OPERATION & MAINTENANCE MANUAL

Water Quality Biofiltration Swale

Manual prepared: June 2018

DFI No. D00249

Figure 1: DFI No. D00249, looking West

Identification

Drainage Facility ID (DFI):	D00249
Facility Type:	Water Quality Biofiltration Swale
Construction Drawings:	(V-File Numbers) 30V-098
Location:	District: 2B
	Highway No.: 001 UD 1
	Mile Post: 306.11 to 306.15, [RT]

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: Off ramp

Flow direction: East

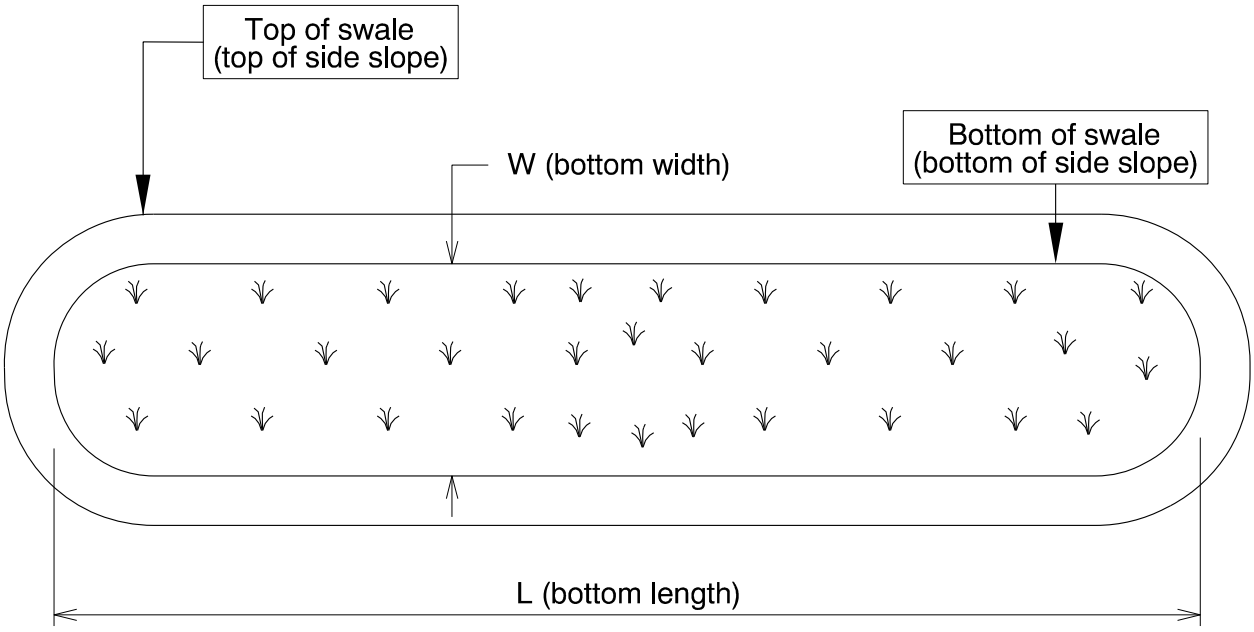
Figure 2: Facility location map

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:

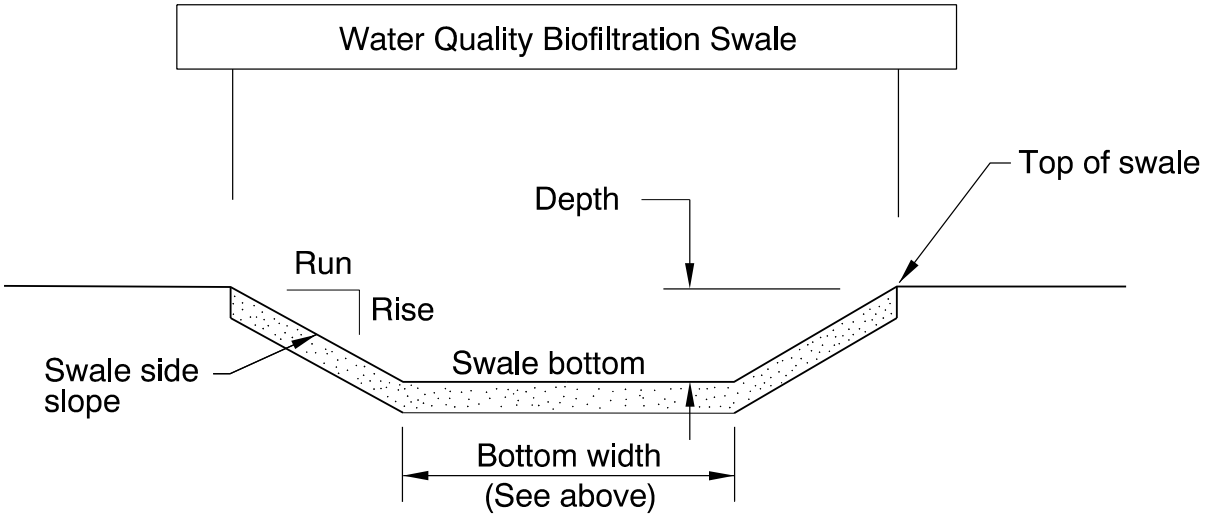
Bottom Length (feet)	Bottom Width (feet)
138	5



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**	**4**



Site Specific Information: This facility has a pre-treatment manhole to remove larger sediment prior to flow entering the swale. The swale is designed with drainage geotextile covered with a 70/30 topsoil to sand mixture as well as a polyethylene geocell grid which is also fill with the topsoil-sand mixture.

4. Facility Access

Maintenance access to the facility:

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

Figure 3: Facility 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
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: describe type	☐	**S19**
Swale Outlet		
Catch basin with grate	☒	**S20**
Outlet Pipe (s)	☐	**S21**
Open channel outlet	☐	**S22**
Auxiliary Outlet: describe type	☐	**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 light duty 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

