

OPERATION & MAINTENANCE MANUAL

Water Quality Biofiltration Swale

Manual prepared: June 2019

DFI No. D00617



Figure 1: DFI No. D00617, looking north along 72nd Ave.

Identification

Drainage Facility ID (DFI):	D00617
Facility Type:	Water Quality Biofiltration Swale
Construction Drawings:	(V-File Numbers) 45v-073
Location:	District: 03
	Highway No.: 162
	Mile Post: 5.86 to 5.86, [right]

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]

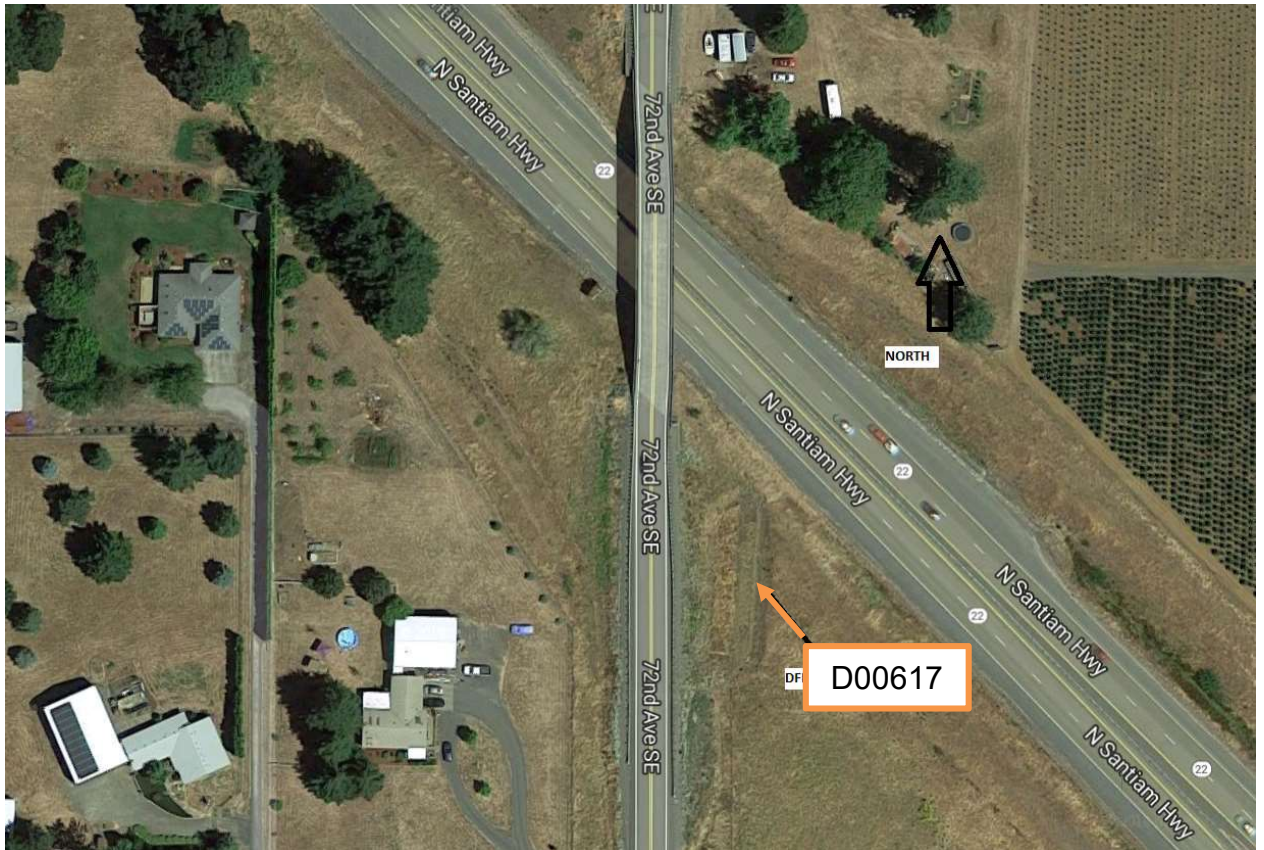


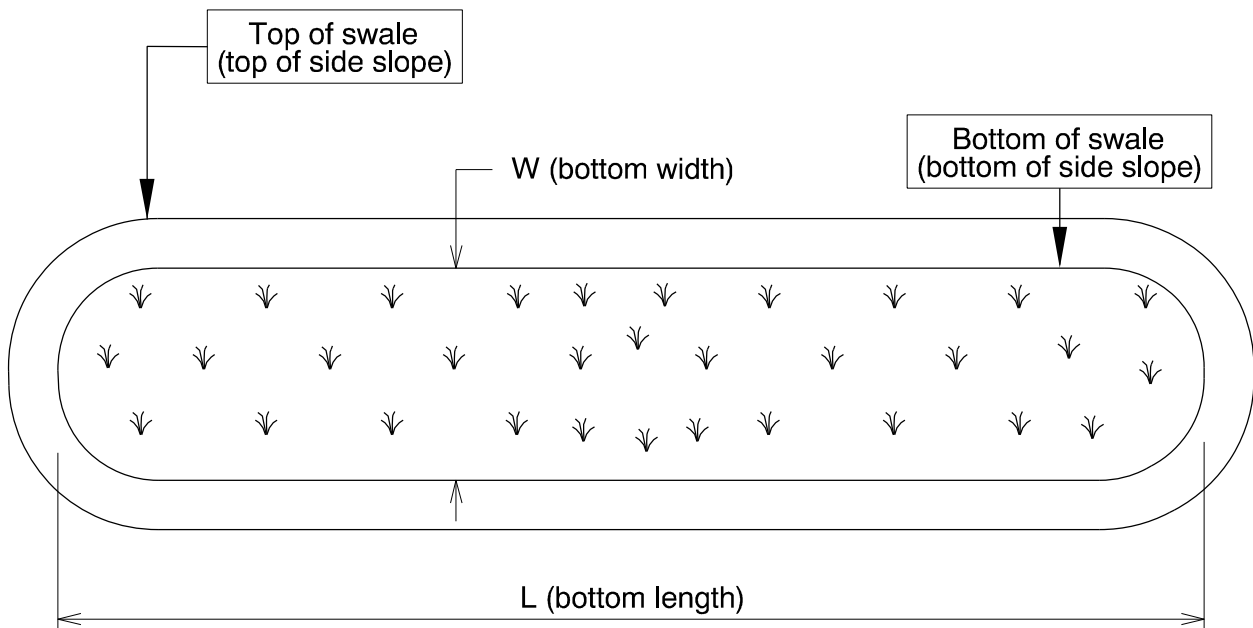
Figure 2: Facility location map

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:

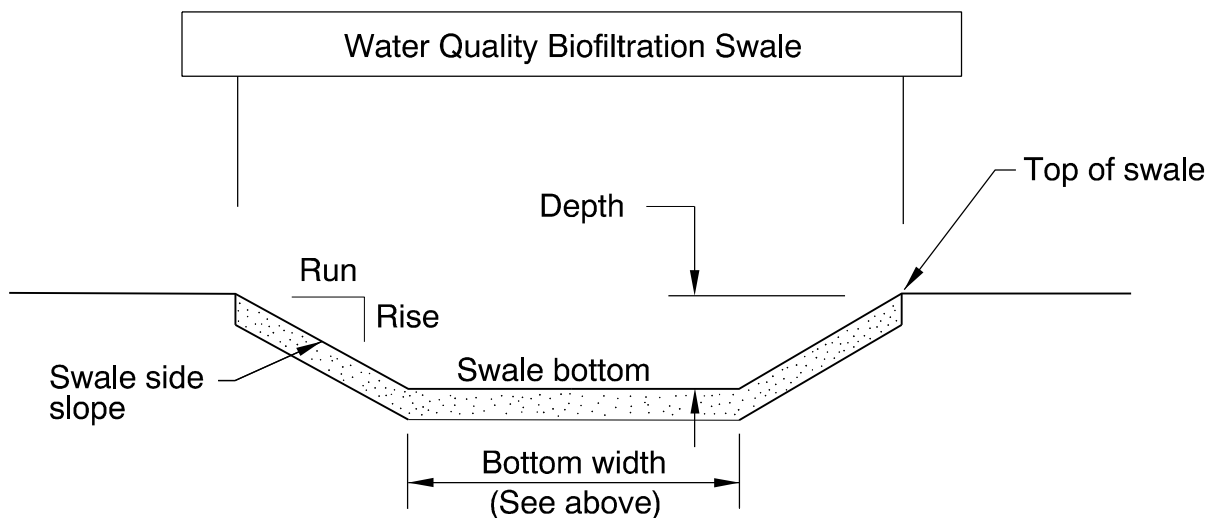
Bottom Length (feet)	Bottom Width (feet)
105	9



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)
1.5	1	4



Site Specific Information: Water enters from 72nd Ave and flows towards the North Santiam highway. A manhole near the end of the guardrail splits low flows and high flows. Low flows are sent to the left and high flows to the right as one looks north. A 4" thick weir wall and an 8" diameter pipe inside the manhole controls the splitting. The 8" hole should be inspected for clogging.

