OPERATION & MAINTENANCE MANUAL

Manual prepared: August 2017

DFI No. D00522

Figure 1: DFI No. D00522, looking southeast

1. Identification

Drainage Facility ID (DFI):	D00522
Facility Type:	Water Quality Biofiltration Swale
Construction Drawings:	(V-File Numbers) 42V-165
Location:	District: 11
	Highway No.: 431
	Mile Post: 21.01 to 21.08, right side

2. Manual Purpose

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

3. 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.

Flow direction: southeast

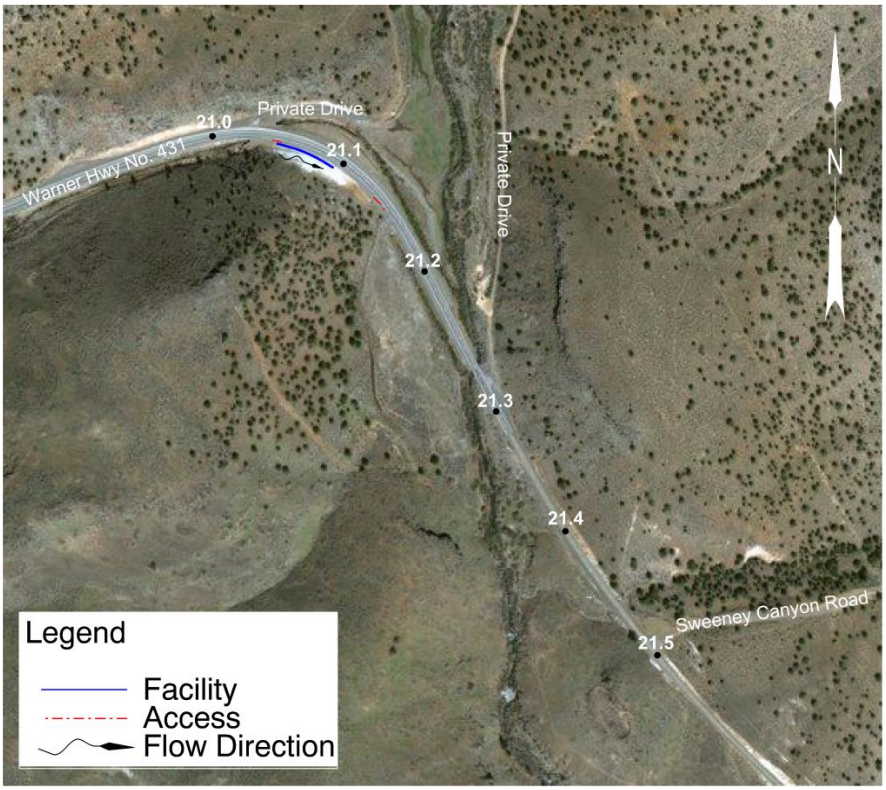


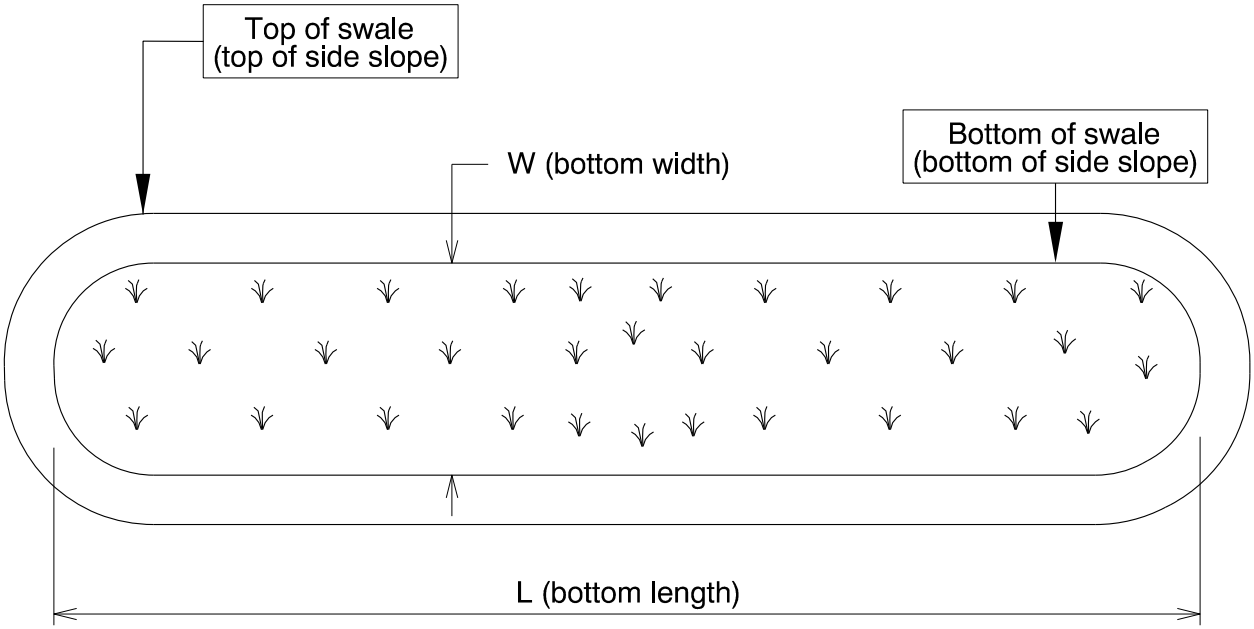
Figure 2: Facility location map

4. 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:

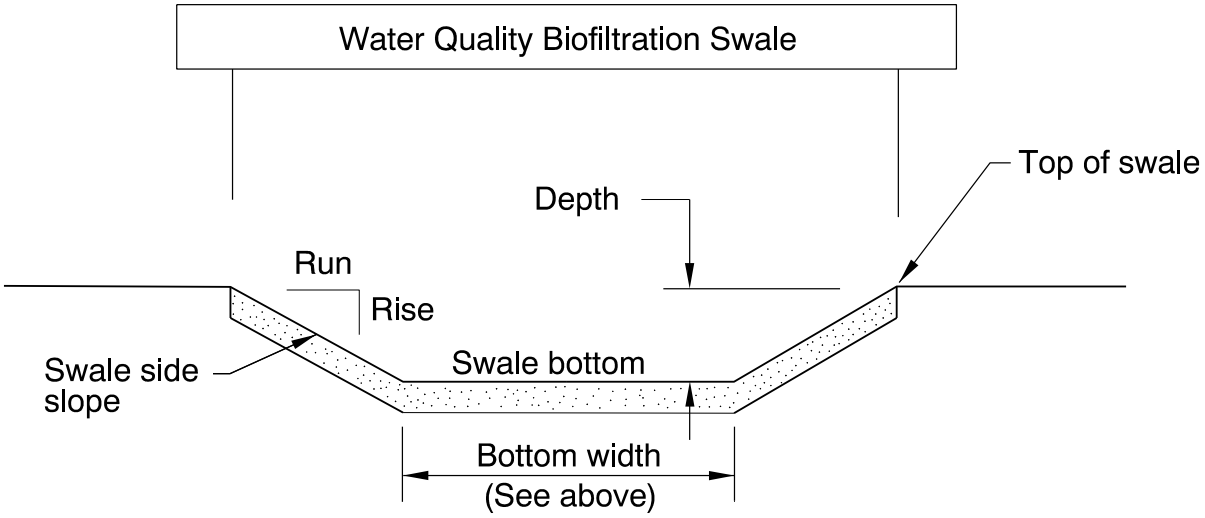
Bottom Length (feet)	Bottom Width (feet)
315	4