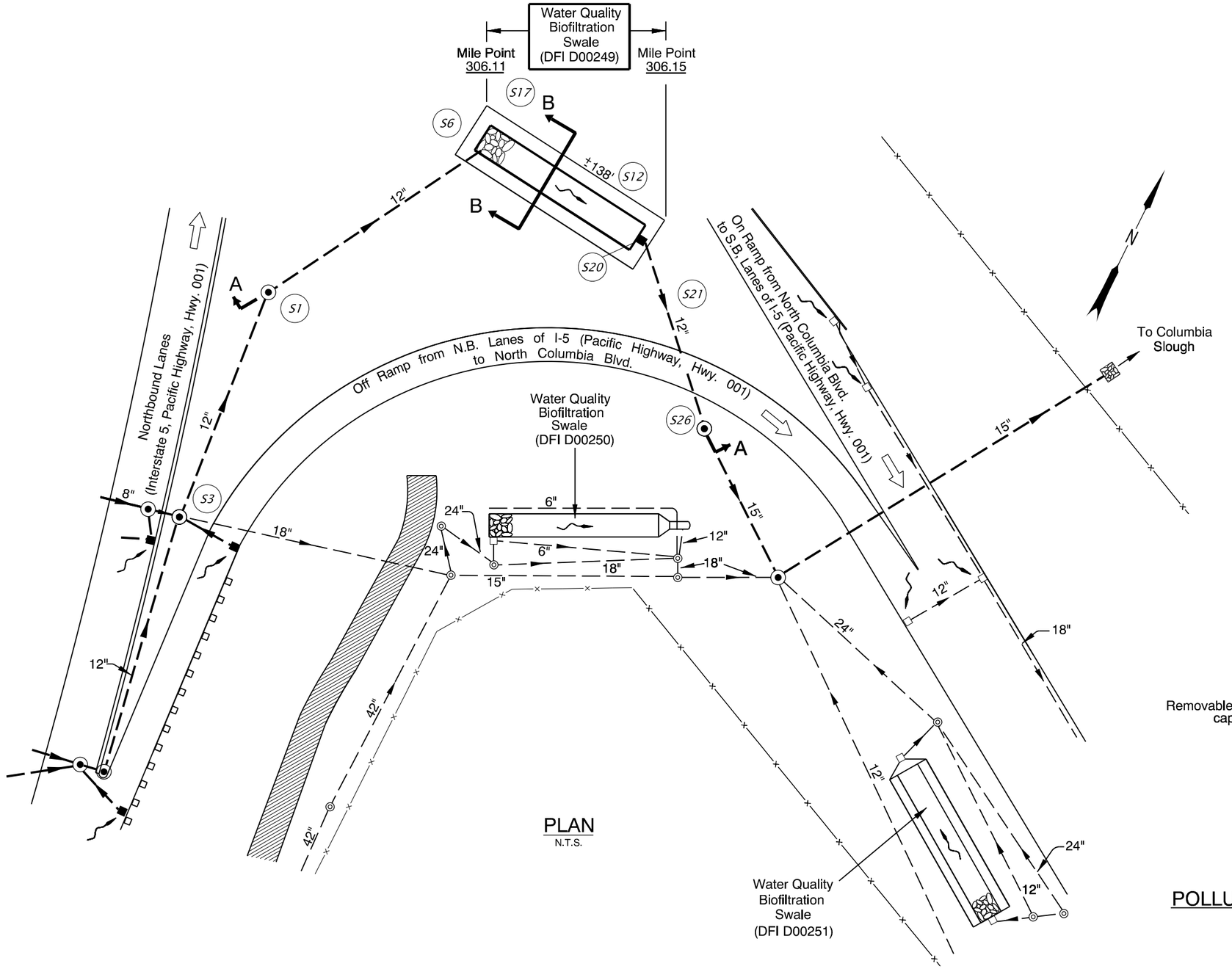
Contact any of the following for more detailed information about management of waste materials found on site:

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:

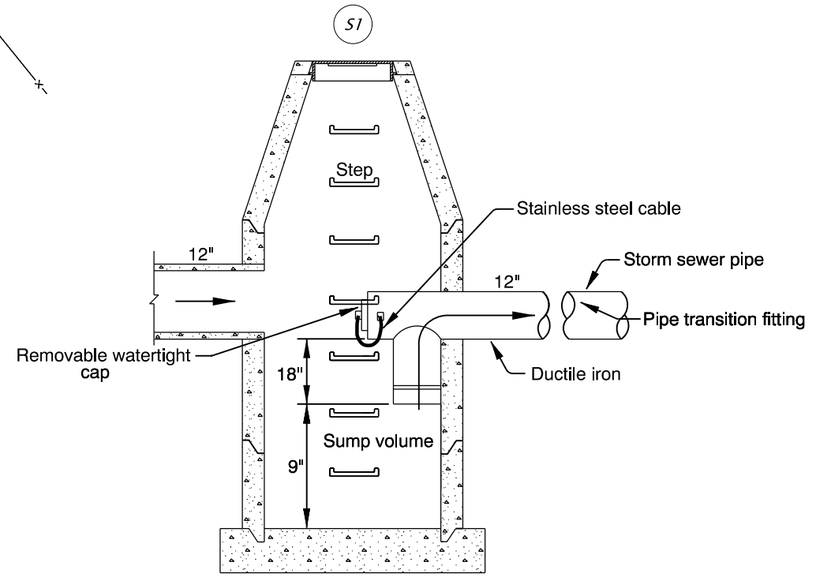
Operational Plan: DFI D00249



PLAN
N.T.S.

LEGEND:

- S# — Facility Component #
- Manhole (and or)
- Inlet (and or)
- Traffic Direction / Flow
- Storm Pipe (Facility)
- Storm Pipe
- Conveyance Direction
- Pavement / Facility Flow Path
- Riprap
- Fence / R/W Boundary
- Guard rail



POLLUTION CONTROL MANHOLE FOR WATER QUALITY BIOFILTRATION SWALE (DFI D00249)

N.T.S.

Sheet 1 of 2

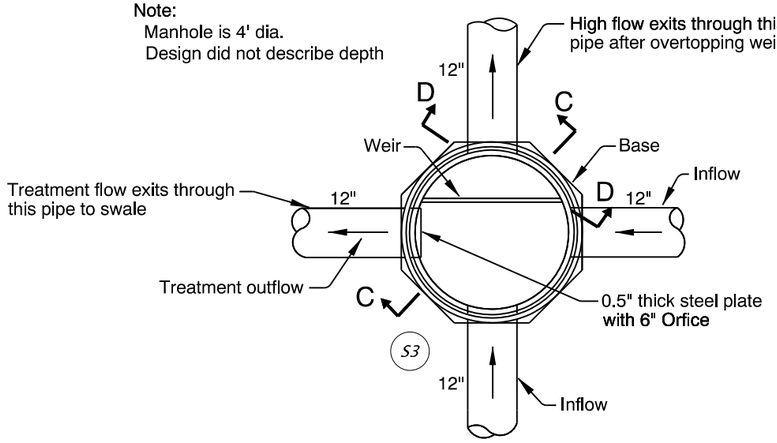
OREGON DEPARTMENT OF TRANSPORTATION

Prepared By: Wynee Hu

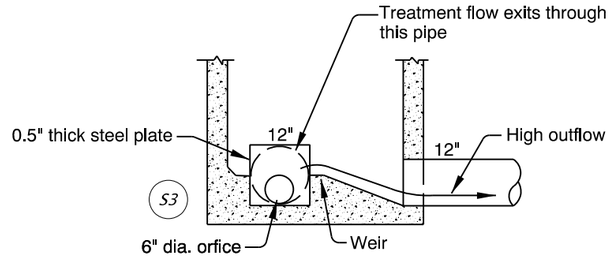
Drafted By: Chris Wallen

DFI D00249
MAINTENANCE DISTRICT 2B HWY 001
WATER QUALITY BIOFILTRATION SWALE
PACICIC HWY. MP 306.11 to 306.15
MULTNOMAH COUNTY

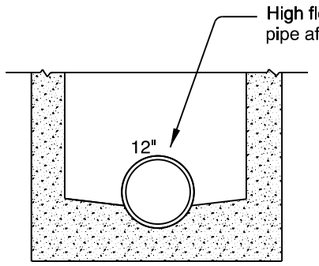
Note:
Manhole is 4' dia.
Design did not describe depth



VIEW FROM ABOVE
N.T.S.