4. Facility Access

Maintenance access to the facility:

<input type="checkbox"/> Roadside pad	<input checked="" type="checkbox"/> Roadside shoulder
<input type="checkbox"/> Access road with Gate	<input type="checkbox"/> Access road without Gate



Figure 3: Maintenance Access

5. Operational Components / Maintenance Items

Classification

This facility is classified as an:

<input type="checkbox"/> On-line Swale	<input checked="" type="checkbox"/> 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:

<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes
There is no bypass component. High flows drain 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:

<input type="checkbox"/> Operational Plan A	<input type="checkbox"/> Operational Plan B	<input checked="" type="checkbox"/> Operational Plan C
<p>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.</p>		

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	<input type="checkbox"/>	S1
Weir type flow splitter/flow splitter manhole	<input type="checkbox"/>	S2
Orifice type flow splitter/flow splitter manhole	<input checked="" type="checkbox"/>	S3
Standard manhole	<input type="checkbox"/>	S4
Swale Inlet		
Pavement sheet flow	<input checked="" type="checkbox"/>	S5
Inlet Pipe (s)	<input checked="" type="checkbox"/>	S6

Open channel inlet	<input type="checkbox"/>	S7
Riprap pad	<input checked="" type="checkbox"/>	S8
Ground Cover		
Grass bottom	<input checked="" type="checkbox"/>	S9
Grass side slopes	<input checked="" type="checkbox"/>	S10
Granular drain rock	<input type="checkbox"/>	S11
Plantings	<input type="checkbox"/>	S12
Underground Components		
Geotextile fabric	<input type="checkbox"/>	S13
Water quality mix	<input type="checkbox"/>	S14
Perforated pipe	<input type="checkbox"/>	S15
Porous pavers (access grid)	<input type="checkbox"/>	S16
Flow Spreader		
Rock basin (rock weir @ 50')	<input checked="" type="checkbox"/>	S17
Anchored board (midpoint of swale or every 50 feet along swale bottom)	<input type="checkbox"/>	S18
Other: concrete weir @ inlet	<input checked="" type="checkbox"/>	S19
Swale Outlet		
Catch basin with grate	<input type="checkbox"/>	S20
Outlet Pipe (s)	<input type="checkbox"/>	S21
Open channel outlet	<input checked="" type="checkbox"/>	S22
Auxiliary Outlet: 2' open channel	<input checked="" type="checkbox"/>	S23
Outfall Type		
Waterbody (Creek/Lake/Ocean)	<input type="checkbox"/> C <input type="checkbox"/> L <input type="checkbox"/> O	S24
Ditch	<input checked="" type="checkbox"/>	S25
Storm drain system	<input type="checkbox"/>	S26
Outfall Components		
Riprap pad	<input type="checkbox"/>	S27
Riprap bank protection	<input checked="" type="checkbox"/>	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:

<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes
There are no 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

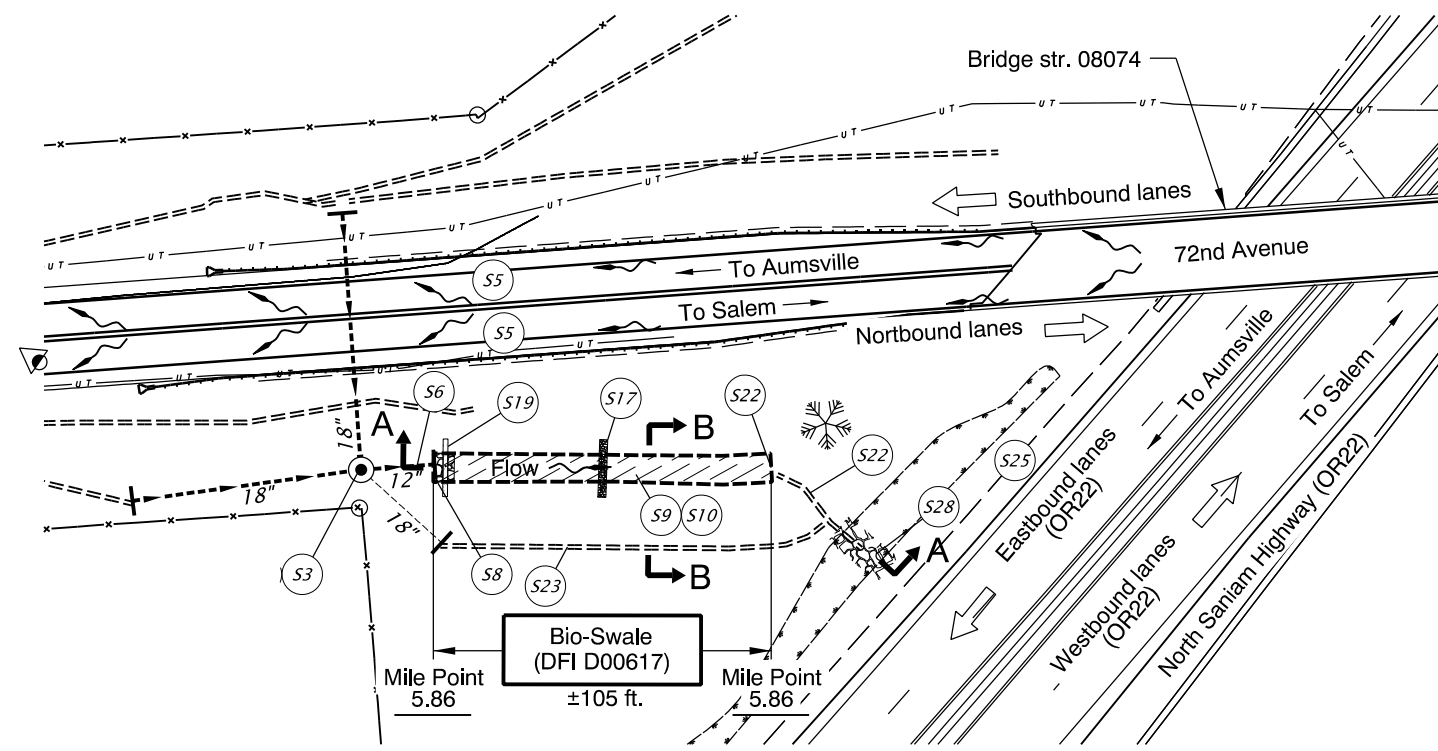
Contact any of the following for more detailed information about management of waste materials found on site:

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

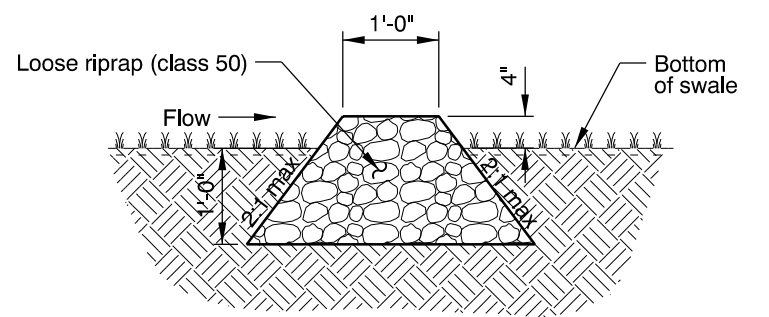
Contents:

Operational Plan: DFI D00617

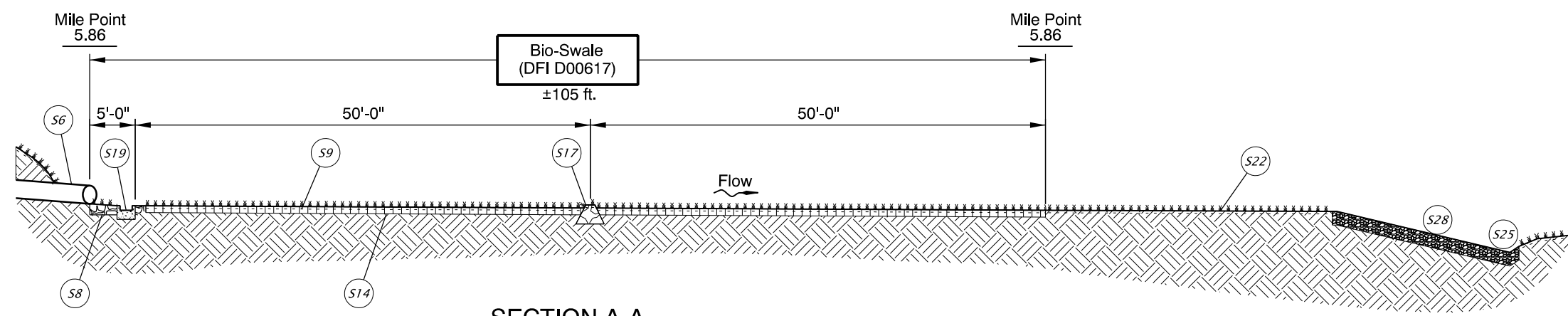


PLAN
N.T.S.

