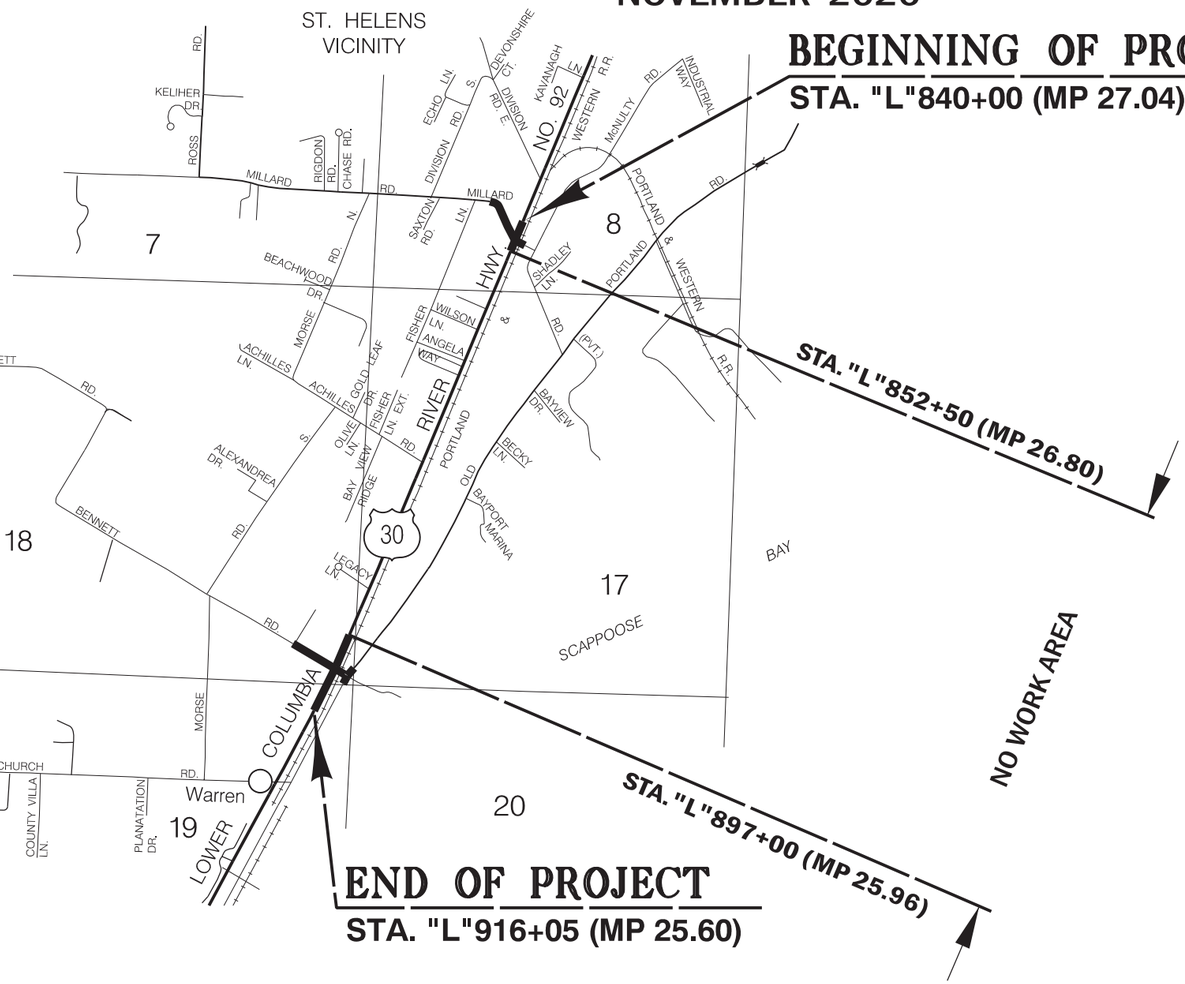
GRADING, DRAINAGE, PAVING, CURB RAMPS, SIGNING, ILLUMINATION, SIGNALS & ROADSIDE DEVELOPMENT

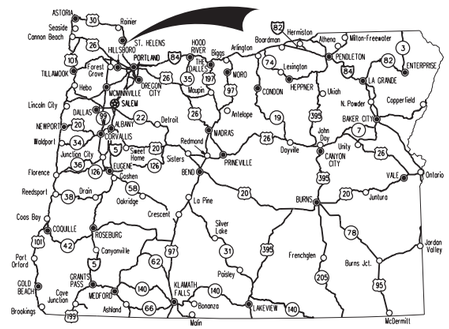
US30: MILLARD & BENNETT ROADS (ST. HELENS) SEC.

LOWER COLUMBIA HIGHWAY

COLUMBIA COUNTY

NOVEMBER 2020





Overall Length Of Project - 1.44 Miles

ATTENTION:
Oregon Law Requires You To Follow Rules Adopted By The Oregon Utility Notification Center. Those Rules Are Set Forth In OAR 952-001-0001 Through OAR 952-001-0090. You May Obtain Copies Of The Rules By Calling The Center (Note: The Telephone Number For The Oregon Utility Notification Center Is (503) 232-1987).