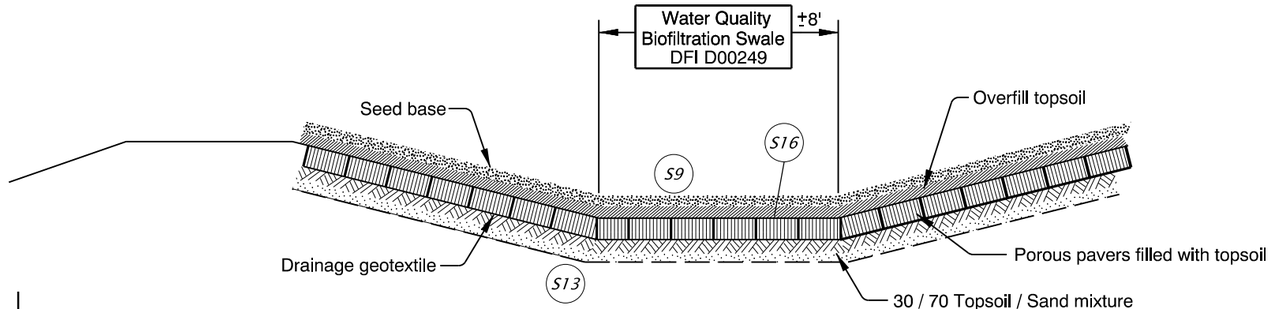


SECTION C-C
N.T.S.



SECTION D-D
N.T.S.

WATER FLOW MANHOLE FOR WATER QUALITY BIOFILTRATION SWALE (DFI D00249)
N.T.S.



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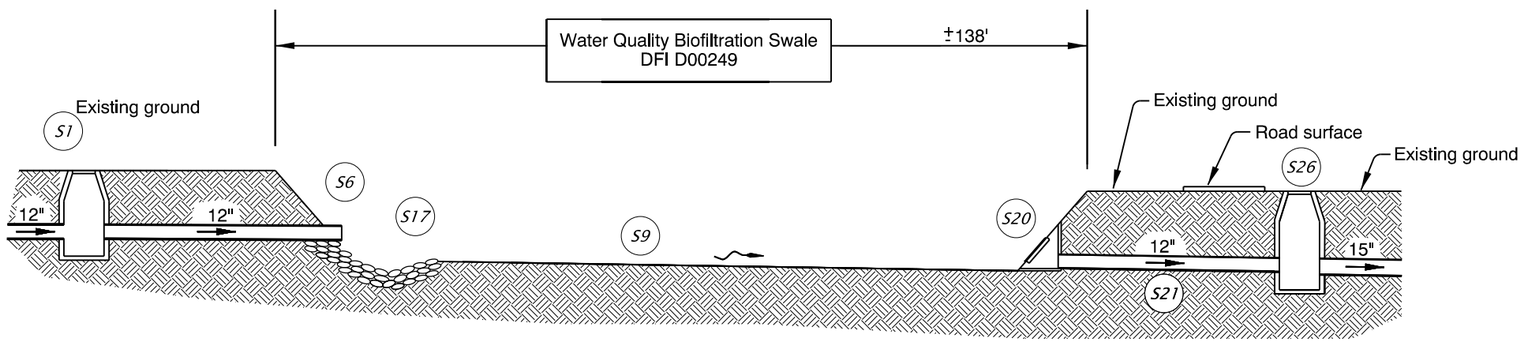


SECTION A-A)
N.T.S.

Sheet 2 of 2

OREGON DEPARTMENT OF TRANSPORTATION

Prepared By: Wynee Hu

Drafted By: Chris Wallen

DFI D00249
MAINTENANCE DISTRICT 2B HWY 001
WATER QUALITY BIOFILTRATION SWALE
PACICIC HWY. MP 306.11 to 306.15
MULTNOMAH COUNTY

B Appendix B – Project Contract Plans

Contents:

Site Specific Subset of Project Contract Plan 33V-093

INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	Title Sheet
1A	Index Of Sheets Contd. & Standard Drawing Nos.
2, 2A, 2A-2	Typical Sections
2B Thru 2B-8 Incl.	Details
2C Thru 2C-4 Incl.	Water Quality
2D Thru 2D-4 Incl.	Erosion Control
2E, 2E-2	Pipe Data
2F	Summary
3, 4, 4A, 5 Thru 13 Incl.	Plan & Profile
14 Thru 34 Incl.	Striping Plans
ROADSIDE DEVELOPMENT	
RD-1	Plant List & Typical Section
RD-2	Planting Plan

STATE OF OREGON
DEPARTMENT OF TRANSPORTATION

PLANS FOR PROPOSED PROJECT

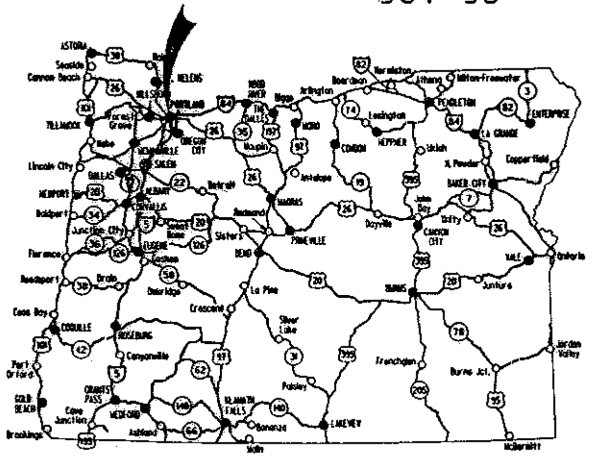
GRADING, STRUCTURE, PAVING, STRIPING, SIGNING, & ILLUMINATION

INTERSTATE BRIDGE - I-405 SEC.

PACIFIC HIGHWAY

MULTNOMAH COUNTY

MAY 1998



Overall Length Of Project - 3.030 km (1.88 Miles)

ATTENTION :
Oregon Law Requires You To Follow Rules Adopted By The Oregon Utility Notification Center. Those Rules Are Set Forth In OAR 952-001-0010 Through OAR 952-001-0090. You May Obtain Copies Of The Rules From The Center.