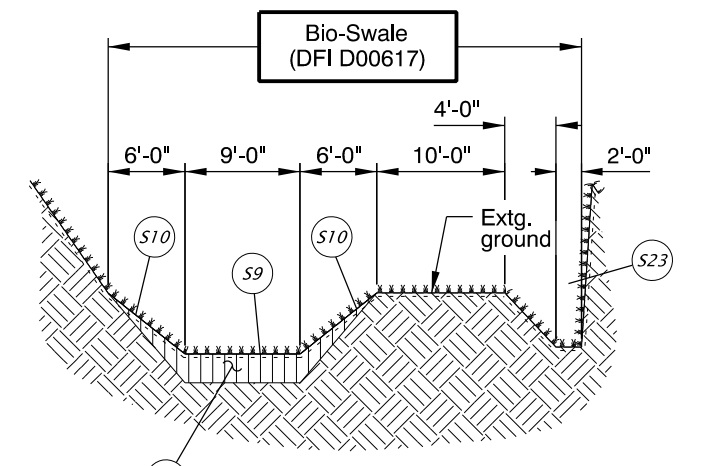
- LEGEND:**
- Photo Location / Direction
 - Facility Component (see table 1 in O&M Manual)
 - Manhole
 - Ditch Line
 - Swale Bottom
 - Swale Boundary
 - Storm Pipe
 - Conveyance Direction
 - Pavement / Facility Flow Path



FLOW SPREADER DETAIL
N.T.S.



SECTION A-A
N.T.S.



SECTION B-B
N.T.S.



Prepared By:
Chris Carman

Drafted By:
Michael Skelton

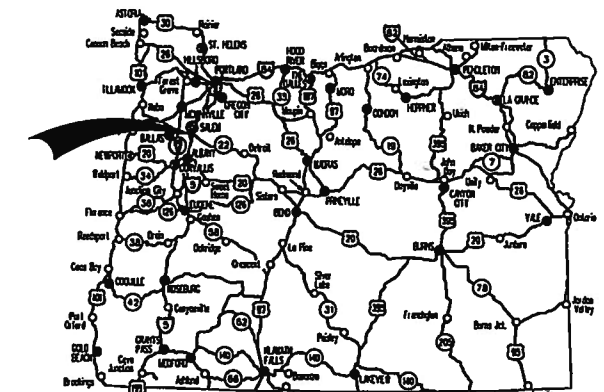
DFI D00617
MAINTENANCE DISTRICT 3 OR22
WATER QUALITY BIOFILTRATION SWALE
NORTH SANTIAM HIGHWAY MP 5.86 RT.
MARION COUNTY

B Appendix B – Project Contract Plans

Contents:

Site Specific Subset of Project Contract Plan 45v-073

STATE OF OREGON
 DEPARTMENT OF TRANSPORTATION
 PLANS FOR PROPOSED PROJECT
 GRADING, DRAINAGE, STRUCTURES, PAVING, SIGNING,
 ILLUMINATION, SIGNALS & ROADSIDE DEVELOPMENT



Overall Length Of Project - 8.37 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 By Calling
 The Center. (Note: The Telephone Number For
 The Oregon Utility Center Is (503) 232-1987.)

**OR 22 BRIDGE VERTICAL CLEARANCE
 BRIDGE PROJECTS**

NORTH SANTIAM HIGHWAY
 MARION COUNTY
 JULY 2012

CORDON ROAD O'XING
 BRIDGE NO. 08473 (M.P. 2.82)

END OF CONTRACT
 NH-S162(050)
 STA. "NS" 626+50 (M.P. 10.04)

ALBUS ROAD O'XING
 BRIDGE NO. 08077 (M.P. 10.04)

INDEX OF SHEETS	
SHEET NO.	DESCRIPTION
1	Title Sheet
1A	Index Of Sheets
1A-2	Std. Drg. Nos.

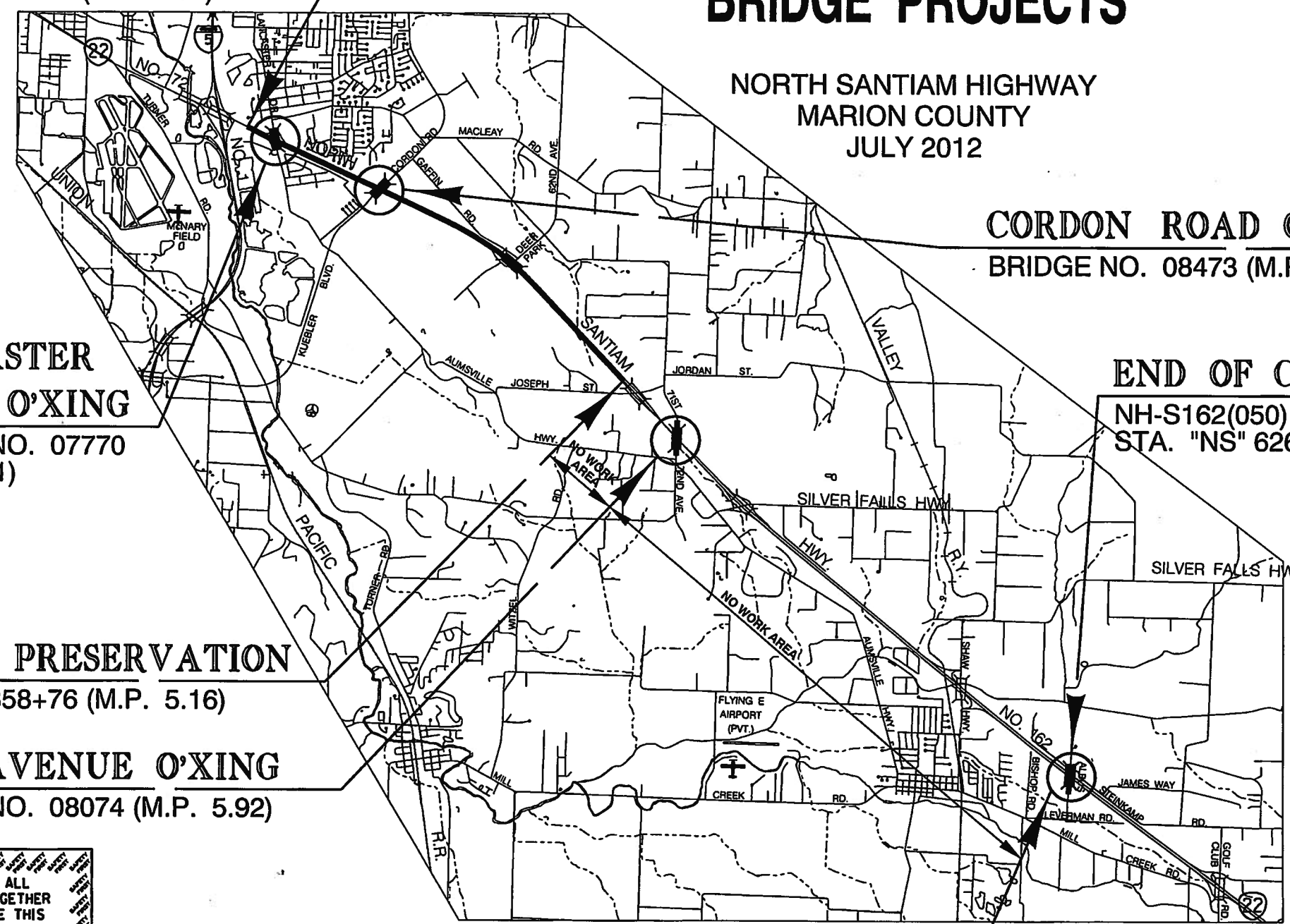
BEGINNING OF CONTRACT

NH-S162(050)
 STA. "NS" 174+44 (M.P. 1.67)

**LANCASTER
 DRIVE O'XING**
 BRIDGE NO. 07770
 (M.P. 1.91)

END OF PRESERVATION
 STA. "NS" 358+76 (M.P. 5.16)

72ND AVENUE O'XING
 BRIDGE NO. 08074 (M.P. 5.92)



T. 7 S., R. 2 W., W.M.
 T. 8 S., R. 2 W., W.M.
 T. 8 S., R. 1 W., W.M.

PLANS PREPARED FOR
 OREGON DEPARTMENT OF TRANSPORTATION
 BY:
WHPacific
 3470 Pipebend Place
 Suite 170
 Salem, OR 97301
 t: 503.362.4675 f: 503.362.5078

OREGON TRANSPORTATION COMMISSION
 Pat Egan CHAIR
 Mary F. Olson COMMISSIONER
 David Lohman COMMISSIONER
 Mark Frohnmayer COMMISSIONER
 Tommy Boney COMMISSIONER
 Matthew L. Garrett 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: *Ed Chamberland* 5/14/12
 Signature & date