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)
5	1	4



Site Specific Information: This facility uses a blended compost and topsoil mixture on the sides and bottom of the swale. The mixture is covered by a gravel drainage blanket across the bottom of the swale. A total of 8 riprap flow spreaders in 50-foot intervals are distributed along the water flow path in the swale. The swale receives flow from pavement sheet flow off of highway 431 and the drainage curb installed along the right side of highway 431. The treated runoff exits the facility via a roadside ditch. An 18" culvert crosses under highway 431, and is connected to an irrigation ditch on the left side of the highway. This is not part of the facility.

5. Facility Access

Maintenance access to the facility:

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

Figure 3: Facility access—west roadside shoulder and east roadside pad

6. 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: riprap flow spreaders	☒	**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**

7. 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

8. 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. 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.

9. 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

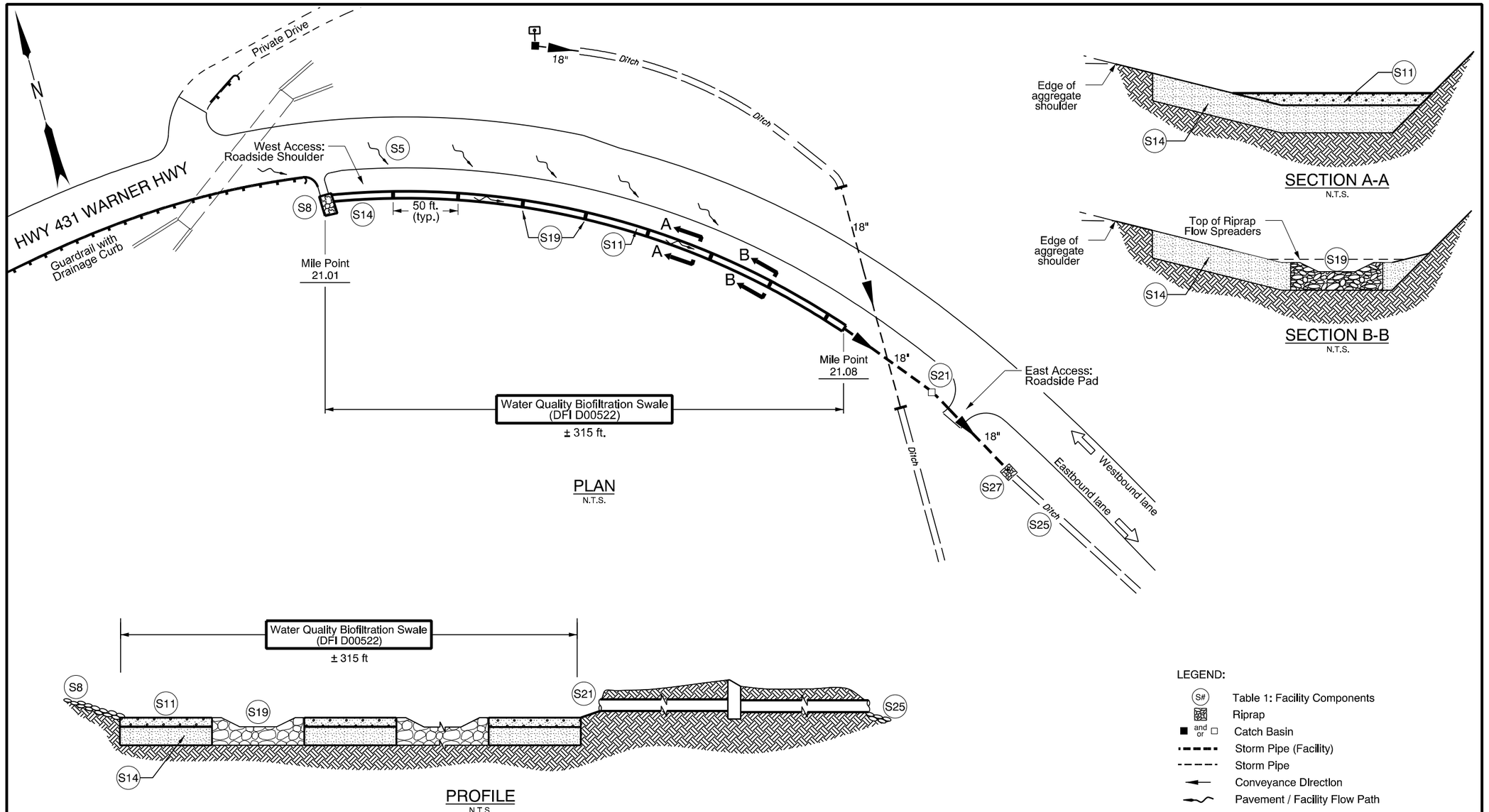
Contact any of the following for more detailed information about management of waste materials found on site:

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 D00522


N
Private Drive
HWY 431 WARNER HWY
Guardrail with Drainage Curb
West Access: Roadside Shoulder
S5
S8
S14
50 ft. (typ.)
S19
S11
A
A
B
B
Mile Point 21.01
Mile Point 21.08
18"
Ditch
Ditch
18"
18"
S21
East Access: Roadside Pad
Water Quality Biofiltration Swale (DFI D00522)
± 315 ft.
Ditch
18"
S27
Eastbound lane
Westbound lane
Ditch
S25
PLAN
N.T.S.
Edge of aggregate shoulder
S11
S14
SECTION A-A
N.T.S.
Edge of aggregate shoulder
Top of Riprap Flow Spreaders
S19
S14
SECTION B-B
N.T.S.
Water Quality Biofiltration Swale (DFI D00522)
± 315 ft
S8
S11
S19
S21
S25
S14
PROFILE
N.T.S.
LEGEND:
S# Table 1: Facility Components
Riprap
■ and/or □ Catch Basin
Storm Pipe (Facility)
Storm Pipe
Conveyance Direction
Pavement / Facility Flow Path
OREGON DEPARTMENT OF TRANSPORTATION
Prepared By: Amory Cervarich
Drafted By: Amory Cervarich
DFI D00522
MAINTENANCE DISTRICT 11 HWY 431
WATER QUALITY BIOFILTRATION SWALE
HIGHWAY MP 21.01 - 21.08
LAKE COUNTY
DFI_D00522.dgn