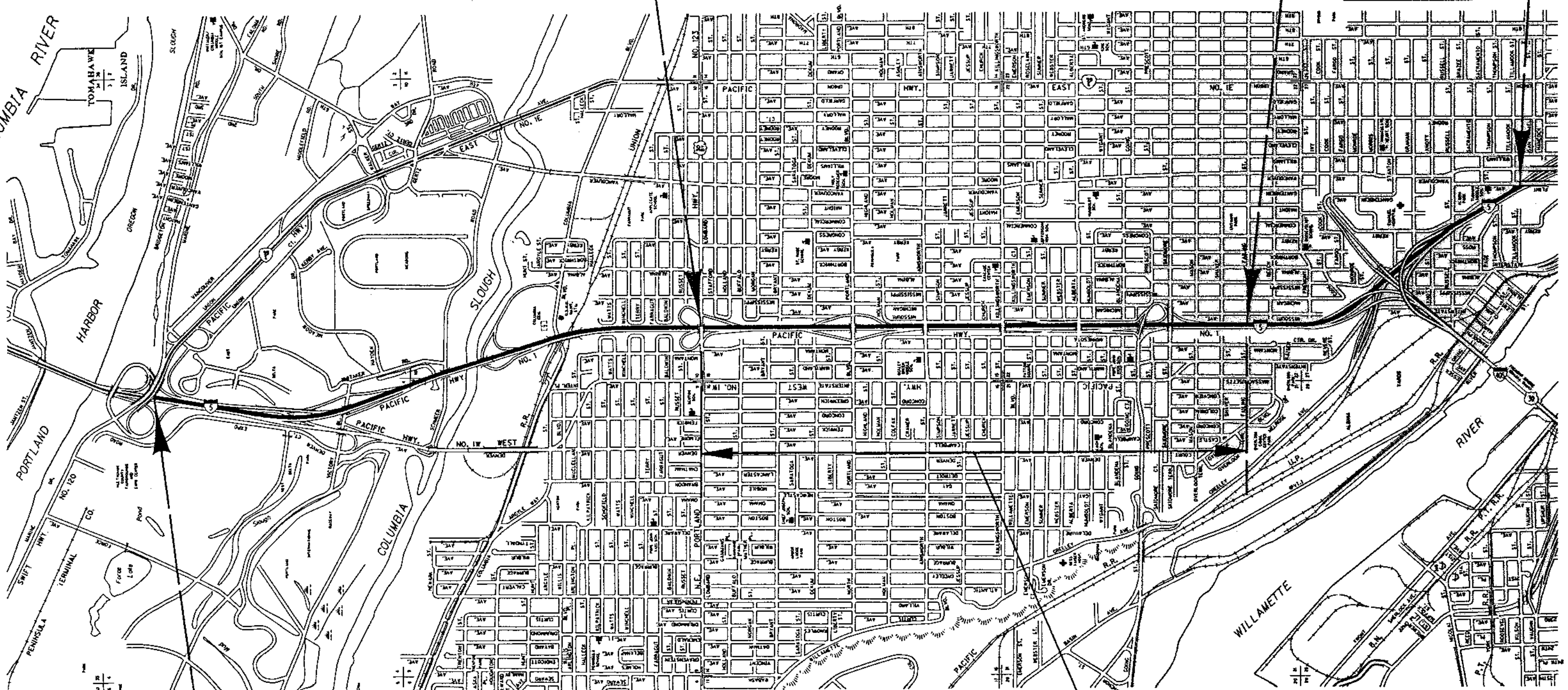
LET'S ALL WORK TOGETHER TO MAKE THIS JOB SAFE

END OF PROJECT X-IM-S001(65)
STA. 5+967 (M.P. 305.45)

END OF STRIPING
STA. 8+900 (M.P. 303.63)

SIGNING ONLY

END OF CONTRACT LIMITS (END OF SIGNING)
M.P. 302.53



BEGINNING OF PROJECT X-IM-S001(65)
STA. 2+936.696 (M.P. 307.33)

SIGNING & STRIPING ONLY

T. 1, 2 N., R. 1 E., W.M.

METRIC

OREGON TRANSPORTATION COMMISSION

Henry H. Hewitt	CHAIRMAN
Susan Brody	VICE CHAIRMAN
Steven H. Corey	COMMISSIONER
Stuart Foster	COMMISSIONER
John Russell	COMMISSIONER
Grace Crunican	DIRECTOR OF TRANSPORTATION

REGISTERED PROFESSIONAL ENGINEER 6499 OREGON JULY 11, 1983 TERRY J. SHIKE Expires Jun. 30, 1998

Terry J. Shike

ACTING TECHNICAL SERVICES MANAGING ENGINEER

INTERSTATE BRIDGE - I-405 SEC.
PACIFIC HIGHWAY
MULTNOMAH COUNTY

FEDERAL HIGHWAY ADMINISTRATION		PROJECT NUMBER	SHEET NO.
REGION 10	OREGON DIVISION	X-IM-S001(65)	1

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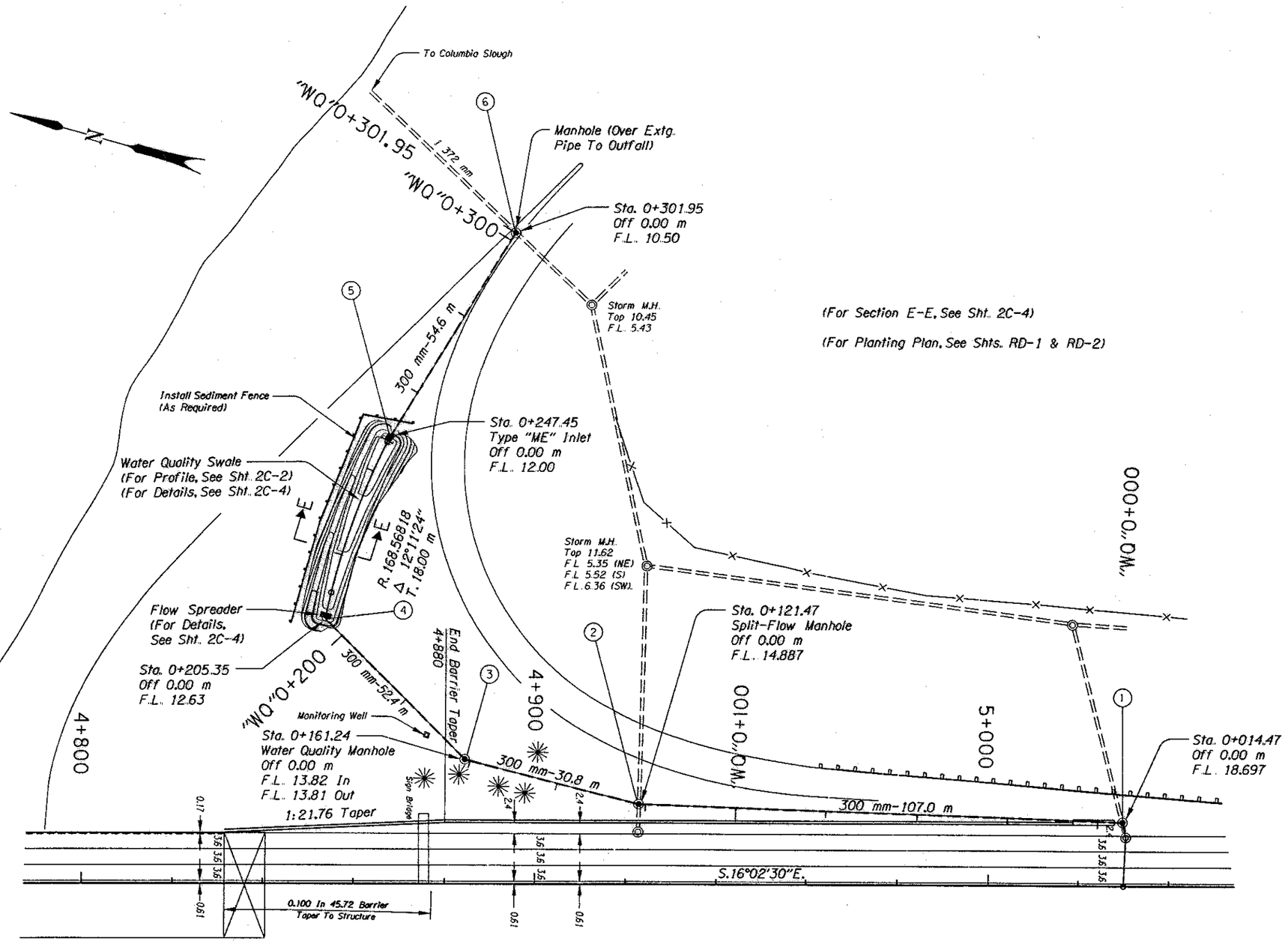
WATER QUALITY TREATMENT FACILITY DETAILS - SWALE