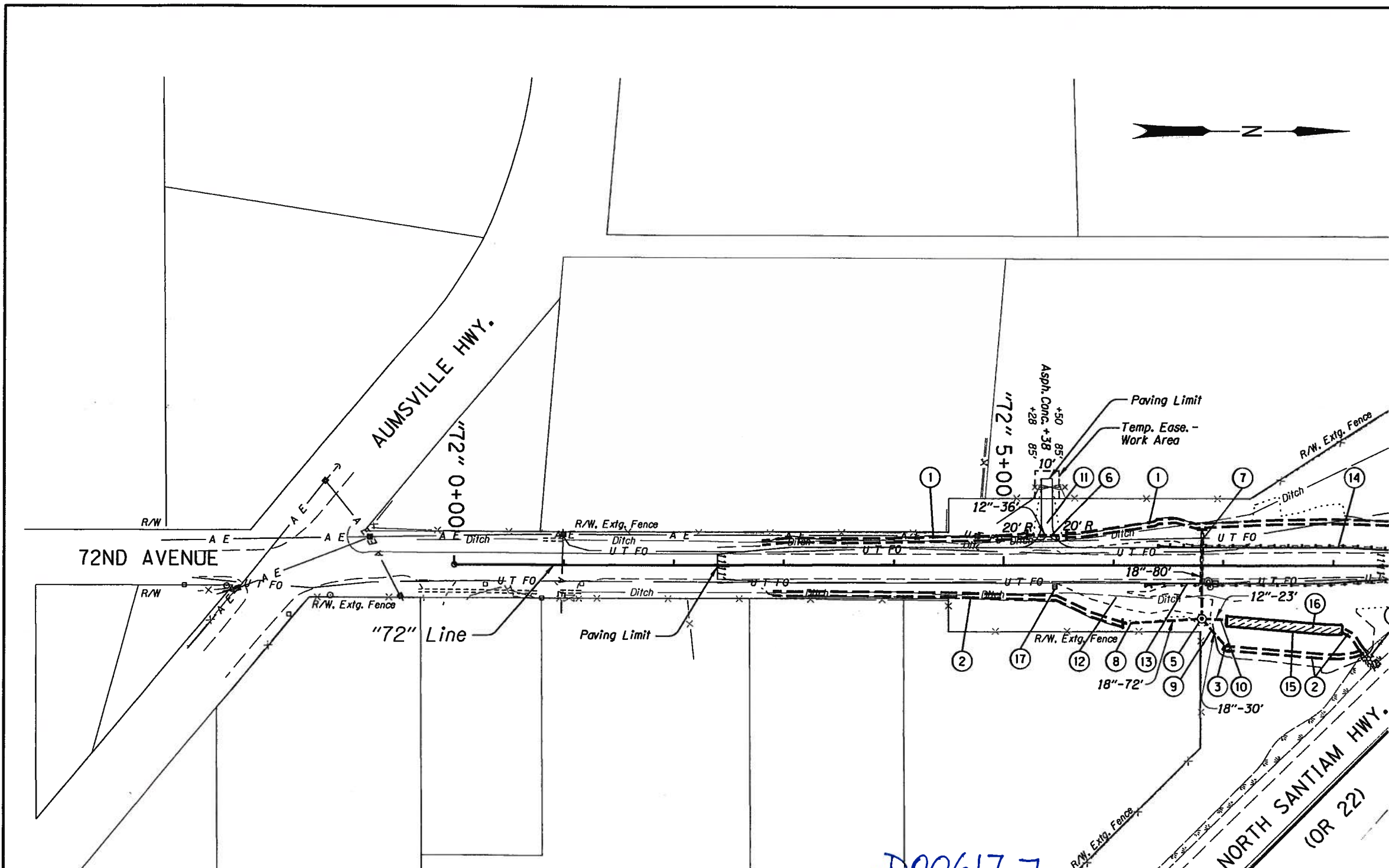
Ed Chamberland, Sr. P.M.
 Print name and title

Ed Chamberland
 Concurrence by ODOT Chief Engineer

**OR22 BRIDGE VERTICAL CLEARANCE
 BRIDGE PROJECTS**

NORTH SANTIAM HIGHWAY MARION COUNTY		
FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	NH-S162(050)	1

45V-073

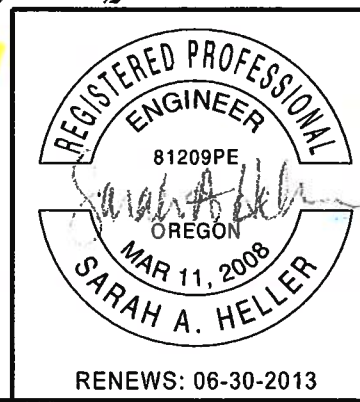


- ① Const. ditch
V bottom, 1:2 slope
- ② Const. ditch
2' flat bottom, 1:2 slope
- ③ Sta. "72" 7+04, 75' Rt.
Const. loose riprap (class 50) - 2 cu.yd.
6'x6'x1.5'
Inst. riprap geotextile type 1 - 7 sq.yd.
- ④ Sta. "72" 8+35, 84' Rt.
Const. loose riprap (class 50) - 11 cu.yd.
20'x10'x1.5'
Inst. riprap geotextile type 1 - 29 sq.yd.
- ⑤ Sta. "72" 6+80, 48' Rt.
Const. manhole diversion 84" dia.
(For details, see Sht. GJ-4)
- ⑥ Sta. "72" 5+21, 27.5' Lt. to
Sta. "72" 5+57, 26.8' Lt.
Remove pipe - 24'
Inst. 12" culv. pipe - 36'
5' depth
- ⑦ Sta. "72" 6+80, 32.4' Lt.
Remove pipe - 53'
Inst. 18" storm sew. pipe - 80'
10' depth, Si. = 1.03%
I.E. (Intake) = 550.72 (W)
Const. sloped end, Lt.
- ⑧ Sta. "72" 6+08, 52.5' Rt.
Inst. 18" storm sew. pipe - 72'
5' depth
- ⑨ Sta. "72" 7+03, 73' Rt.
Inst. 18" storm sew. pipe - 33'
5' depth, Si. = 0.5%
I.E. = 548.33
Const. sloped end, Rt.
- ⑩ Sta. "72" 7+02, 49' Rt.
Inst. 12" storm sew. pipe - 23'
5' depth
Const. sloped end, Rt.
- ⑪ Const. approach
(For details, see Shts. 2B-3 and 2B-6)
- ⑫ Const. access road

- ⑬ Sta. "72" 6+28 to Sta. "72" 8+71.50, Rt.
Remove extg. guardrail - 60'
Const. guardrail - 112.5' (Type 2A)
Const. guardrail - 75' (Type 3)
W=1', E=2', FL=0
Const. guardrail terminal, non-flared
Test level - 3
- ⑭ Sta. "72" 6+39.50 to Sta. "72" 8+95.50, Lt.
Const. guardrail - 125' (Type 2A)
Const. guardrail - 75' (Type 3)
W=1', E=2', FL=0
Const. guardrail terminal, non-flared
Test level - 3

- ⑮ Const. water quality swale, D00617 - 105'
9' flat bottom, 1:4 side slopes
Inst. stormwater field marker
(For details, see Sht. GJ & GJ-10)
- ⑯ Seed and mulch water quality swale with water
quality seeding, mix no. 1 - 0.05 ac.
- ⑰ Remove extg. mailbox support
Inst. single mailbox support
Const. conc. collar
(See drg. nos. RD100 and RD101)

D00617 ↘



OREGON DEPARTMENT OF TRANSPORTATION	
WHPacific 3470 Pipebend Place NE Ste 170 Salem, OR 97301 t: 503.362.4675 f: 503.362.5078	
OR22 BRIDGE VERTICAL CLEARANCE BRIDGE PROJECTS NORTH SANTIAM HIGHWAY MARION COUNTY	
Design Team Leader - Sarah Heller Designed By - Devin Doring, Travis Sater Drafted By - Linda Foote	
GENERAL CONSTRUCTION	SHEET NO. 18

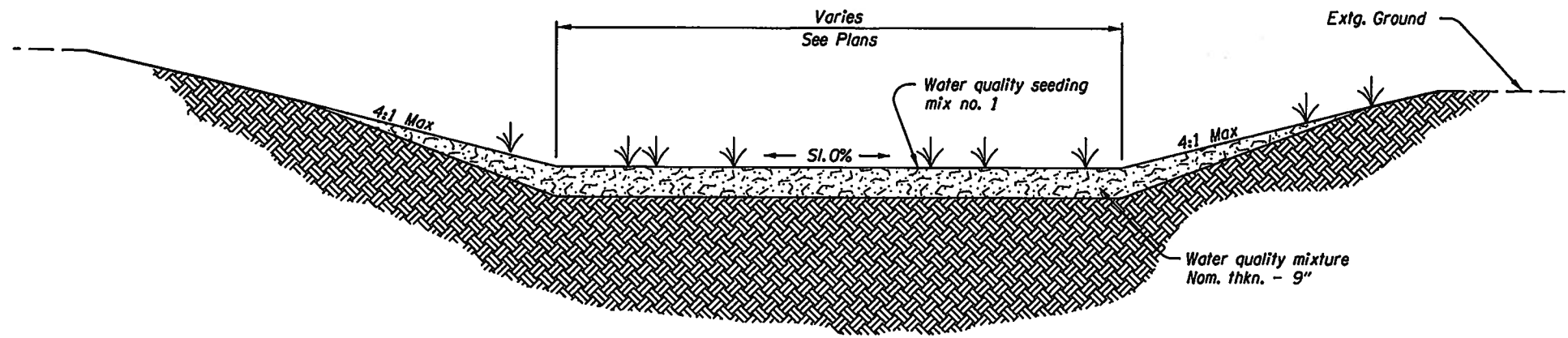
Wetland Shown Thus:

STORMWATER CONTROL FIELD FACILITY MARKER TABLE

FACILITY LOCATION		DF1 #	TYPE S2 MARKER LOCATION		TYPE S1 MARKER	
STATION	MP		BEGIN	END	RED	GREEN
"NS" 170+65, Rt.	1.60	D 00611	✓			
"NS" 236+40, Rt.	2.85	D 00612	✓		✓	
"NS" 236+40, Lt.	2.85	D 00613		✓		✓
"NS" 239+20, Rt.	2.90	D 00612		✓		✓
"NS" 239+50, Lt.	2.90	D 00613	✓		✓	
"NS" 264+67, Lt.	3.38	D 00614		✓		✓
"NS" 265+72, Lt.	3.40	D 00614	✓		✓	
"NS" 288+20, Lt.	3.83	D 00615	✓			
"NS" 400+60, Rt.	5.95	D 00616	✓			
"NS" 395+60, Lt.	5.86	D 00617	✓			
"NS" 605+10, Rt.	9.63	D 00618	✓		✓	
"NS" 612+80, Rt.	9.78	D 00618		✓		✓
"NS" 621+20, Rt.	9.94	D 00619	✓		✓	
"NS" 626+50, Rt.	10.04	D 00619		✓		✓

See drg. no. RD399

✓ Check where appropriate
 Red = Beginning of facility
 Green = End of facility



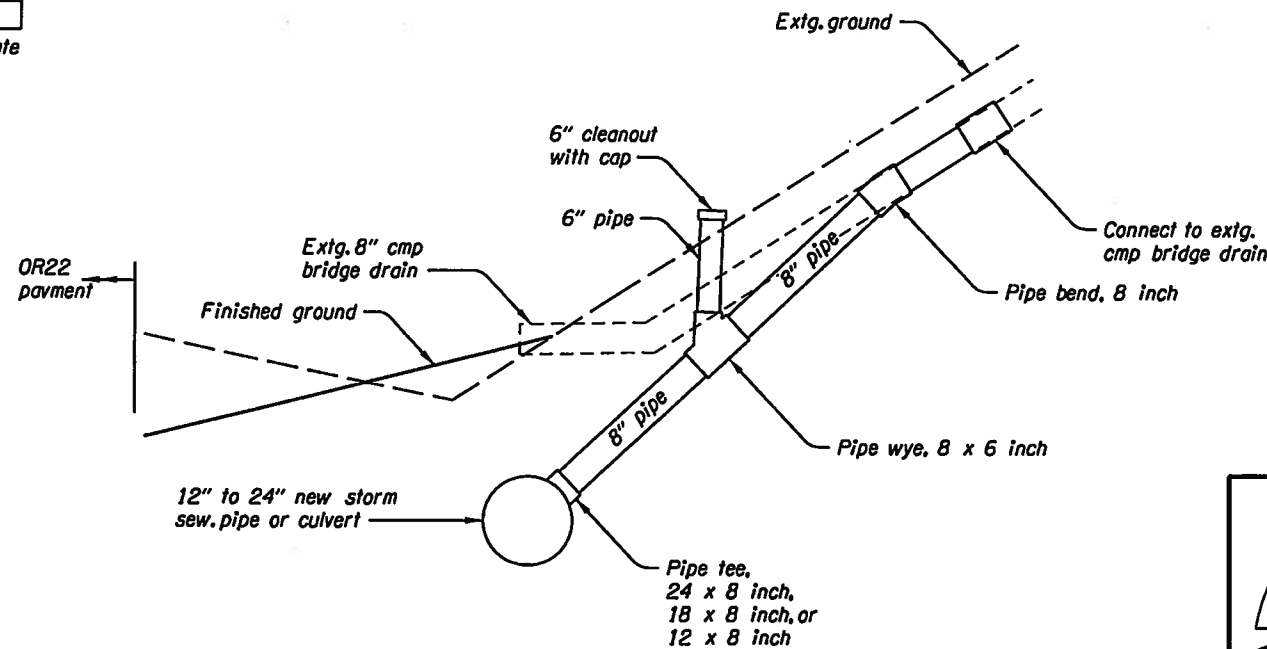
WATER QUALITY BIOFILTRATION SWALE
 N.T.S.

CULVERT DRAINAGE FACILITY MARKER TABLE

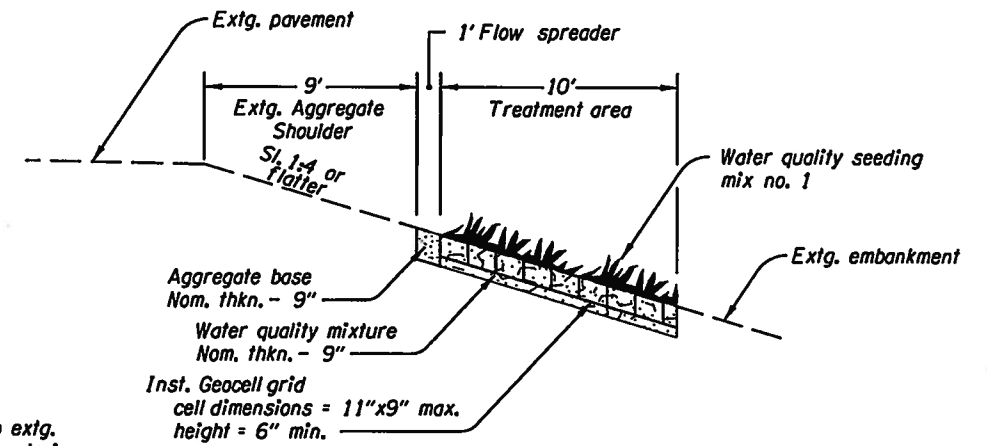
FACILITY LOCATION		TYPE 1 MARKER	
STATION	MP	INLET	INLET & OUTLET
"NS" 183+80	1.85	✓	
"B" 189+20	1.96	✓	
"D" 192+20	2.01	✓	
"NS" 237+60	2.87		✓
"NS" 266+50	3.40	✓	
"NS" 288+20	3.82	✓	

See drg. no. RD398

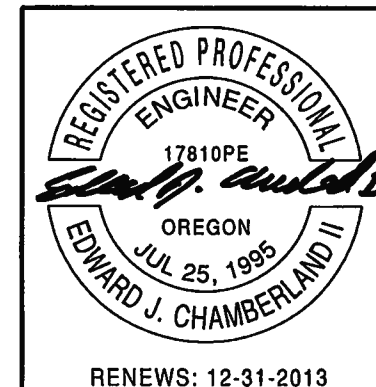
✓ Check where appropriate



TYPICAL BRIDGE DRAIN CONNECTION
 N.T.S.

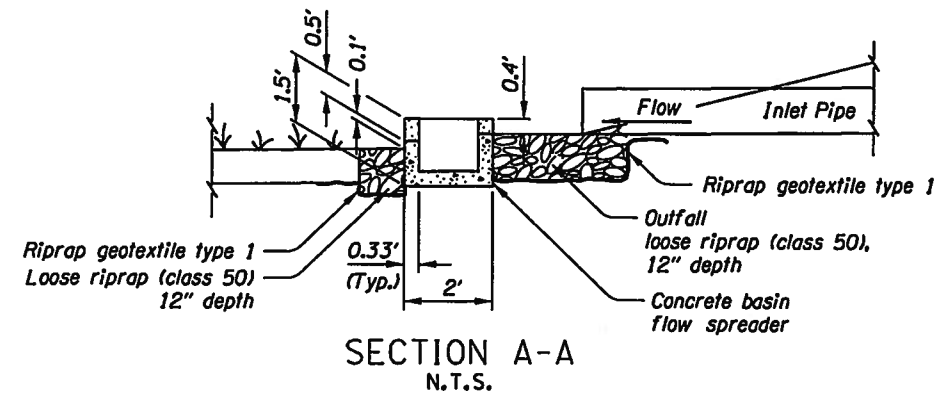


WATER QUALITY FILTER STRIP
 N.T.S.