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B Appendix B – Project Contract Plans

Contents:

Site Specific Subset of Project Contract Plan 42V-165

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Contract Plans
42V-165

INDEX OF SHEETS	
SHEET NO.	DESCRIPTION
1	*Title Sheet*
1A	*Index Of Sheets Cont'd. & Std. Drg. Nos.*
1B	*Survey Control Data*

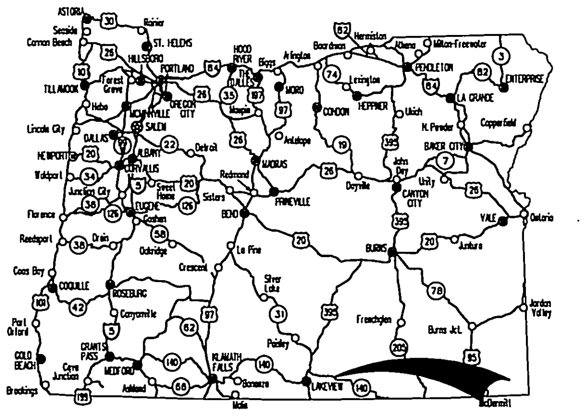
STATE OF OREGON
DEPARTMENT OF TRANSPORTATION
PLANS FOR PROPOSED PROJECT

GRADING, DRAINAGE, STRUCTURE & PAVING

OR140: WARNER HIGHWAY CURVE CORRECTION (M.P. 21) SEC.

WARNER HIGHWAY

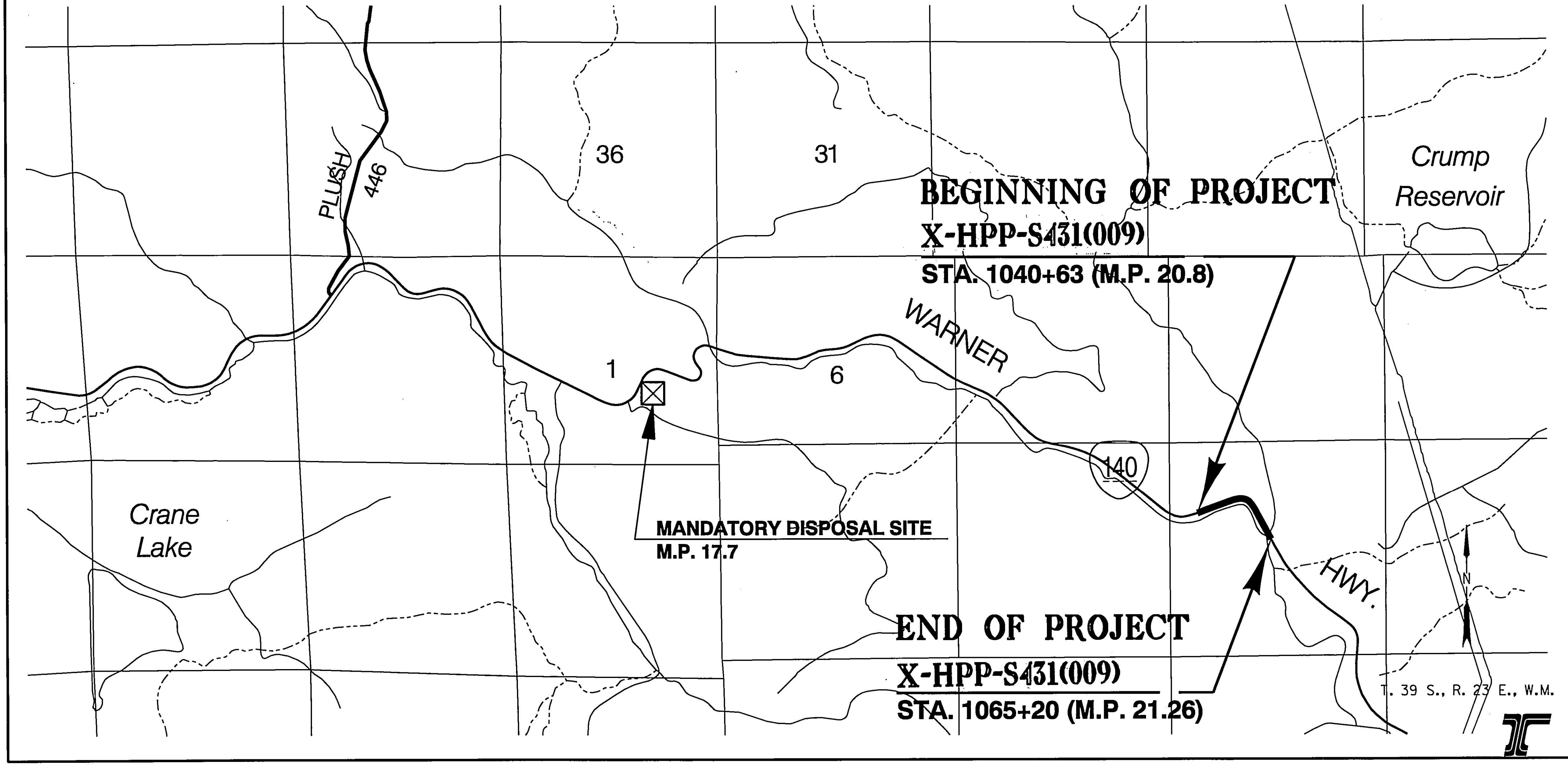
LAKE COUNTY
SEPTEMBER 2009



Overall Length Of Project – 0.46 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.)

LET'S ALL
WORK TOGETHER
TO MAKE THIS
JOB SAFE



OREGON TRANSPORTATION COMMISSION

Gail Achterman	CHAIR
Michael Nelson	VICE-CHAIR
Janice Wilson	COMMISSIONER
Alan Brown	COMMISSIONER
David Lohman	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: Jon W. Heacock 7-21-09
Signature & date

Jon Heacock, Region 4 TCM
Print name and title

Concurrence by ODOT Chief Engineer

OR140: WARNER HIGHWAY
CURVE CORRECTION (M.P. 21) SEC.
WARNER HIGHWAY
LAKE COUNTY

FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	X-HPP-S431 (009)	1

1:1200 - 001

PE001377 000

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INDEX OF SHEETS, CONT'D.