(For Section E-E, See Sht. 2C-4)

(For Planting Plan, See Shts. RD-1 & RD-2)

① Sta. "WQ"0+014.47
Const. Manhole Over Extg. Pipe

② Sta. "WQ"0+121.47
Const. Split-Flow Manhole With Ladder Over Extg. Pipe (Field Verify Elevations)
Inst. 300 mm Sew. Pipe - 107.0 m
Tr. Exc. - 429 m³
(For Details, See Shts. 2B-3, 2C-2 & 2C-4)
(See Drg. Nos. RD324 & RD327)

③ Sta. "WQ"0+161.24
Const. 1 800 mm Water Quality Manhole With Ladder
Inst. 300 mm Sew. Pipe - 30.8 m
Tr. Exc. - 90 m³
(For Details, See Shts. 2B-3, 2C-2 & 2C-3)
(See Drg. Nos. RD324, RD327 & RD330)

④ Sta. "WQ"0+205.35
Inst. 300 mm Sew. Pipe With Paved End Slope - 52.4 m
Tr. Exc. - 18 m³
(For Details, See Sht. 2C-2)
(See Drg. Nos. RD312 & RD315)

⑤ Sta. "WQ"0+247.45
Const. Water Quality Swale
Const. Type "ME" Inlet
Const. Stone Embankment - 1 m³
Inst. Type 1 Drainage Geotextile - 6 m²
Inst. Type 2 Drainage Geotextile - 275 m²
Inst. Geocell Grid - 275 m²
Inst. Water Quality Grass Seed Mix - 275 m²
Inst. Field Fabricated Silt Fence - 61 m
Topsoil - 42 m³
Topsoil/Sand (30/70) - 42 m³
(For Details, See Shts. 2C-2, 2C-3 & 2C-4)
(For Planting Plan, See Shts. RD-1 & RD-2)
(See Specifications 00280, 00350, 00445 & 01040.62)

⑥ Sta. "WQ"0+301.95
Const. 2 100 mm Manhole With Ladder Over Extg. Pipe
Inst. 300 mm Sew. Pipe - 54.6 m
Tr. Exc. - 45 m³
(For Details, See Shts. 2B-3, 2C-2)
(See Drg. Nos. RD324, RD327 & RD330)

WATER QUALITY PLANS & DETAILS		INTERSTATE BRIDGE - I-405 SEC. PACIFIC HIGHWAY MULTNOMAH COUNTY	
Elaine Kuehn - Designer	Designer		
Larry D. Carrison - Drafter	REGISTERED PROFESSIONAL ENGINEER OREGON ELAINE KUEHN	FEDERAL HIGHWAY ADMINISTRATION: REGION 10 / OREGON DIVISION	PROJECT NUMBER: SHEET NO. 2C

"WQ" LINE

Sta. 5+030 - Sta. "WQ" 0+00

0+011.04
19.680
-28.66%

0+014.47
18.697

Extg. M.H., Sta. 5+030.49, 11.03 Lt., F.L. 19.68

M.H. At Attenuator, Sta. "WQ" 0+014.473, F.L. 18.697

-3.56%

Split Flow M.H.
F.L. 14.887 (Field Verify)
(For Details, See Sht. 2C-4)

0+121.47
14.887

-2.68%

Water Quality M.H.
F.L. 13.82 In
F.L. 13.81 Out
(For Details, See Sht. 2C-3)

0+161.23
13.820 In

0+161.24
13.810 Out

-2.68%

Sl. 1:4

0+205.35
12.630

Start Of Swale
F.L. 12.63

Water Line

For Plan View, See Sht. 2C

Type "ME" Inlet
(For Details, See Sht. 2C)
(See Drg. No. RD339)
End Of Swale
F.L. 12.00

0+247.45
12.000

Sl. 1:4

-1.50%

Water Quality Swale
(For Details, See Shts. 2C, 2C-3 & 2C-4)

-2.75%

Outfall M.H. To Extg. 1 370 mm Line
F.L. 10.50

0+301.95
10.50

0+000 0+100 0+200 0+300

INTERSTATE BRIDGE - I-405 SEC.
PACIFIC HIGHWAY
MULTNOMAH COUNTY

FEDERAL HIGHWAY ADMINISTRATION		PROJECT NUMBER	SHEET NO.
REGION 10	OREGON DIVISION		2C-2

28-APR-1998 14:50
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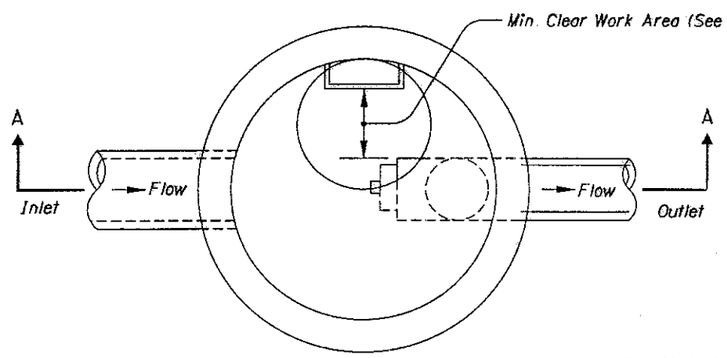
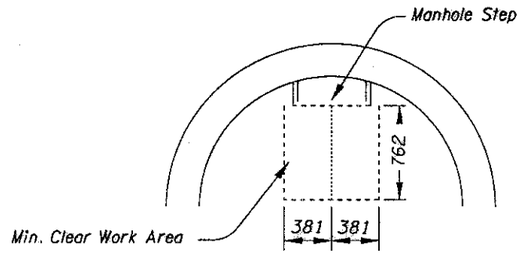
VIEW 5