OREGON TRANSPORTATION COMMISSION

Robert Van Brocklin	CHAIR
Alando Simpson	COMMISSIONER
Martin Callery	COMMISSIONER
Julie Brown	COMMISSIONER
Sharon Smith	COMMISSIONER
Kristopher W. Strickler	DIRECTOR OF TRANSPORTATION

These plans were developed using ODOT design standards. Exceptions to these standards, if any, have been submitted and approved by the ODOT Chief Engineer or their delegated authority.

Approving Authority: [redacted] Sep 17 2020 4:29 PM
Signature & date

Vidal T. Francis-R2 Tech Center Manager
Print name and title

[redacted] Sep 21 2020 11:22 AM
Concurrence by ODOT Chief Engineer

N

T. 4 N., R. 1 W., W.M.

US30: MILLARD & BENNETT ROADS (ST. HELENS) SEC.
LOWER COLUMBIA RIVER HIGHWAY
COLUMBIA COUNTY

FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	S092(066)	A01

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FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

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"OXS" LINE
(For profile, see sht. C02F)

"OP" LINE
(For profile, see sht. C02F)

"L" LINE
(For profile, see sht. C02E)

"BE" LINE
(For profile, see sht. C02F)

"BW" LINE
(For profile, see sht. C02F)

"B1" LINE
(For profile, see sht. C02F)

"OP" 8°00'00" C.L.
R 716.197'
TΔ 12°02'10"
Ts 75.50'
e 4.0%

"L" 905

"L" 900

"OP" 15

"OXS" 10

"B1"
11°27'33" C.R.
R 500.000'
TΔ 6°96'40"
Ts 26.69'

"L"
0°22'46" C.R.
R 15100.000'
TΔ 5°42'51"
Ts 753.60'

"OP"10+00 P.O.T.
"OXS"11+14.44 P.O.T.
"OP"13+31.50 P.C.
"OP"14+81.95 P.T.
"BE"5+44.43 P.O.T.
"OP"13+65.09 P.O.C.
"OXS"10+00 P.O.T.
"OP"13+70.41 P.O.C.
"BE"3+50 P.O.T.
"L"905+54.69 P.O.C.
"BW"9+00 P.O.T.
"L"905+49.3 P.O.C.
"L"899+40.04 P.C.
"B1"1+00 P.O.T.
"L"908+71.78 P.O.C.
"B1"1+52.53 P.C.
"B1"2+25.30 P.O.T.
"B1"2+05.86 P.T.

OLD PORLTAND ROAD
S 37°07'19" W
S 64°27'38" E
S 25°05'09" W
S 66°47'19" E
N 65°35'07" W
N 59°28'27" W
N 60°59'21" W

PORTLAND & WESTERN RR
LOWER COLUMBIA RIVER HIGHWAY (US30)
Access control line
F. COOPER DLC NO. 58
J.C. MARTIN DLC
BENNETT ROAD

SEC. 20 T4N., R1W. W.M.
SEC. 17 T4N., R1W. W.M.
SEC. 19 T4N., R1W. W.M.
SEC. 18 T4N., R1W. W.M.
SEC. 17 T4N., R1W. W.M.
SEC. 18 T4N., R1W. W.M.

R/W
RR R/W
Temp. ease.– Work area
Temp. ease.– Drv. approach
NO WORK AREA

REGISTERED PROFESSIONAL ENGINEER
81784
[redacted] Sep 3 2020 3:27 PM
OREGON
JANUARY 8, 2009
CALVIN RAY LARWOOD
RENEWS: 12-31-2020

FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

OREGON DEPARTMENT OF TRANSPORTATION

US30: MILLARD & BENNETT ROADS (ST. HELENS) SEC.
LOWER COLUMBIA RIVER HIGHWAY
COLUMBIA COUNTY

Designer: Calvin Larwood
Drafter: Charlotte Gerken
Reviewer: Derryl James
Checker: N/A