SHEET NO.	DESCRIPTION
2 Thru 2A-8 Incl.	Typical Sections
2B Thru 2B-5 Incl.	Details
2C Thru 2C-11	Traffic Control Plans
2D	Pipe Data Sheet
3 Thru 5A Incl.	General Construction & Profiles
	GEO/HYDRO/ENVIRO
GA Thru GA-3 Incl.	Erosion Control
GB	Geotechnical Data
GE Thru GE-2 Incl.	Parsnip CR Culvert
GF	Fish Passage Details
GG & GG-2	Temporary Water Management Plan
GG-3	Temporary Water Management Details
⚠1 GH Thru GH-3 Incl.	Wetland & Waterway Protection Plan
GJ	Water Quality Swale Details
GM	Mandatory Disposal Site
GM-2	Mandatory Disposal Site Cross Sections
GP Thru GP-4 Incl.	Waterway Enhancement Details
GX	Irrigation Headgate Details
	BRIDGE
	Structure 03937A
81725	Bridge Rail Replacement
81726	Details on Rail and Approach Roadway Slab
	TRAFFIC
ST	Striping Plan
S-08258	Sign Installation Plan
S-08259	Sign Installation Plan
S-08260	Sign Installation Plan
S-08261	Sign Details
S-08262	Sign And Post Data Table

Standard Drg. Nos.

RD150 - Slope Rounding

RD300 - Trench Backfill, Bedding, Pipe Zone and Multiple Installations
RD317 - Culvert Embankment Protection
RD322 - Safety End Section Metal Pipe
RD324 - Safety End Section Concrete Pipe
RD326 - Coupling Bands for Corrugated Metal Pipe
RD336 - Standard Storm Sewer Manhole
RD364 - Concrete Inlets Type G-1, G-2, G-2M, & G-2MA
RD380 - Aluminum & Steel Corrugated Pipe Fill Height Tables
RD386 - Circular Concrete Pipe Fill Height Table
RD390 - Fill Height Table for HDPE Pipe

RD400 - Guardrail and Metal Median Barrier
RD405 - Guardrail and Metal Median Barrier Parts
RD410 - Guardrail Parts (Thrie Beam)
RD415 - Guardrail and Metal Median Barrier Parts
RD420 - Energy Absorbing Terminal
RD440 - Guardrail Installation at Bridge Ends
RD450 - Guardrail Anchors (Steel)
RD470 - Guardrail Over Low-Fill Culverts

RD610 - Asphalt Pavement Details

RD700 - Curbs
RD715 - Approaches and Non-Sidewalk Driveways

RD810 - Barbed and Woven Wire Fences

RD1000 - Construction Entrances
RD1005 - Check Dams
RD1035 - Sediment Barrier (Type 3)
RD1040 - Sediment Fence, Supported Sediment Fence, Unsupported

Standard Drg. Nos.

TM200 - Sign Installation Details
TM201 - Miscellaneous Sign Placement Details
TM204 - Flag Board Mounting Detail
TM222 - Installation Details Milepost Marker Posts

TM500 - Pavement Marking Standard Detail Blocks
TM560 - Alignment Layout: General
TM570 - Traffic Delineators
TM571 - Traffic Delineators Steel Post Details

TM670 - Wood Post Sign Supports
TM671 - 3 Second Gust Wind Speed Isotach

TM800 - Tables, Abrupt Edge, and PCMS Details
TM820 - Temporary Barricades
TM821 - Temporary Sign Supports
TM850 - 2-Lane, 2-way Roadways
TM870 - Bridge Construction

BR233 - Thrie-Beam Rail and Transition
BR266 - Modified Type 2A Rail

BR720 - Standard Gravity Retaining Wall Details

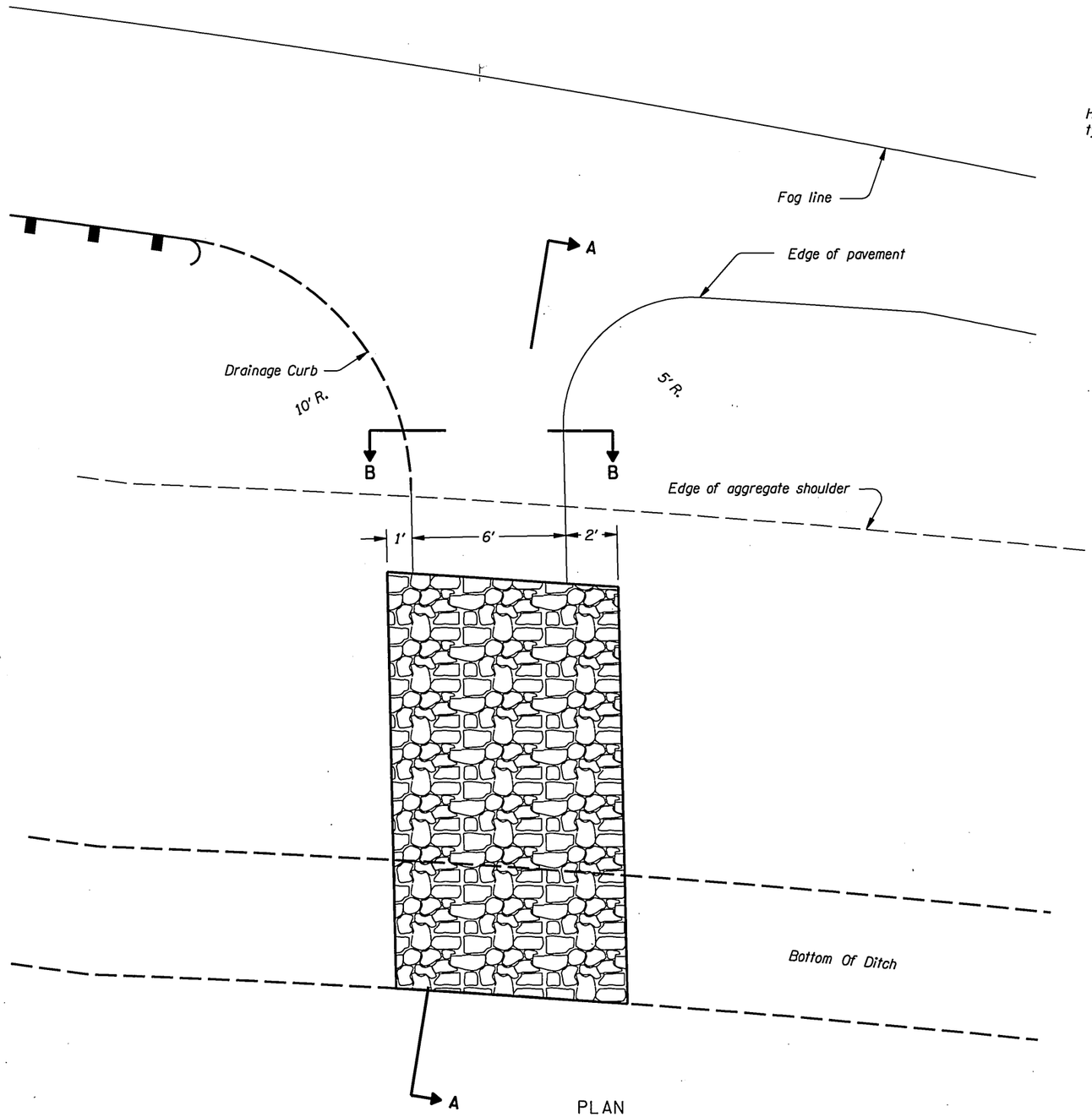
BR800 - Box Culvert Wingwalls Details
BR825 - Cast-in-Place Box Culverts (8'x4', 8'x6', 8'x8')