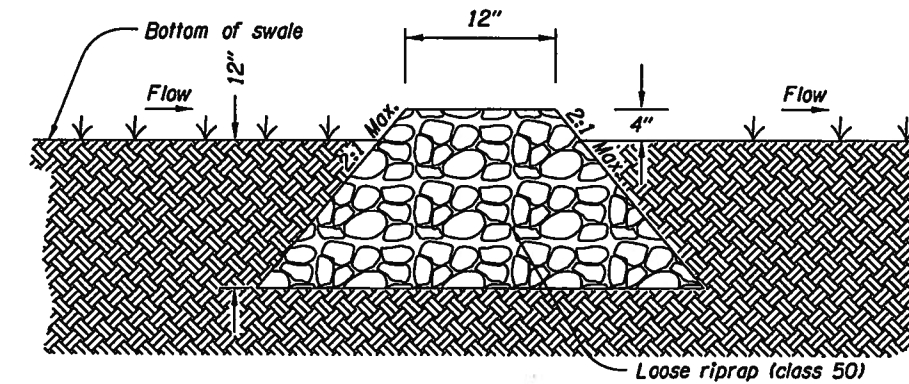
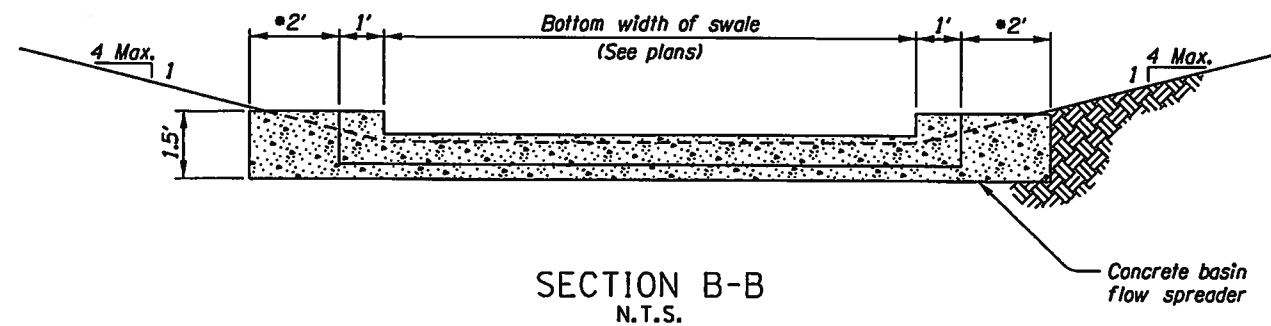


RENEWS: 12-31-2013

OREGON DEPARTMENT OF TRANSPORTATION	
3470 Pipebend Place NE Ste 170 Salem, OR 97301 t: 503.362.4675 f: 503.362.5078	
OR22 BRIDGE VERTICAL CLEARANCE BRIDGE PROJECTS NORTH SANTIAM HIGHWAY MARION COUNTY	
Design Team Leader - Ed Chamberland Designed By - Travis Sater Drafted By - Linda Foote	
STORMWATER DETAILS	SHEET NO. GJ

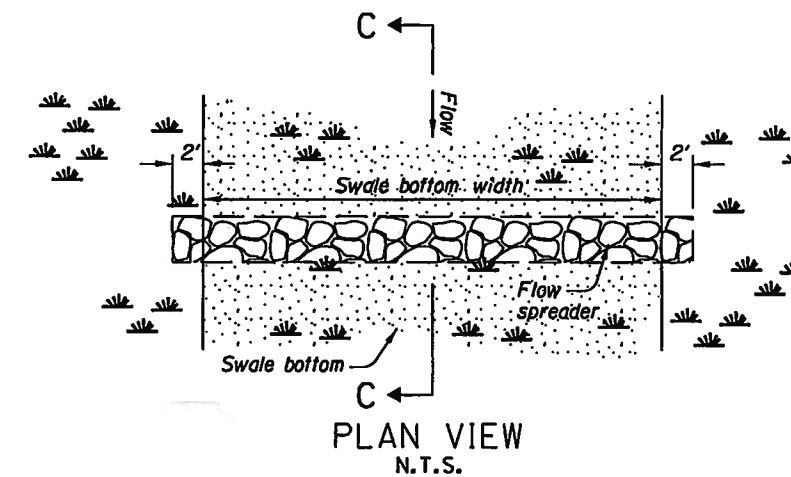


• 3' at 1:6 side slope

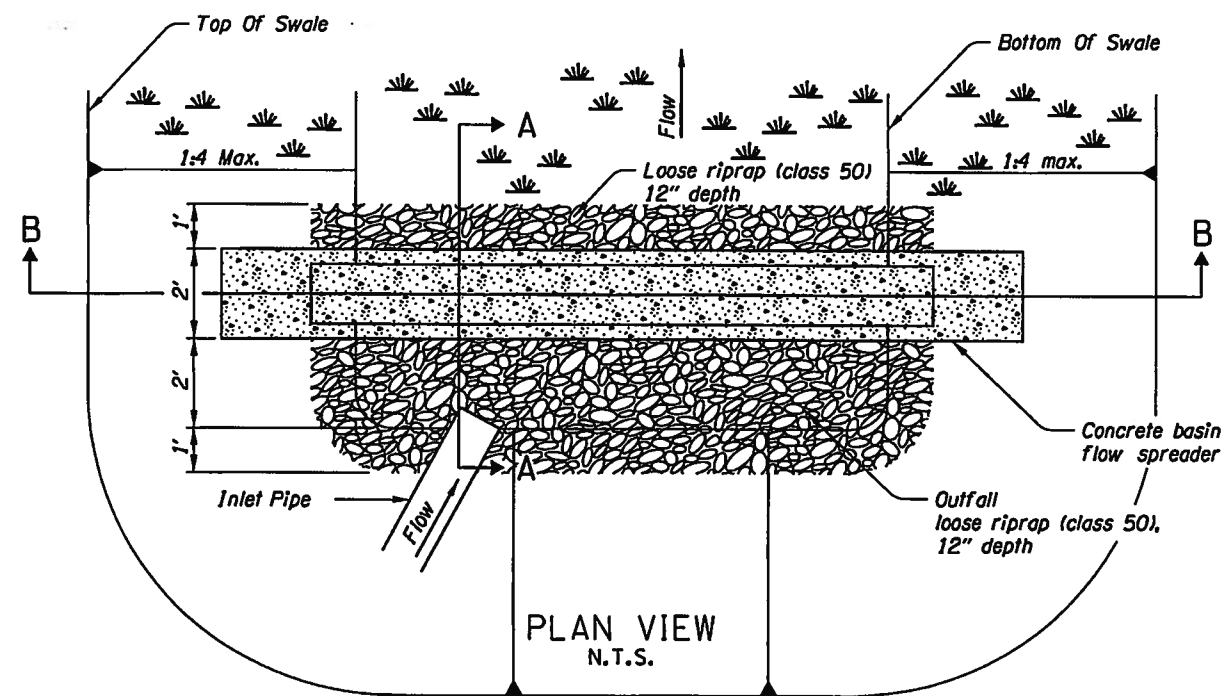


Note: Place 0-15 lb rock gradation as the top layer of the flow spreader.

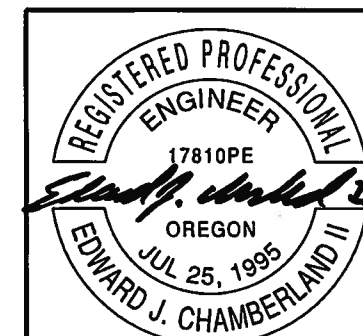
SECTION C-C
N.T.S.