ALIGNMENT

SHEET NO. C02

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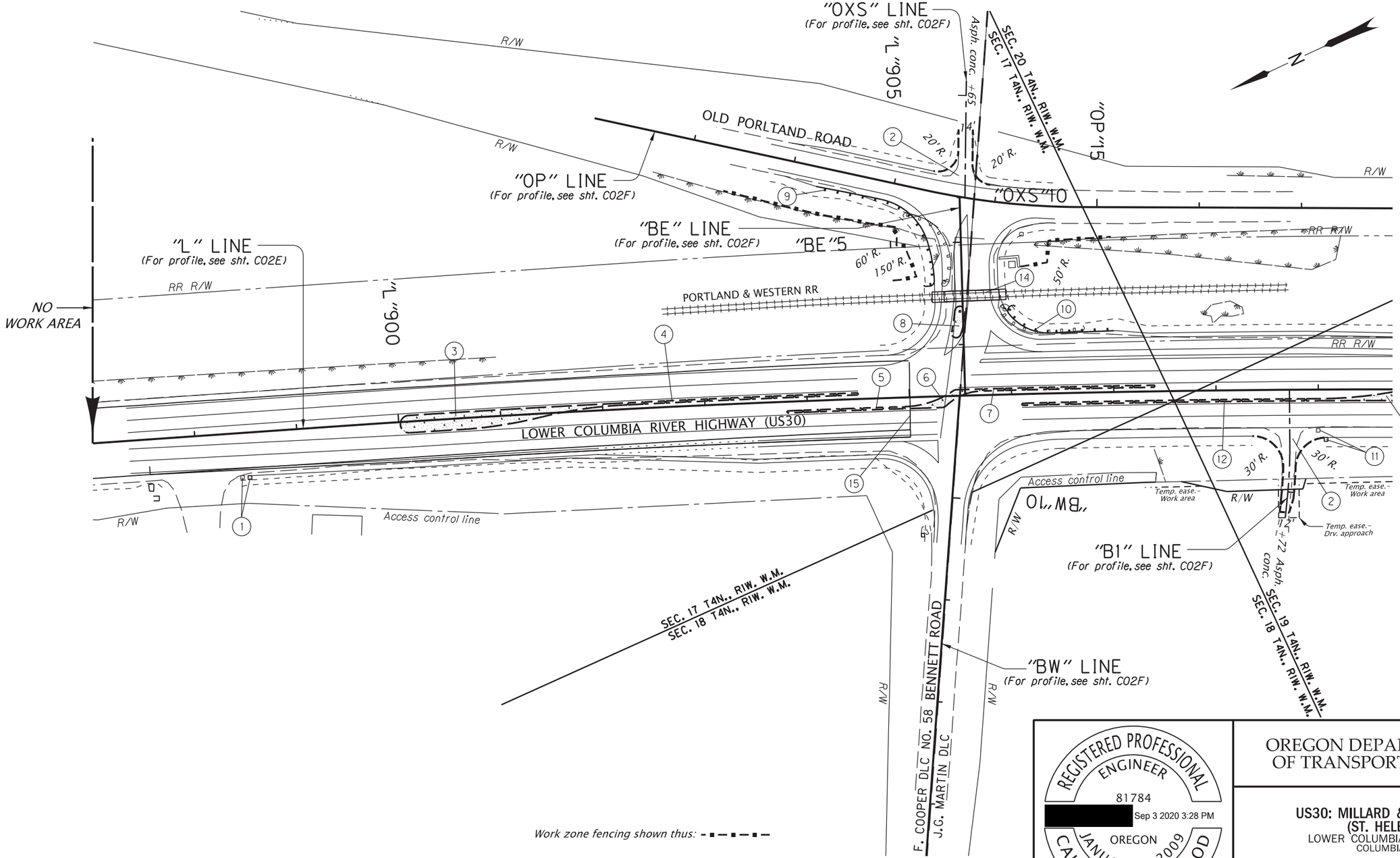

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LOWER COLUMBIA RIVER HIGHWAY
COLUMBIA COUNTY

Designer: Calvin Larwood
Drafter: Charlotte Gerken
Reviewer: Derryl James
Checker: N/A

GENERAL CONSTRUCTION

SHEET NO. CO2A

(1) *Inst. multiple mailbox support*
Const. conc. collar
(See dwg. nos. RD100 & RD101)

(2) *Const. appr. - 2*
(See dwg. no. RD715)

(3) *Const. Type "C" conc. Island, Non-mountable*
(For details, see sht. BB05)

(4) *Const. Type "C" traffic separator*
(For details, see sht. BB05)
(See dwg. no. RD706)

(5) *Const. Type "C" traffic separator*
(For details, see sht. BB05)

(6) *Const. Type "C" conc. Island, Non-mountable*
(For details, see sht. BB05)

(7) *Const. Type "C" traffic separator*
(For details, see sht. BB05)

(8) *Const. Type "C" conc. Island, Non-mountable*
(For details, see sht. BB06)

(9) *Sta. "OP"12+25.79 to Sta. "OP"13+55.56, Lt.*
Const. midwest guardrail system- 118.2' (Type 2A)
Const. midwest guardrail system- 12.5' (Type 3)
Inst. end piece (Type B)
Const. anchor (Type 1) (Mod.)
Const. guardrail terminal, non-flared
Test level 3
(See dwg. nos. RD401, RD402, RD403, RD404, RD407, RD416, RD417, RD419, RD420, RD445, RD450, RD451 & RD482)

(10) *Sta. "L"905+98.44 to Sta. "L"907+01.34, Lt.*
Const. midwest guardrail system- 58.5' (Type 2A)
Const. midwest guardrail system- 12.5' (Type 3)
Inst. end piece (Type B)
Const. anchor (Type 1) (Mod.)
Const. guardrail terminal, non-flared
Test level 3

(11) *Inst. single mailbox support*
Const. conc. collar

(12) *Const. Type "C" traffic separator*
(For details, see shts. BB05 & BB06)

(13) *Const. Type "C" conc. Island, Non-mountable*
(For details, see sht. BB06)

(14) *Const. R.R. crossing*
USDOT Crossing #057924P
(By others)