R/W Map No. 11B-3-6

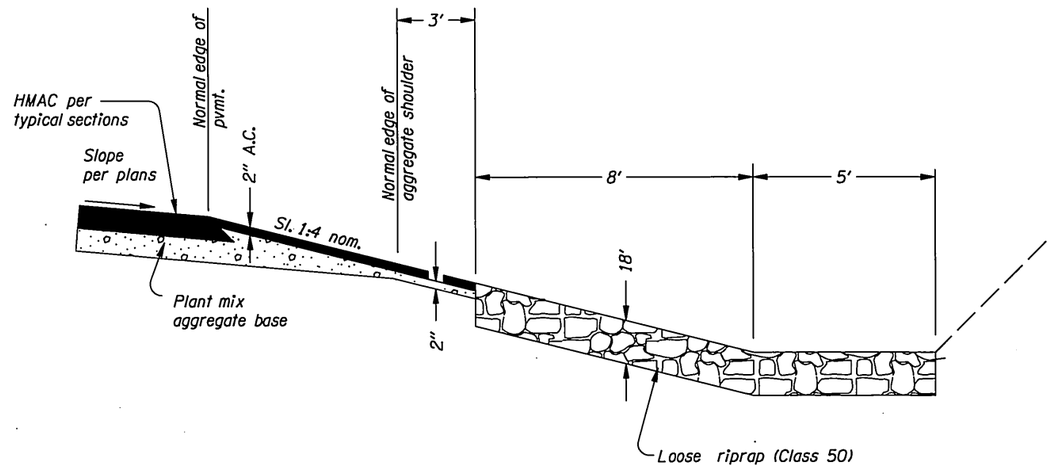
No.	REVISIONS	DATE	BY
⚠1	Added sheets	8-10-09	RWT

OR140: WARNER HIGHWAY
CURVE CORRECTION (M.P. 21) SEC.
WARNER HIGHWAY
LAKE COUNTY

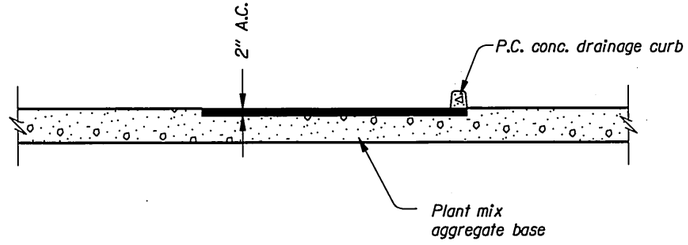
FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	X-HPP-S431(009)	1A



PLAN



SECTION A-A



SECTION B-B

ASPHALT CONCRETE OVERSIDE DRAIN

OREGON DEPARTMENT OF TRANSPORTATION

REGION 4 TECHNICAL CENTER

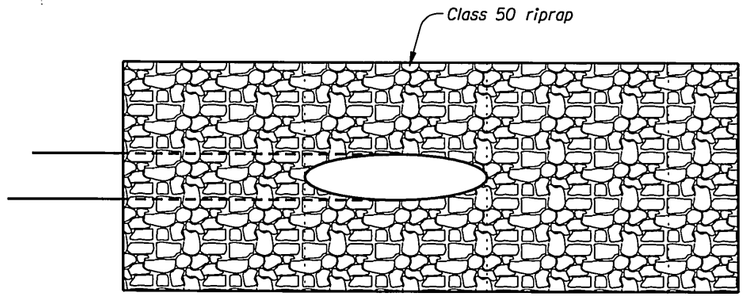
REGISTERED PROFESSIONAL ENGINEER
15-036
OREGON
JULY 25, 1990
RAYMOND W. THWAITS
RENEWS: 6-30-10

OR140: WARNER HIGHWAY
CURVE CORRECTION (M.P. 21) SEC.
WARNER HIGHWAY
LAKE COUNTY

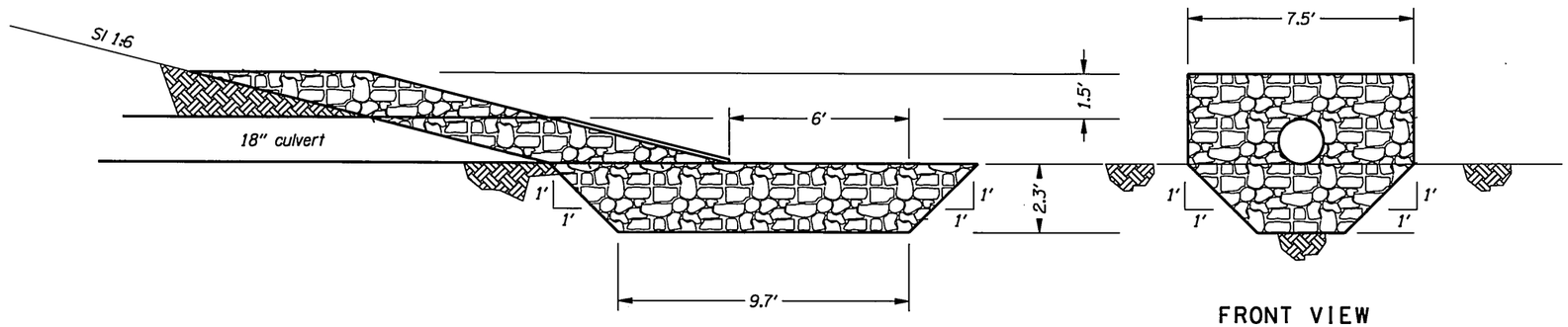
Designed By - Raymond W. Thwaits
Drafted By - Joseph J. Rodriguez

DETAILS

SHEET NO. 2B



PLAN VIEW



SIDE VIEW

FRONT VIEW

(See RD317 for details not shown)