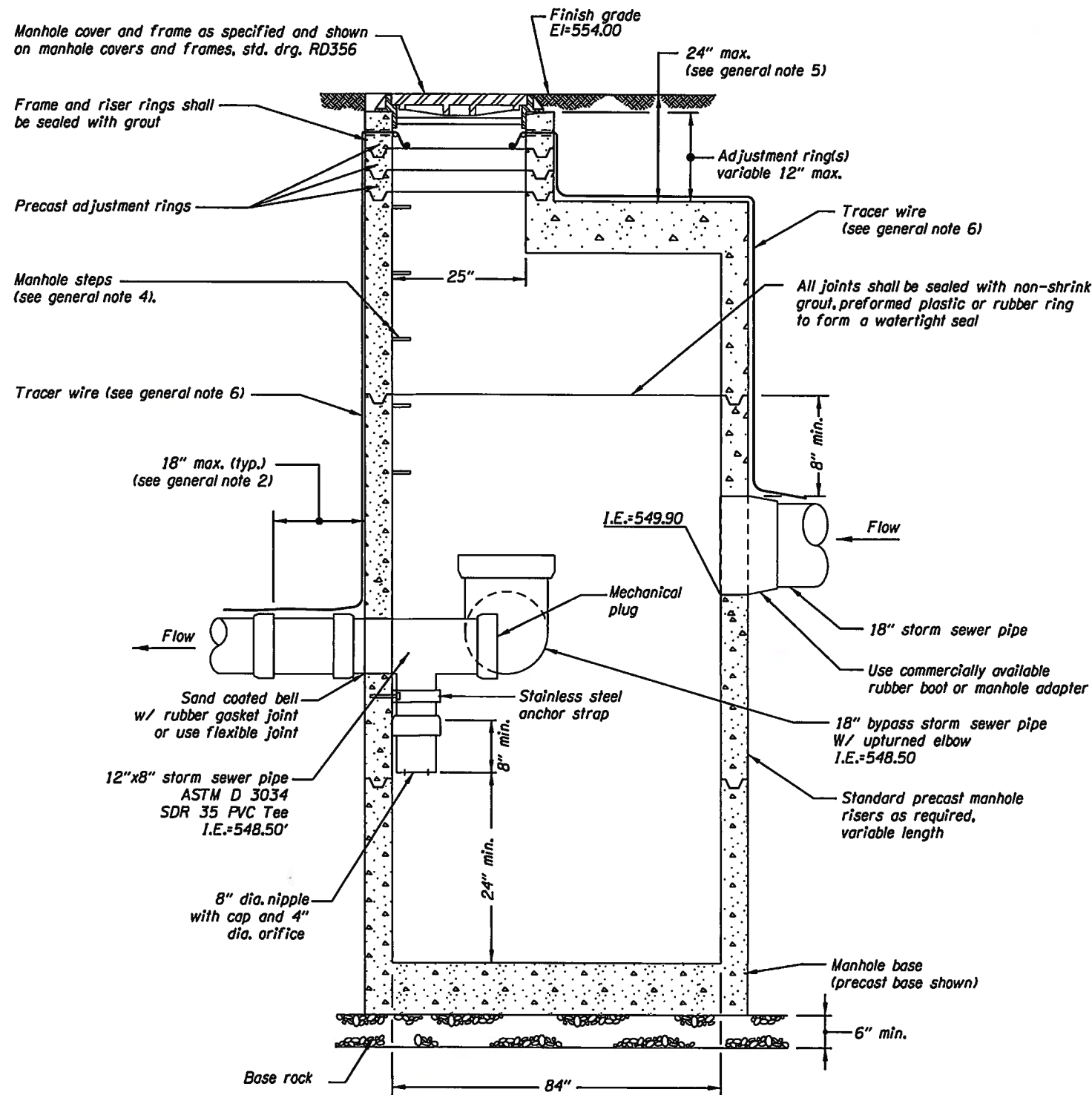
ROCK BASIN FLOW SPREADER



CONCRETE BASIN FLOW SPREADER



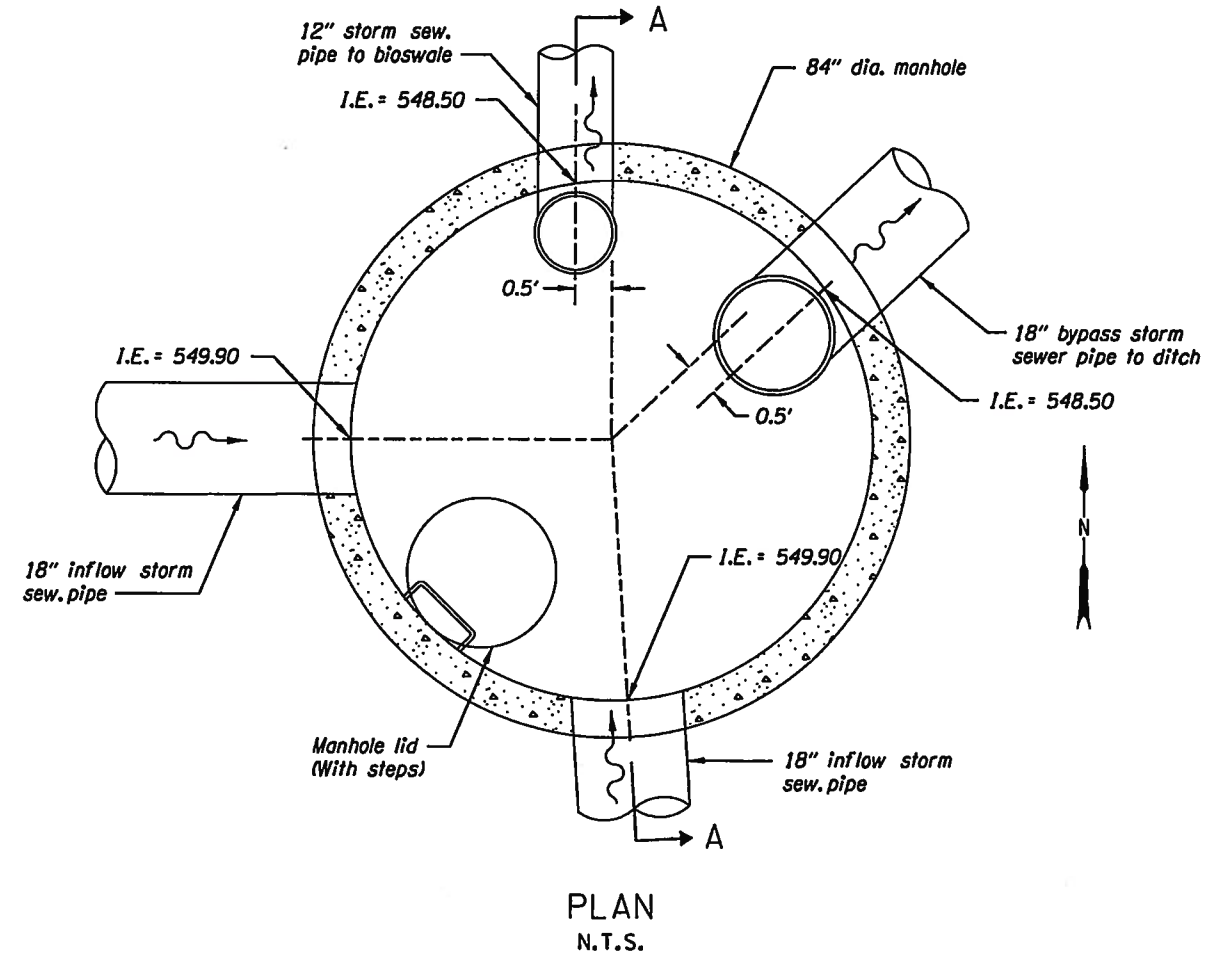
WHPacific	
3470 Pipebend Place NE Ste 170 Salem, OR 97301 t: 503.362.4675 f: 503.362.5078	
OR22 BRIDGE VERTICAL CLEARANCE BRIDGE PROJECTS	
NORTH SANTIAM HIGHWAY MARION COUNTY	
Design Team Leader - Ed Chamberland Designed By - Travis Sater Drafted By - Linda Foote	
STORMWATER DETAILS	SHEET NO. GJ-2



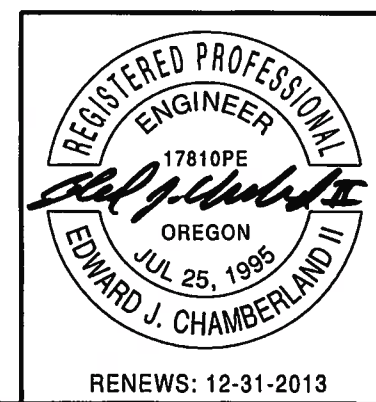
SECTION A-A
N.T.S.

MANHOLE DIVERSION 84" DIA.
AT 72nd AVE
N.T.S.

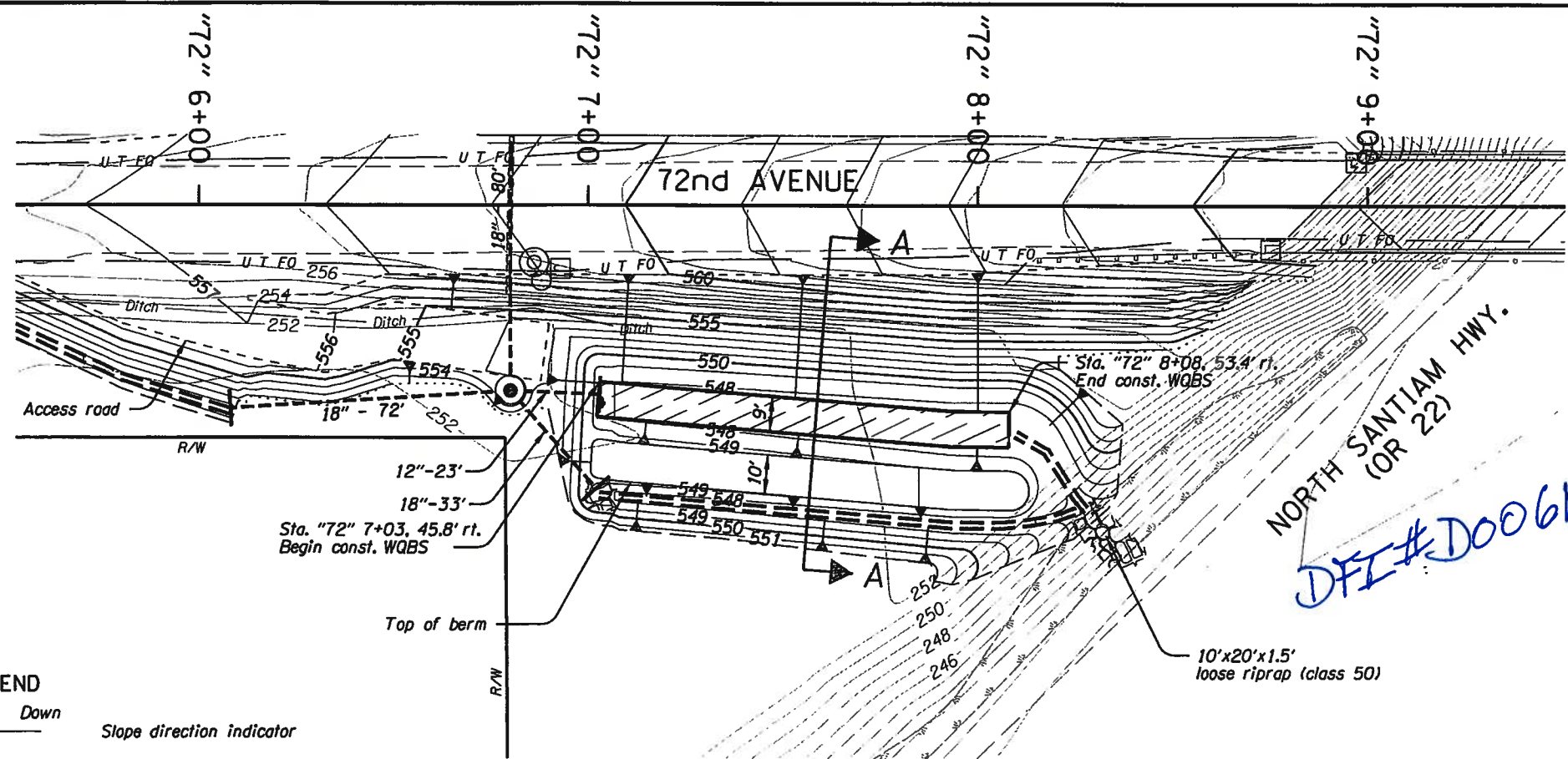
Sta. "72" 6+80, 48' Rt.
See sht. 18, note 5