(15) *Const. ACP to conc. pmvt. transition*
(For details, see sht. BB08)

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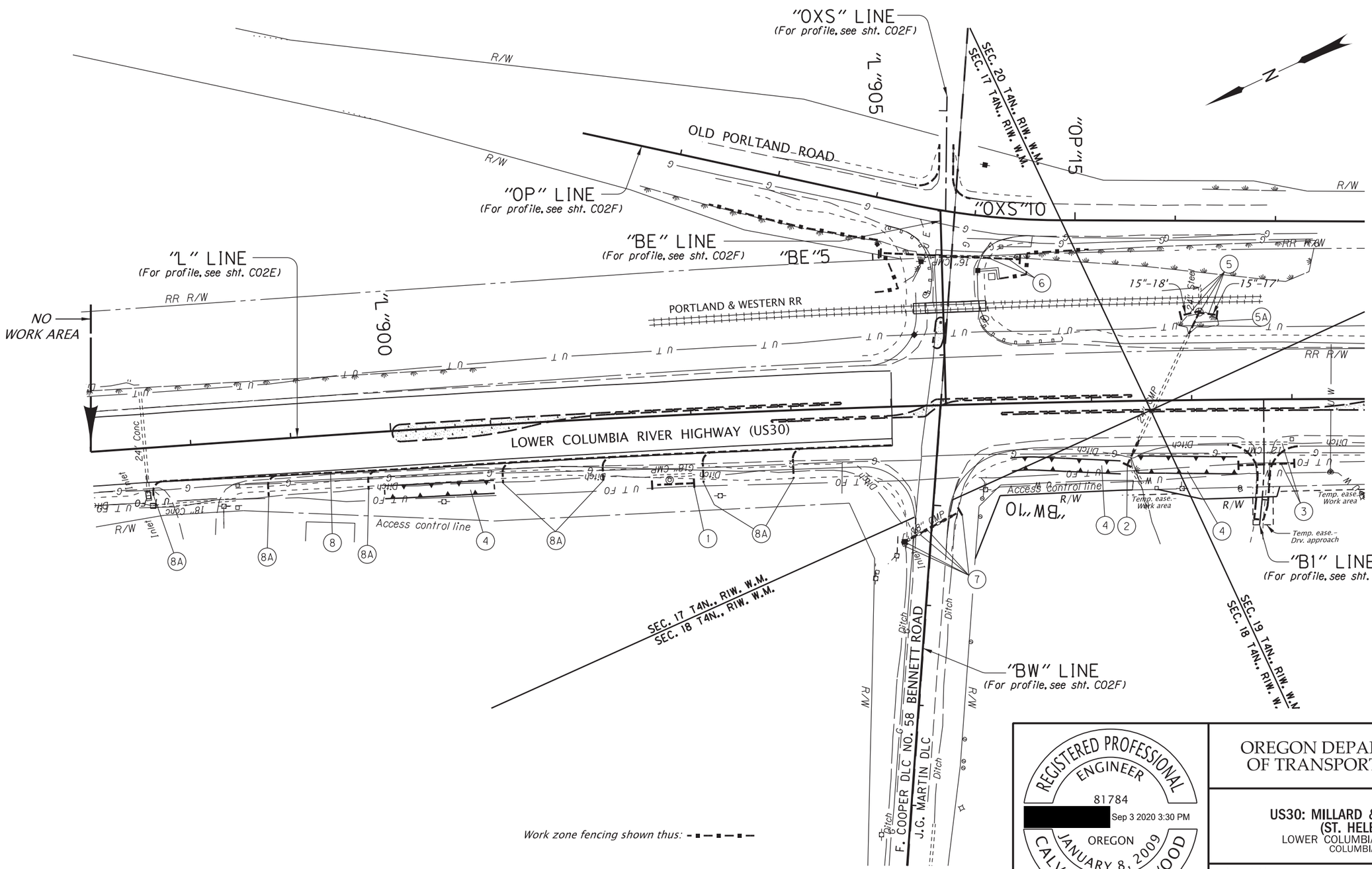
US30: MILLARD & BENNETT ROADS (ST. HELENS) SEC.
LOWER COLUMBIA RIVER HIGHWAY
COLUMBIA COUNTY

Designer: Calvin Larwood | Reviewer: Derryl James
Drafter: Charlotte Gerken | Checker: N/A

GENERAL CONSTRUCTION NOTES

SHEET NO. C02B



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[redacted] Sep 3 2020 3:30 PM
OREGON
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OREGON DEPARTMENT OF TRANSPORTATION

US30: MILLARD & BENNETT ROADS (ST. HELENS) SEC.
LOWER COLUMBIA RIVER HIGHWAY
COLUMBIA COUNTY

Designer: Calvin Larwood
Reviewer: Derryl James
Drafter: Charlotte Gerken
Checker: N/A

DRAINAGE & UTILITIES

SHEET NO. C02C

R_K21459_dr_01.dgn :: Default 9/3/2020 1:43:50 PM hwye61v

Rotation: 0° Scale: 1"=100'