RIPRAP PAD

REGISTERED PROFESSIONAL ENGINEER
15436
OREGON
JULY 25, 1990
RAYMOND W. THWAITS
RENEWS: 6-30-10

OREGON DEPARTMENT OF TRANSPORTATION

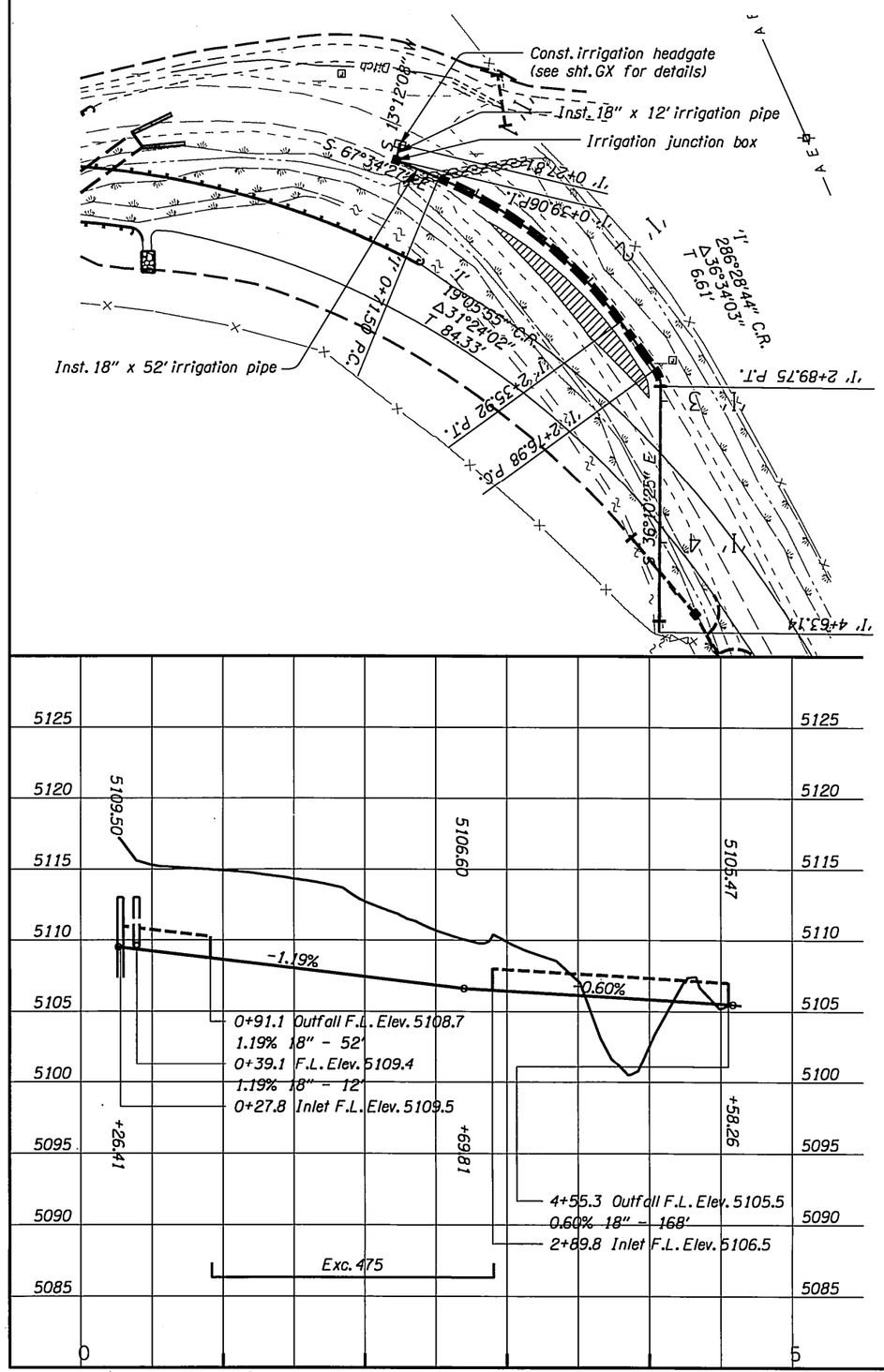
REGION 4 TECHNICAL CENTER

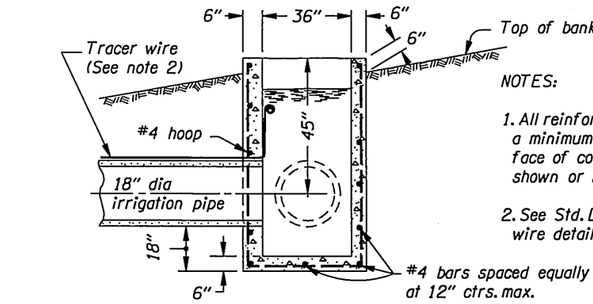
OR140: WARNER HIGHWAY
CURVE CORRECTION (M.P. 21) SEC.
WARNER HIGHWAY
LAKE COUNTY

Designed By - Raymond W. Thwaits
Drafted By - Joseph J. Rodriguez

DETAILS

SHEET NO. 2B-4

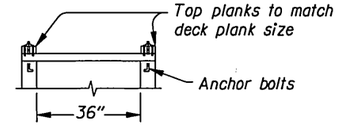




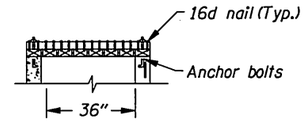
SECTION A-A

NOTES:

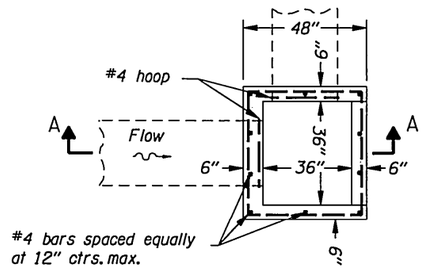
1. All reinforcement to be placed a minimum of 2" clear of nearest face of concrete unless otherwise shown or noted.
2. See Std. Drg. RD336 for tracer wire details.



END VIEW

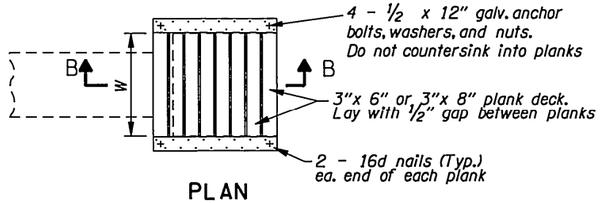


SECTION B-B



PLAN
JUNCTION BOX

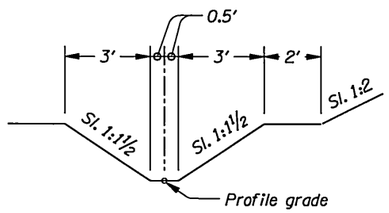
NOTE:
All reinforcement to be #4 bars at 12" ctrs. max.



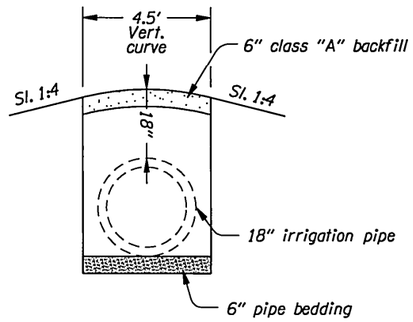
PLAN
JUNCTION BOX COVER

NOTE: All wood shall be pressure treated.