WATER QUALITY MANHOLE - SWALE

STA. "WQ"0+161.24

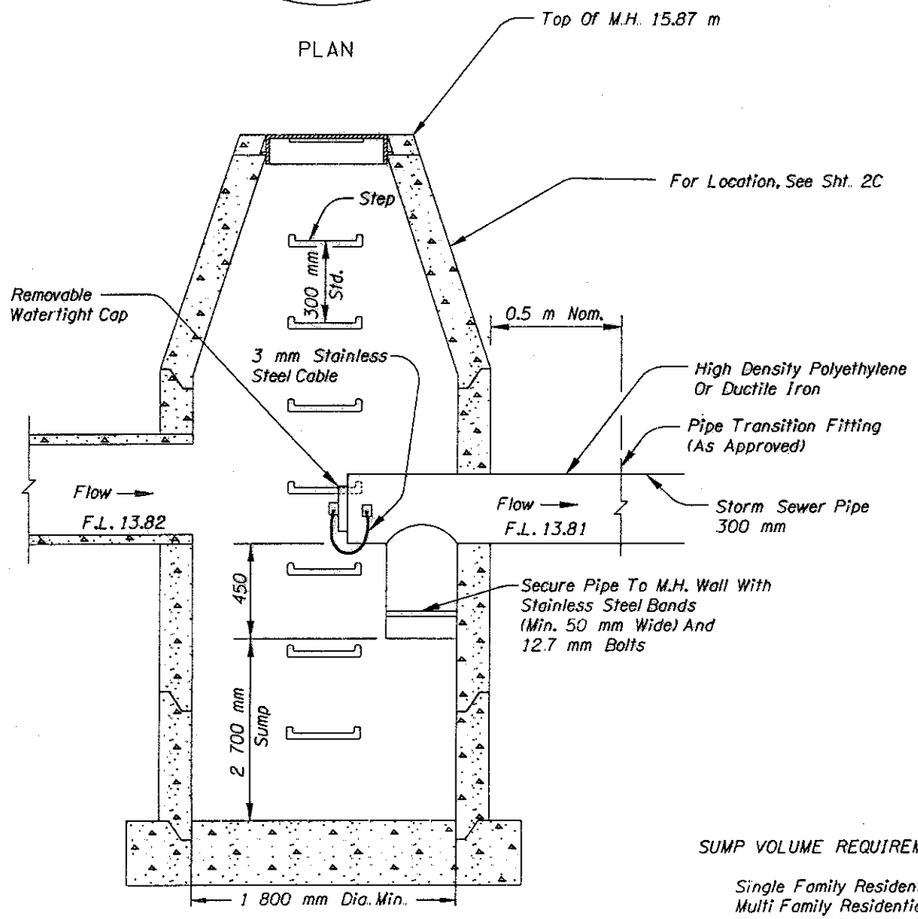


PLAN



DETAIL "A"

Locate Pipes, Etc. So That No Portion Of Them Are Are Within Min. Clear Work Area



SECTION A-A

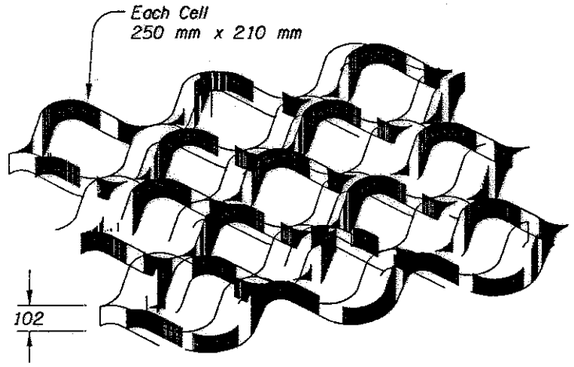
(For Details Not Shown, See Manhole Standard Drawings)

NOTES:

1. Hardware, Fasteners And Anchors To Be Stainless Steel: Use 3 mm Stainless Steel Cable
2. See Pipe Data Sheet And Plan Sheets For Pipe Size(s).
3. See Pipe Data Sheet And Plan Sheets For Manhole Size(s).
4. See Pipe Data Sheet And Plan Sheets For Sump Depth.
5. Manhole And Base Per Manhole Standard Drawings.
6. Hardware, Fasteners, Anchors, Fittings, Appurtenances, Labor And Equipment Is Incidental To Water Quality Manhole Item.

SUMP VOLUME REQUIREMENTS

Single Family Residential	.245 m^3/hectare
Multi Family Residential	1.539 m^3/hectare
Commercial/Industrial	6.577 m^3/hectare



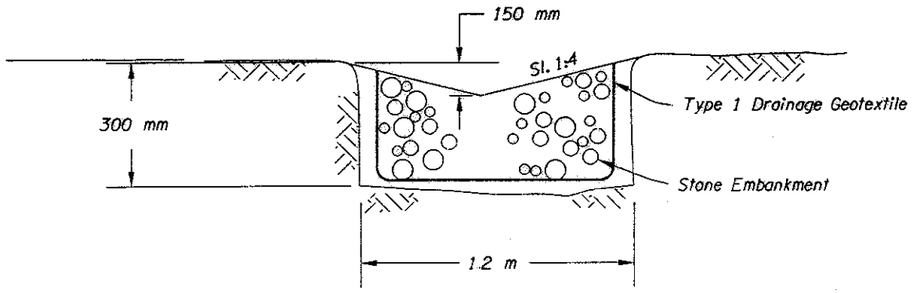
POLYETHYLENE GEOCELL GRID

All Dimensions Are Shown In Millimeters (mm) Unless Otherwise Noted.