(1) *Remove pipe – 42'*
Inst. 18" culv. pipe – 42'
5' depth
Inst. culv. ID marker, Type 2
DFI no D050109
MP 25.85
(See dwg. no. RD398)

(2) *24" culv. pipe – 130' (In pl.)*
Extend – 28' Rt., 5' depth
Inst. culv. ID marker, Type 2
DFI no D029040
MP 25.76
Const. temp. water management facility
(See special provision 00245)

(3) *Remove pipe – 50'*
Inst. 15" culv. pipe – 56'
5' depth

(4) *Const. water quality system – 3*
(For sht. nos., see sht. A02, Hydraulic)

(5) *Sta. "L"908+08.5, 88' Lt.*
Const. manhole, over extg. sew.
Connect to extg. culv. pipe
(5A) *24" culv. pipe – 130' (In pl.)*
Extend – 26' Lt., 5' depth
Inst. 15" storm sew. pipe – 35'
5' depth
Inst. locator post
Const. temp. water management facility
(See special provision 00245)
(See dwg. no. RD334)

(6) *Remove pipe – 100'*
Inst. 24" culv. pipe – 139'
5' depth
Inst. culvt. ID marker, Type 1 – 2
Const. temp. water management facility
(See special provision 00245)
(See dwg. no. RD398)

(7) *Sta. "BW"10+40, 25.8' Lt.*
Remove inlet
Const. type "D" inlet
Remove pipe – 55'
Inst. 18" storm sew. pipe – 64'
5' depth
Const. sloped end
(See dwg. no. RD370)

(8) *Inst. 3" drain pipe – 730'*
5'
(8A) *Const. subsurface drain outlet – 7*
(See dwg. no. RD312)

REGISTERED PROFESSIONAL ENGINEER
81784
[redacted] Sep 3 2020 3:30 PM
OREGON
JANUARY 8, 2009
CALVIN RAY LARWOOD
RENEWS: 12-31-2020
FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

OREGON DEPARTMENT OF TRANSPORTATION

US30: MILLARD & BENNETT ROADS (ST. HELENS) SEC.
LOWER COLUMBIA RIVER HIGHWAY
COLUMBIA COUNTY

Designer: Calvin Larwood
Drafter: Charlotte Gerken
Reviewer: Derryl James
Checker: N/A

DRAINAGE & UTILITIES NOTES

SHEET NO.
C02D

54V-010

"L" LINE

NO WORK AREA
STA. "L"897+00

55
50
45
40
35
30
25
20

33.35 33.82 34.37 35.02 36.56 37.07 37.66 41.96 38.70 40.31 39.67 41.00 39.67 41.51 41.79

+42.53 +90 +00 +30 +58 +00 +50 +45 +68 +00 +28 +45 +38 +46 +02

200' V.C.

Profile grade @ ℄

+1.17%

+0.76%

50' V.C.

+0.88%

+1.20%

+1.20%
18"-42'

+1.00%

+0.50%

+0.50%

"DR1" profile grade @ ℄

+58 Rt. FL Out 36.56

+00 Rt. FL In 37.07

Ground line @ ℄

"DR2" profile grade @ ℄

+08.5 Lt. MH FL

In 37.66 (NW)
Out 37.66 (E) Extg.
In 39.77 (S)
In 39.46 (N)

+19.00%

+0.50%

+0.50%

+0.00%

+0.50%
15"-56'

+2.11%

+35 Rt. FL In 39.67

+0.53%, 24"-28'
Extg. pipe

+90 Lt. FL In 39.84

+2.00%, 15"-18'

+3.76%, 24"-26'

Extg. pipe

+02 Rt. FL In 41.79

+46 Rt. FL Out 41.51

+46 Rt. FL Out 42.13

+2.00%, 15"-17'

Exc. 8.025

Emb. 360

To Sta. "L"909+50

900

905

REGISTERED PROFESSIONAL ENGINEER
81784
[redacted] Sep 3 2020 3:32 PM
OREGON
JANUARY 8, 2009
CALVIN RAY LARWOOD
RENEWS: 12-31-2020