CONCRETE IRRIGATION BOX AND COVER



STA. "IR" 0+91.1 To STA. "IR" 2+89.8



STA. "IR" 3+92 To STA. "IR" 4+55.3

REGISTERED PROFESSIONAL ENGINEER
15,030
OREGON
JULY 25, 1990
RAYMOND W. THWAITS
RENEWS: 6-30-10

OREGON DEPARTMENT OF TRANSPORTATION

REGION 4 TECHNICAL CENTER

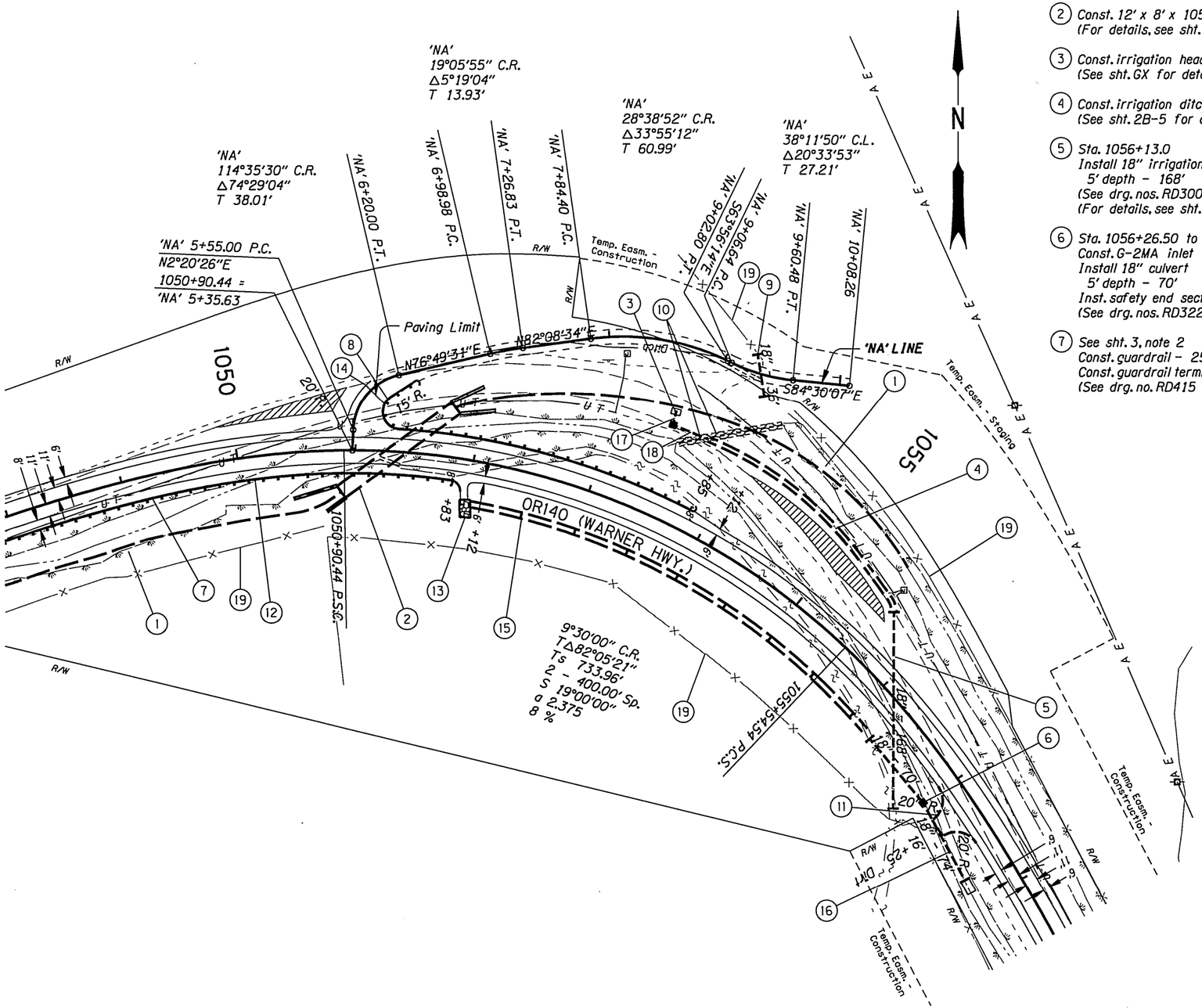
OR140: WARNER HIGHWAY
CURVE CORRECTION (M.P. 21) SEC.
WARNER HIGHWAY
LAKE COUNTY

Designed By - Raymond W. Thwaits
Drafted By - Joseph J. Rodriguez

DETAILS

SHEET NO. 2B-5

Sec. 9, T. 39 S., R. 23 E., W.M.



1. Const. channel change
(For details, see shts. GP thru GP-4)

2. Const. 12' x 8' x 105' box culvert
(For details, see sht. GE thru GE-2 & GF)

3. Const. irrigation headgate
(See sht. GX for details)

4. Const. irrigation ditch
(See sht. 2B-5 for details)

5. Sta. 1056+13.0
Install 18" irrigation pipe
5' depth - 168'
(See drg. nos. RD300, RD326, RD380 & RD386)
(For details, see sht. 2B-5)

6. Sta. 1056+26.50 to Sta. 1056+99.70, Rt.
Const. G-2MA inlet
Install 18" culvert
5' depth - 70'
Inst. safety end section
(See drg. nos. RD322, RD324 & RD364)

7. See sht. 3, note 2
Const. guardrail - 25' (Type 2A mod.)
Const. guardrail terminal, non-flared test level 3
(See drg. no. RD415 & BR266)

8. Sta. 1051+20.5 to Sta. 1053+90.1, Lt.
Const. guardrail - 250' (Type 2A)
Const. weakpost w-beam guardrail radius - 37.5'
Const. type 1 mod guardrail anchor
Const. type 5 guardrail anchor
Inst. type 'C' end piece
Weatherized rail
Const. guardrail terminal, non-flared test level 3
(For details, see sht. 2B-2 & 2B-3)
(See drg. no. RD450)

9. Sta. 'NA' 9+32.8
Inst. 18" culv. pipe - 36'
5' depth

10. Remove extg. pipe - 2

11. Sta. 1057+25, Rt.
Const. approach
1:6 fill slopes
(See drg. no. RD715)

12. See sht. 3, note 3
Const. P.C. conc. drainage curb

13. Sta. 1051+96
Const. A.C. overside drain
Loose riprap class 50 6.5 cu. yd.
(For details, see sht. 2B)

14. Const. approach

15. Sta. 1052+07 to Sta. 1055+60, Rt.
Const. water quality swale
(For details, see sht. GJ)

16. Sta. 1056+99.70 to Sta. 1057+76.10, Rt.
Inst. 18" culvert
5' depth - 74'
Inst. safety end section
Const. riprap pad
(For details, see sht. 2B-4)
(See drg. no. RD317)

17. Sta. 'I' 0+27.8 to Sta. 'I' 0+39.1
Inst. 18" irrigation pipe
10' depth - 12'
Const. irrigation jct. box
(For details, see sht. 2B-5)
(See drg. no. RD390)