- GENERAL NOTES FOR ALL DETAILS:
1. All precast sections shall conform to requirements of ASTM C478.
 2. All connecting pipes shall have a flexible, gasketed, and unrestrained joint within 18" of manhole wall.
 3. See std. drg. RD344 for manhole base section.
 4. See std. drg. RD336 for manhole steps details and flat-top slab orientation.
 5. Adjust 24" max.
 6. See std. drg. RD336 for tracer wire details.

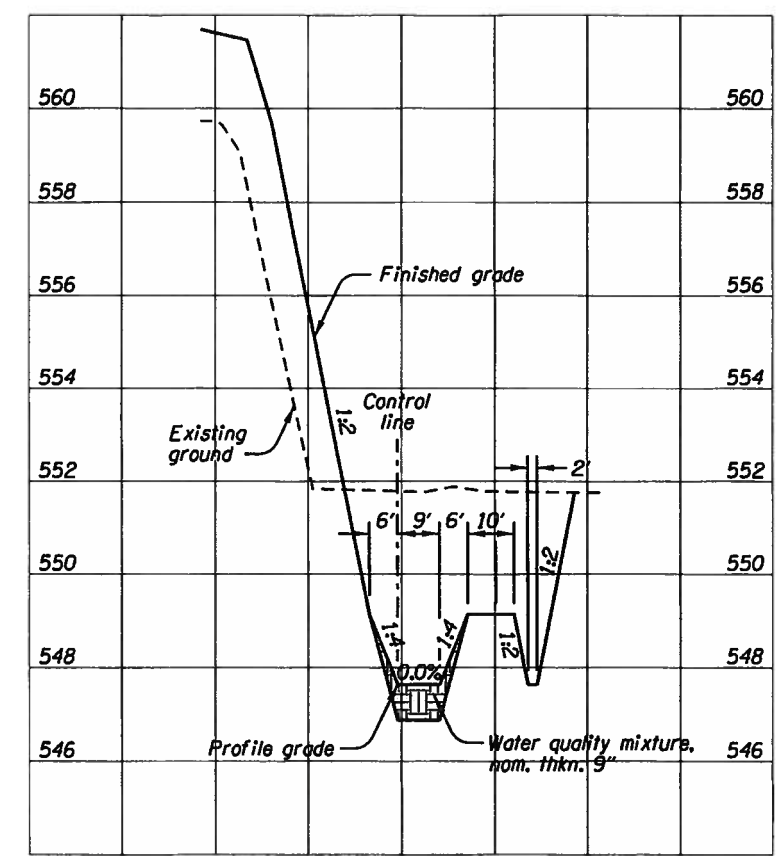
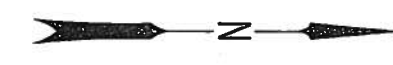


<p>OREGON DEPARTMENT OF TRANSPORTATION</p>	
<p>WHPacific 3470 Pipebend Place NE Ste 170 Salem, OR 97301 t: 503.362.4675 f: 503.362.5078</p>	
<p>OR22 BRIDGE VERTICAL CLEARANCE BRIDGE PROJECTS</p> <p>NORTH SANTIAM HIGHWAY MARION COUNTY</p>	
<p>Design Team Leader - Ed Chamberland Designed By - Travis Sater Drafted By - Linda Foote</p>	
<p>STORMWATER DETAILS</p>	<p>SHEET NO. GJ-4</p>

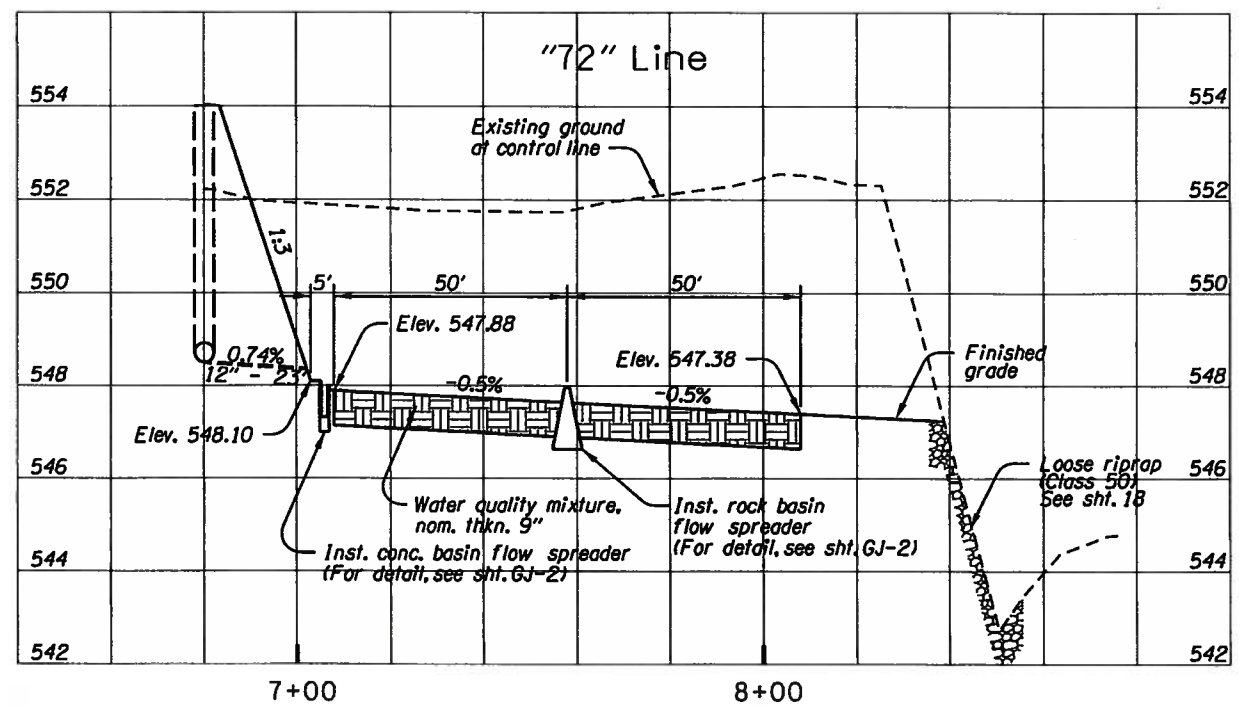


LEGEND
 Up Down
 Slope direction indicator

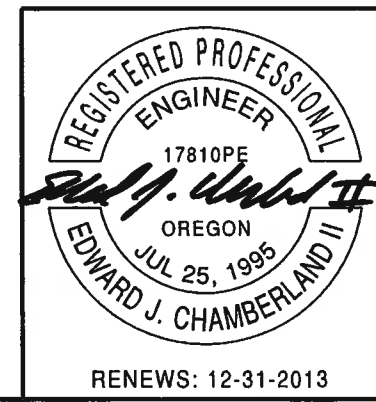
WATER QUALITY BIOFILTRATION SWALE (WQBS)
 SCALE: 1"=40'



SECTION A-A
 SCALE: 1"=40'



WQBS PROFILE
 SCALE: 1"=40'



RENEWS: 12-31-2013

OREGON DEPARTMENT OF TRANSPORTATION

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 Salem, OR 97301
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**OR22 BRIDGE VERTICAL CLEARANCE
 BRIDGE PROJECTS**

**NORTH SANTIAM HIGHWAY
 MARION COUNTY**

Design Team Leader - Ed Chamberland
 Designed By - Travis Sater
 Drafted By - Linda Foote

STORMWATER DETAILS SHEET NO. **GJ-10**