FINAL ELECTRONIC DOCUMENT
AVAILABLE UPON REQUEST

OREGON DEPARTMENT OF TRANSPORTATION

US30: MILLARD & BENNETT ROADS (ST. HELENS) SEC.
LOWER COLUMBIA RIVER HIGHWAY
COLUMBIA COUNTY

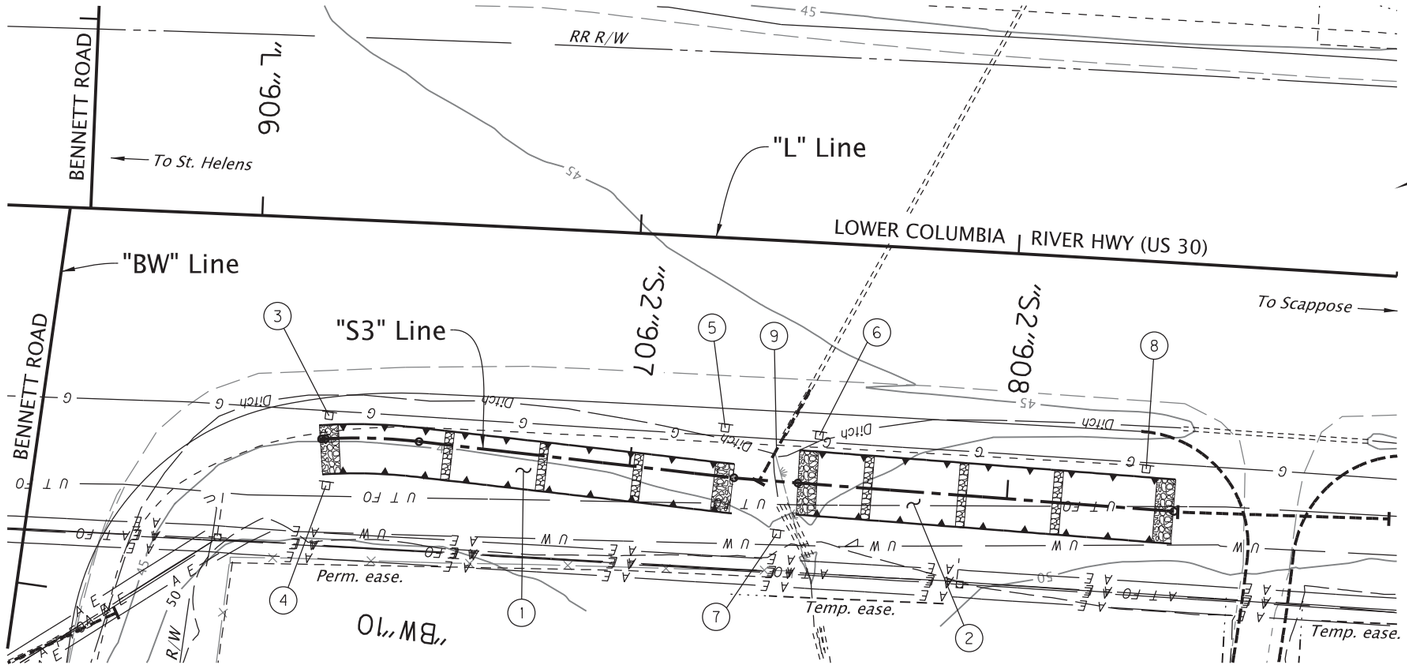
Designer: Calvin Larwood
Drafter: Charlotte Gerken
Reviewer: Derryl James
Checker: N/A

PROFILE

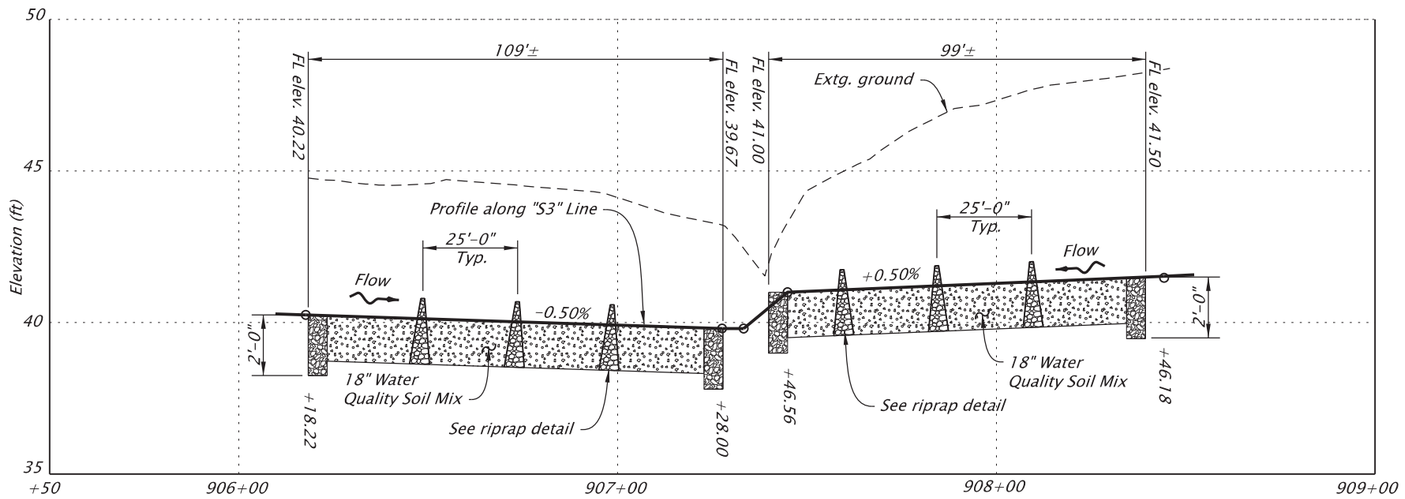
SHEET NO.
C02E

R_K21459_pf_01.dgn :: Default 8/26/2020 11:03:57 AM tdb081

Rotation: 0° Scale: 1"=100'