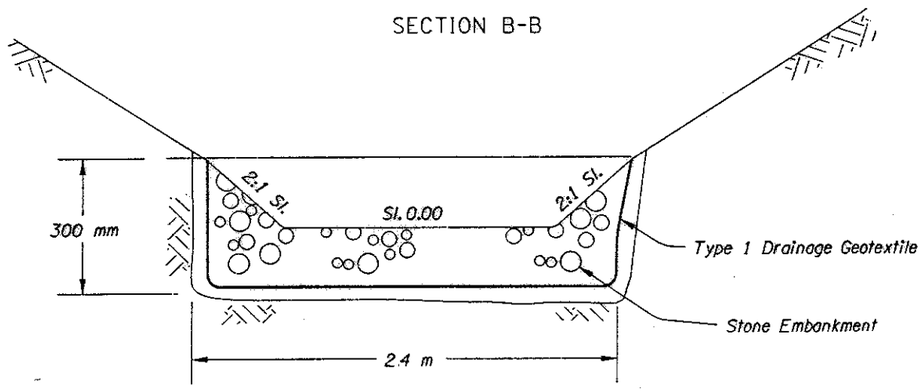
INTERSTATE BRIDGE - I-405 SEC.
PACIFIC HIGHWAY
MULTNOMAH COUNTY

FEDERAL HIGHWAY ADMINISTRATION		PROJECT NUMBER	SHEET NO.
REGION 10	OREGON DIVISION		2C-3

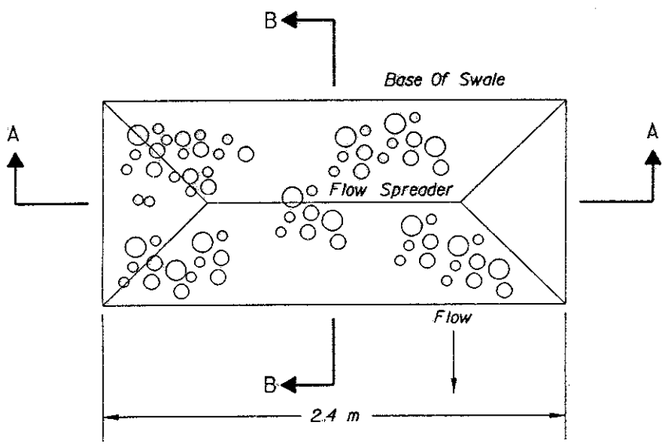
WATER QUALITY TREATMENT FACILITY DETAILS - SWALE



SECTION B-B

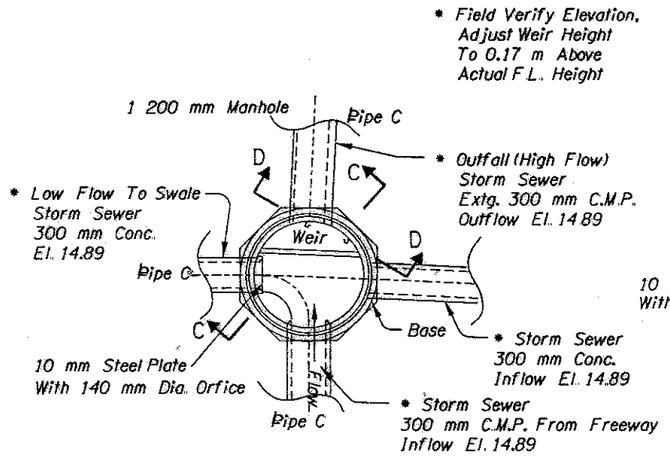


SECTION A-A

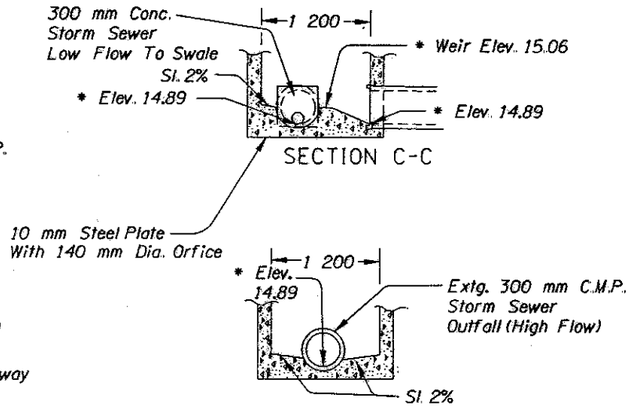


PLAN

FLOW SPREADER



PLAN

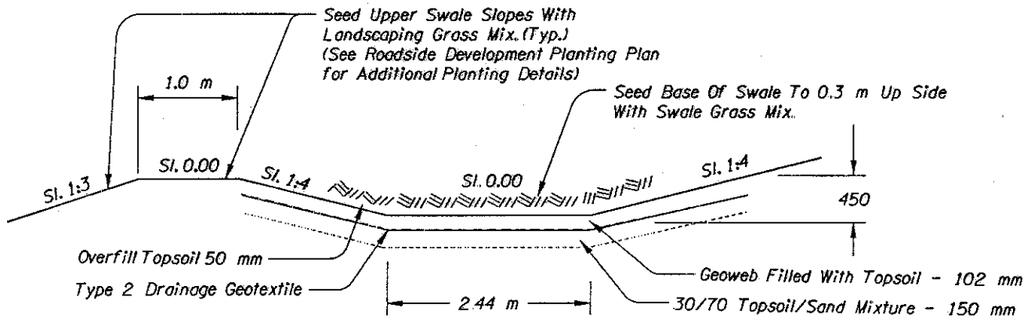


SECTION D-D

Sta. "WQ" 0+121.469

SPLIT FLOW MANHOLE

(For Details Not Shown, See Drg. Nos. RD327 & RD330



Swale At Sta. "WQ" 0+205.35

SECTION E-E

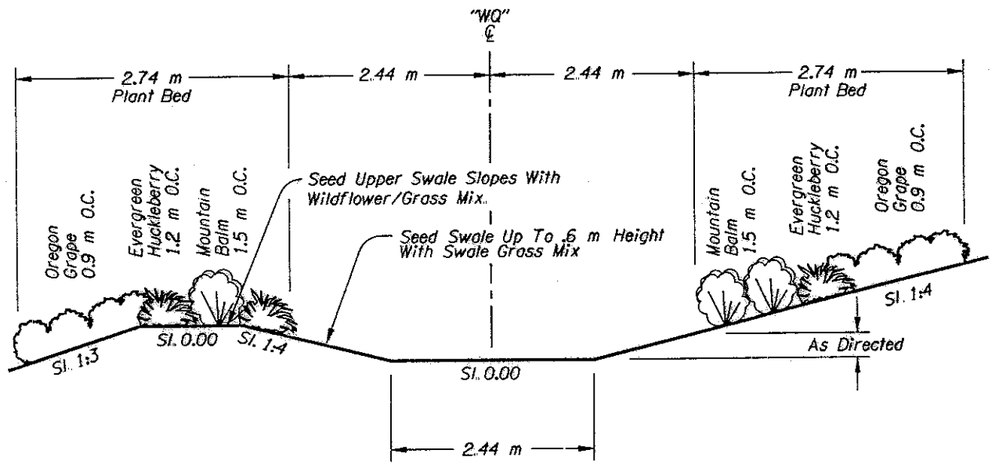
SWALE

All Dimensions Are Shown In Millimeters (mm) Unless Otherwise Noted.

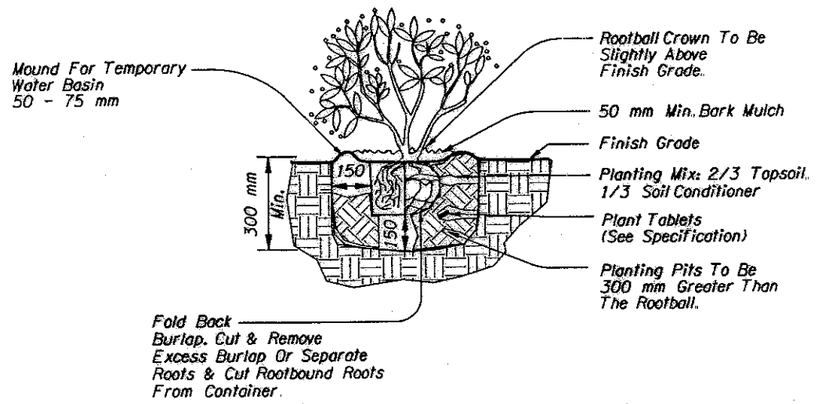
INTERSTATE BRIDGE - I-405 SEC.
PACIFIC HIGHWAY
MULTNOMAH COUNTY

FEDERAL HIGHWAY ADMINISTRATION		PROJECT NUMBER	SHEET NO.
REGION 10	OREGON DIVISION		2C-4

ROADSIDE DEVELOPMENT
PLANT LIST & TYPICAL SECTION



SECTION A-A



SHRUB PLANTING - CONTAINER OR B&B

Plant The Following Shrubs On The Slope Areas Shown & At The Spacing Shown On The Plant List:

Mountain Balm - Inside Slopes
Evergreen Huckleberry - Middle Of Slopes
Oregon Grape - Outside Of Slopes

Plant In Groups Of Three, Five, Or Seven & Vary Spacing For Natural Appearance.