18. Sta. 'I' 0+39.1 to Sta. 'I' 0+91.1
Inst. 18" irrigation pipe
10' depth - 52'
(For details, see sht. 2B-5)

19. Remove fence

Remove Old Pavement Shown Thus:

REGISTERED PROFESSIONAL ENGINEER
15-036
OREGON
JULY 25, 1990
RAYMOND W. THWAITS
RENEWS: 6-30-10

OREGON DEPARTMENT OF TRANSPORTATION

REGION 4 TECHNICAL CENTER

OR140: WARNER HIGHWAY
CURVE CORRECTION (M.P. 21) SEC.
WARNER HIGHWAY
LAKE COUNTY

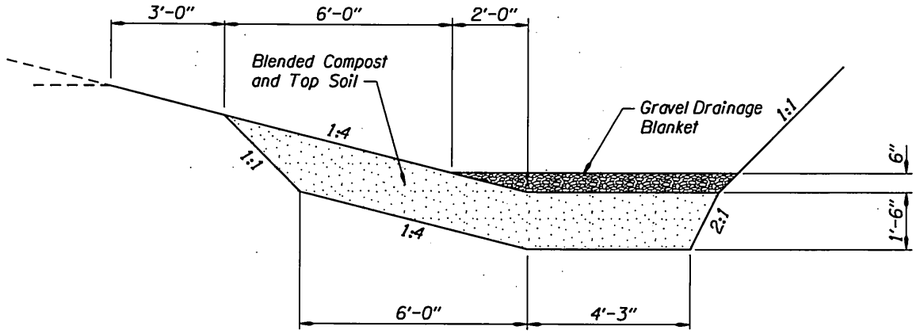
Designed By - Raymond W. Thwaits
Drafted By - Joseph J. Rodriguez

GENERAL CONSTRUCTION

SHEET NO. 4

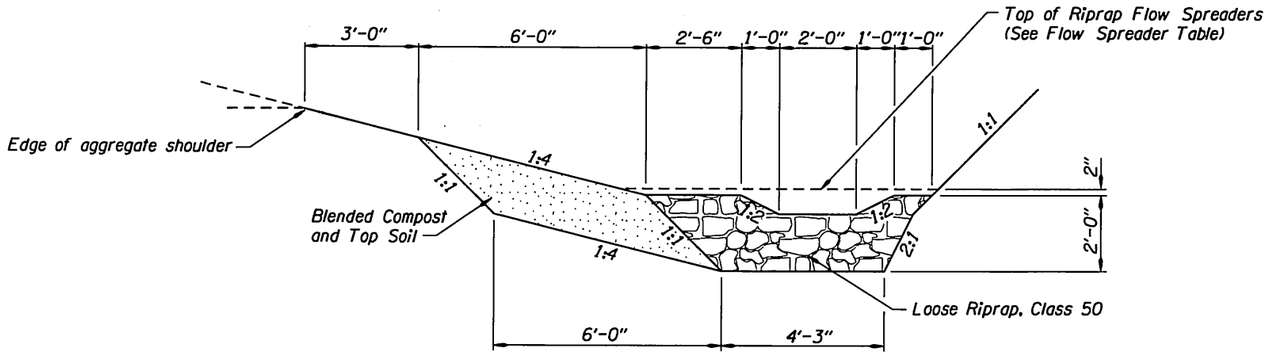
T. 39 S., R. 23 E., Sec. 9., W.M.

42V-165



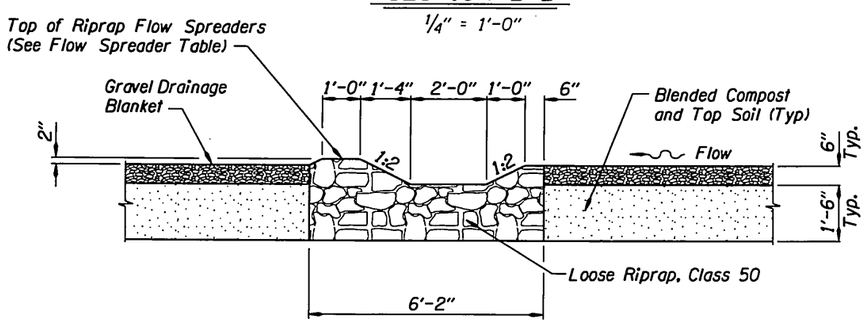
SECTION A-A

1/4" = 1'-0"



SECTION B-B

1/4" = 1'-0"

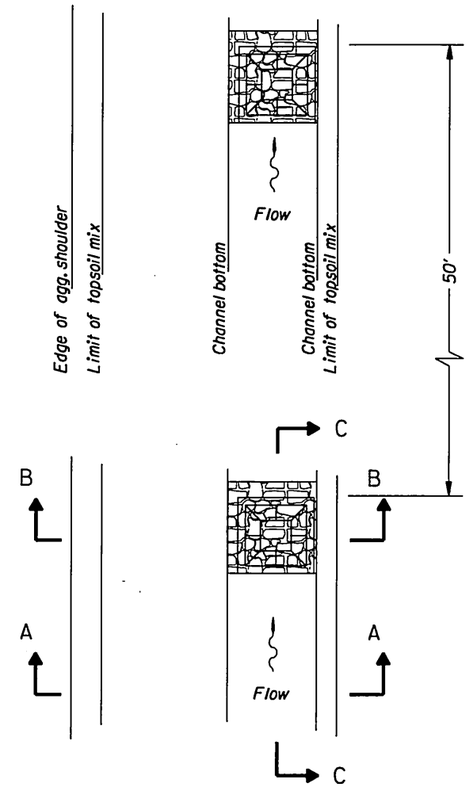


SECTION C-C

1/4" = 1'-0"

FLOW SPREADER TABLE

Station	Top of Riprap Elev.
1052+50	5115.9'
1053+00	5114.7'
1053+50	5113.2'
1054+00	5111.8'
1054+50	5110.4'
1055+00	5108.9'
1055+50	5107.4'
1056+00	5106.0'



PLAN

Stormwater Quality Ditch
with Flow Spreaders and Riprap Basins
(Total - 8)

REGISTERED PROFESSIONAL ENGINEER
56155
OREGON
SEPTEMBER 9, 2003
MICHAEL W. OGDEN

RENEWAL DATE: 12-31-2010

OREGON DEPARTMENT OF TRANSPORTATION

REGION 4 TECHICAL CENTER

OR140: WARNER HIGHWAY
CURVE CORRECTION (M.P. 21) SEC.
WARNER HIGHWAY
LAKE COUNTY

Reviewed By - Michael L. Morris
Designed By - Michael W. Ogden
Drafted By - Joseph Rodriguez/M.L.Graves

WATER QUALITY
SWALE DETAILS

SHEET NO.
GJ