PLAN



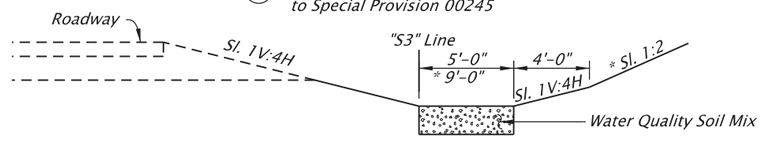
PROFILE ALONG "S3" LINE

Horiz. Scale: 1"=40'
Vert. Scale: 1"=5'

1. *Sta. "S3" 906+18.31 to Sta. "S3" 907+27.78*
   Construct water quality swale - DFI no. D01148
   Water Quality Soil Mix - 28 cu. yd.
   Const. loose riprap (Class 50) - 16 cu. yd.
   (For details, see sht. HA04)
2. *Sta. "S3" 907+39.86 to Sta. "S3" 908+39.42*
   Construct water quality swale - DFI no. D01148
   Water Quality Soil Mix - 45 cu. yd.
   Const. loose riprap (Class 50) - 22 cu. yd.
   (For details, see sht. HA04)
3. *Sta. "L" 906+20*
   Inst. field facility marker, Type S1, Green
4. *Sta. "L" 906+20*
   Inst. field facility marker, Type S2
5. *Sta. "L" 907+25*
   Inst. field facility marker, Type S1, Red
6. *Sta. "L" 907+50*
   Inst. field facility marker, Type S1, Green
7. *Sta. "L" 907+40*
   Inst. field facility marker, Type S2
8. *Sta. "L" 908+37*
   Inst. field facility marker, Type S1, Red
9. *Provide temporary water management according to Special Provision 00245*

NOTE:
Swale material estimated quantities are listed in the Special Provisions.

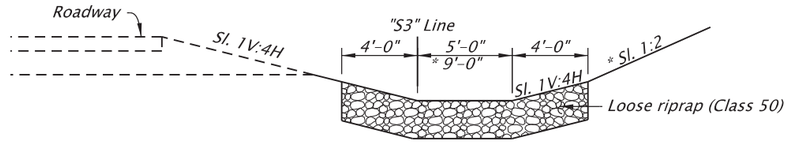
** See riprap detail (Sht. HA01)*



"S3" LINE SECTION

Scale: 1/8"=1'-0"

STA. "S3" 906+23.22 To STA. "S3" 907+23.00
* "S3" 907+51.56 To "S3" 908+41.18



"S3" LINE SECTION

Scale: 1/8"=1'-0"

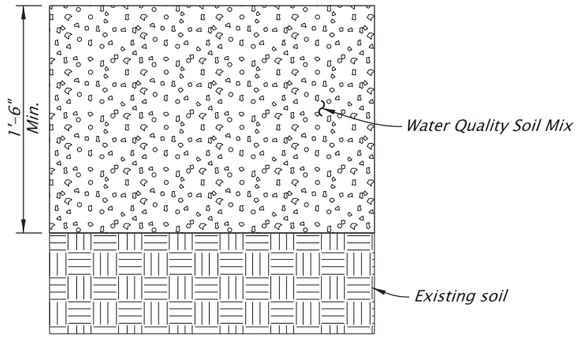
STA. "S3" 906+18.22 To STA. "S3" 906+23.22
"S3" 907+23.00 To "S3" 907+28.00
* "S3" 907+46.56 To "S3" 907+51.56
* "S3" 908+41.18 To "S3" 908+46.18

REGISTERED PROFESSIONAL ENGINEER
94,880
[redacted] Sep 3 2020 12:42 PM
OREGON
MAY 14, 2019
RAMIRO PEREZ
RENEWS: 12-31-2020
FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