Sta. "WQ" 0+204.854

SWALE SHRUB PLANTING

NOTES:

**See "American Standard For Nursery Stock" For Min. Plant Quality Standards Such As Size Of Root Ball Or Caliper Of Trunk.*

**All Dimensions Shown On Details Are Minimum Dimensions.*

**Provide Planting Backfill Mix: 1/3 Soil Conditioner & 2/3 Soil Mix & Wet Backsoil Throughly.*

PLANT LIST

BOTANICAL NAME	COMMON NAME	GRADE CLASS	SIZE & DESCRIPTION	SPACING	TOTAL	REV. QTY.
Shrubs, No. 2 Container						
Ceanothus velutinus	*Mountain Balm*	*4.1.3.4.*	*No. 2 Container.*	*1.5 m O.C.*	*50*	
Mahonia aquifolium	*Oregon Grape*	*2.1.5.3.*	*No. 2 Container.*	*0.9 m O.C.*	*100*	
Vaccinium ovatum	*Evergreen Huckleberry*	*2.1.5.5.*	*No. 2 Container.*	*1.2 m O.C.*	*100*	

REGISTERED 284 MICHAEL S. LUCKER OREGON LANDSCAPE ARCHITECT

Designed By: MSL Drawn By:
Checked By:

INTERSTATE BRIDGE - I-405 SEC.
PACIFIC HIGHWAY
MULTNOMAH COUNTY

FEDERAL HIGHWAY ADMINISTRATION		PROJECT NUMBER	SHEET NO.
REGION 10	OREGON DIVISION		RD-1

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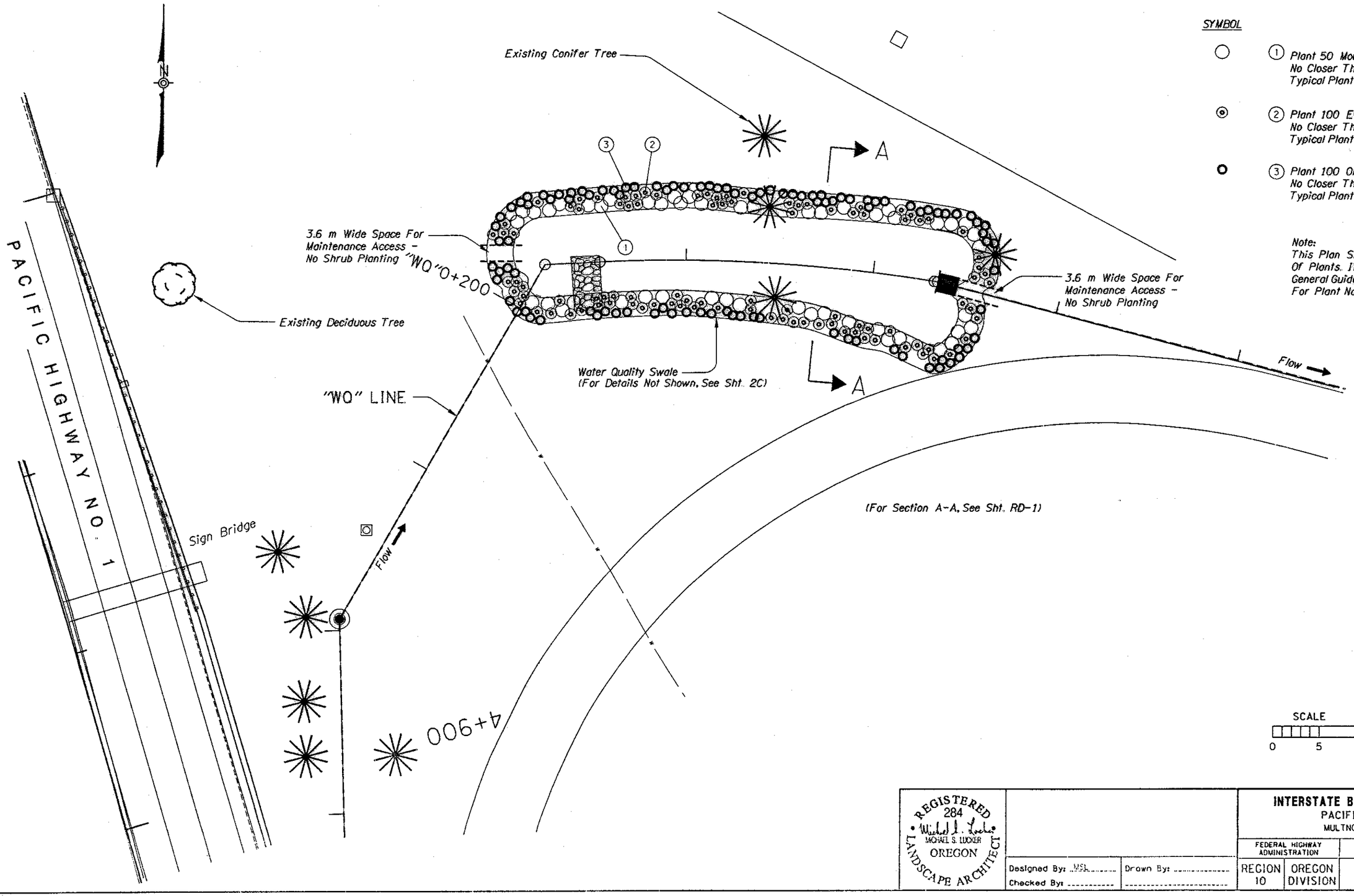
VIEW 1

ROADSIDE DEVELOPMENT
PLANTING PLAN



SYMBOL

○ (1) Plant 50 Mountain Balm - No Closer Than 1.5 m O.C. Typical Plant Layout Shown.

◉ (2) Plant 100 Evergreen Huckleberry No Closer Than 1.2 m O.C. Typical Plant Layout Shown.

● (3) Plant 100 Oregon Grape No Closer Than 0.9 m O.C. Typical Plant Layout Shown.

Note:
This Plan Shows A Typical Layout Of Plants. It Is Intended To be A General Guide Only. See Plant List For Plant Names & Quantities.

(For Section A-A, See Sht. RD-1)

SCALE IN METERS
0 5 10 20

REGISTERED 284 MICHAEL S. LUCKER OREGON LANDSCAPE ARCHITECT

Designed By: MSL Drawn By:
Checked By:

INTERSTATE BRIDGE - I-405 SEC.
PACIFIC HIGHWAY
MULTNOMAH COUNTY

FEDERAL HIGHWAY ADMINISTRATION		PROJECT NUMBER	SHEET NO.
REGION 10	OREGON DIVISION		RD-2

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VIEW 2