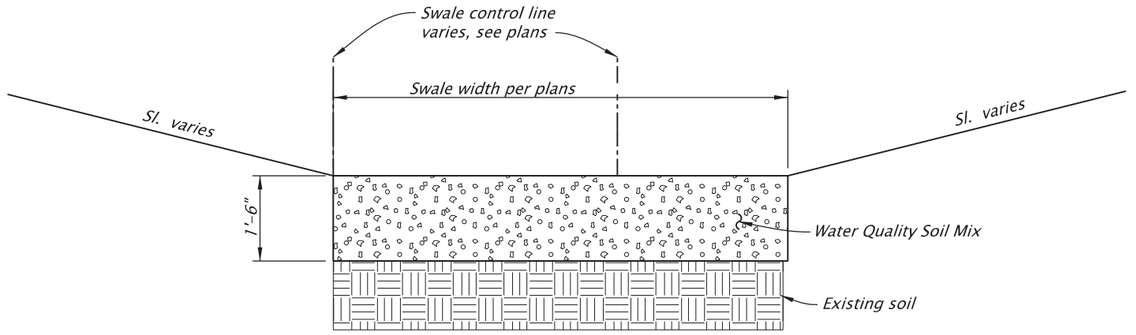
OREGON DEPARTMENT OF TRANSPORTATION

US30: MILLARD & BENNETT ROADS (ST. HELENS) SEC.
LOWER COLUMBIA RIVER HIGHWAY
COLUMBIA COUNTY

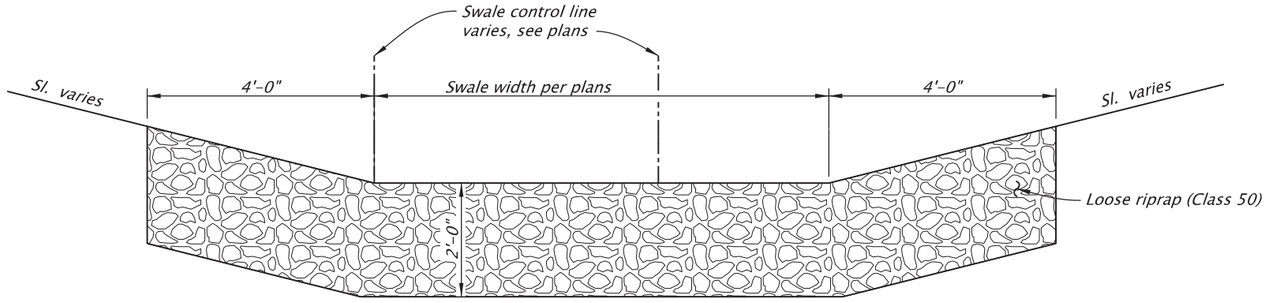
HWY: 000	
M.P.: 000.00-000.00	
COUNTY: Columbia	
DFI/TSSU NO.: D01148	
Designer: Ramiro Perez	Reviewer: Christopher Carman
Drafter: Jeff Coon	Checker: N/A
STORMWATER	SHEET NO.: HA03



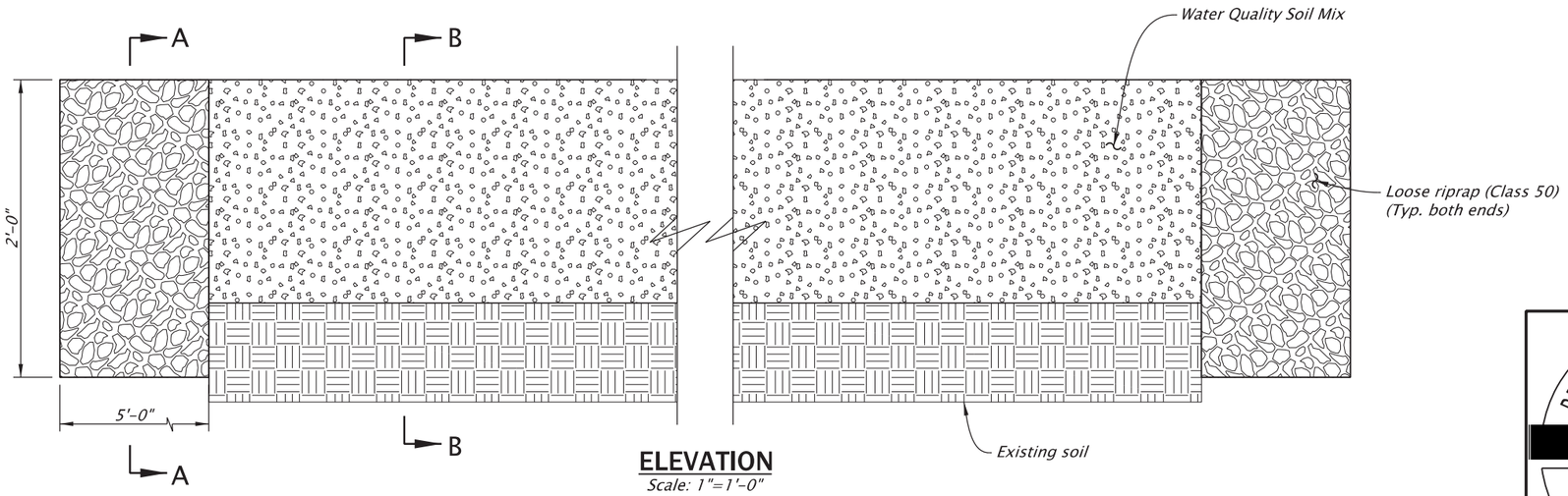
COMPONENTS FOR SWALE BOTTOM
Scale: 1"=1'-0"



SECTION B-B
Scale: 3/8"=1'-0"



SECTION A-A
Scale: 3/8"=1'-0"



ELEVATION
Scale: 1"=1'-0"

REGISTERED PROFESSIONAL ENGINEER
94880
Sep 1 2020 8:59 AM
OREGON
MAY 14, 2019
RAMIRO PEREZ
RENEWS: 12-31-2020
FINAL ELECTRONIC DOCUMENT AVAILABLE UPON REQUEST

OREGON DEPARTMENT OF TRANSPORTATION

US30: MILLARD & BENNETT ROADS (ST. HELENS) SEC.
LOWER COLUMBIA RIVER HIGHWAY
COLUMBIA COUNTY

Designer: Ramiro Perez
Reviewer: Christopher Carman
Drafter: Jeff Coon
Checker: N/A

STORMWATER DETAILS

SHEET NO.
HA04