OPERATION & MAINTENANCE MANUAL

Water Quality Biofiltration Swale

Manual prepared: August 2017

DFI No. D00608

Figure 1: DFI No. D00608, looking southwest

1. Identification

Drainage Facility ID (DFI):	D00608
Facility Type:	Water Quality Biofiltration Swale
Construction Drawings:	(V-File Numbers) 45V-34
Location:	District: 3
	Highway No.: 160
	Mile Post: 24.06 to 24.08, 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: southwest

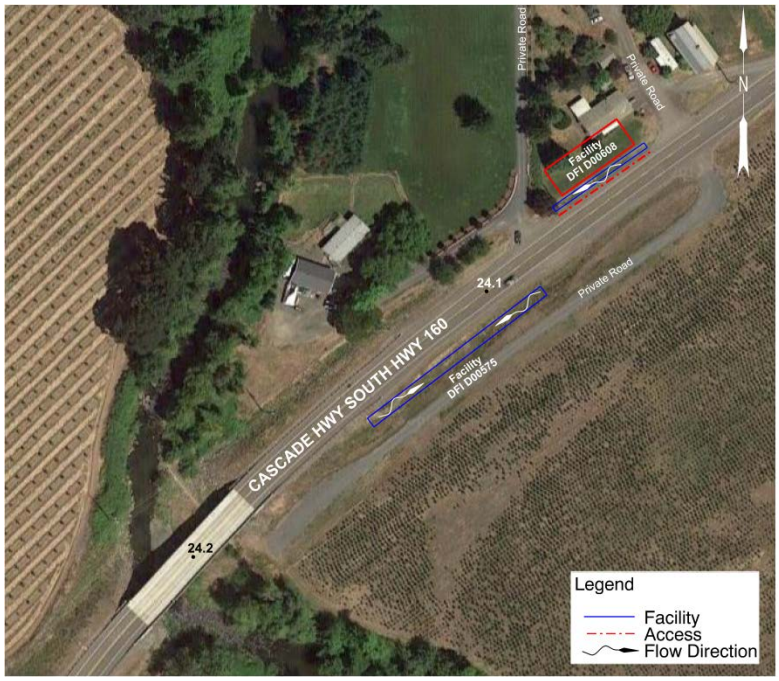


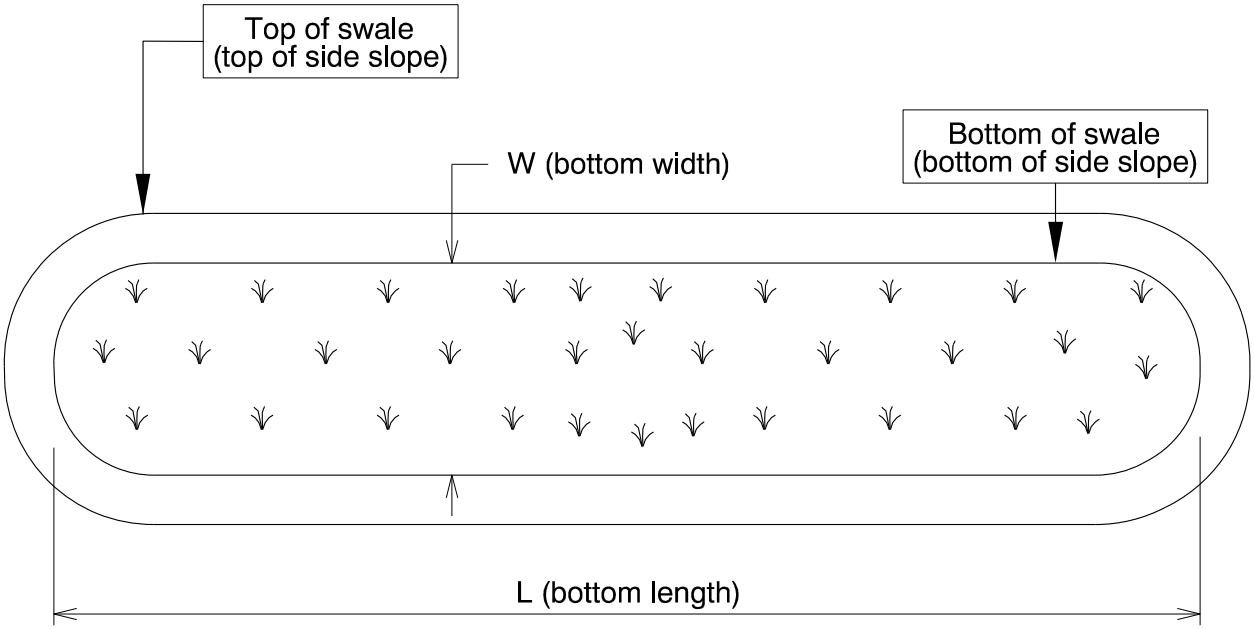
Figure 2: Facility location map

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:

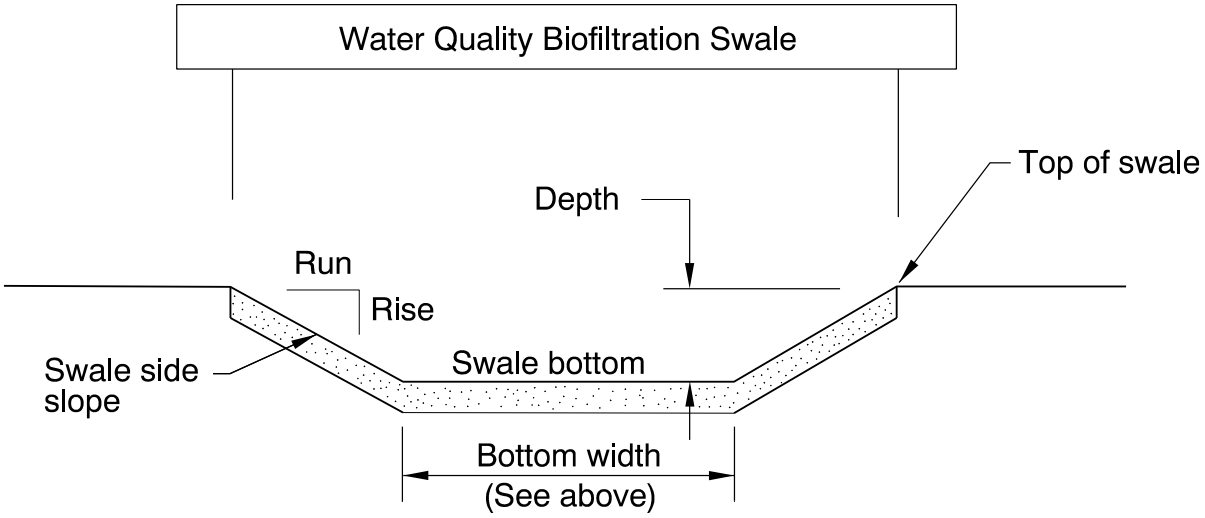
Bottom Length (feet)	Bottom Width (feet)
106	**3**



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	1	4



Site Specific Information: The facility runs parallel to Cascade Highway South (OR 213). Treated stormwater outfalls into Butte Creek. The contract plans indicate that two plastic board flow spreaders were to be installed in the facility. The flow spreaders were not installed.

5. Facility Access

Maintenance access to the facility:

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

Figure 3: Swale footprint looking southwest towards Butte Creek Bridge

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	☐	**S18**
Other	☐	**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

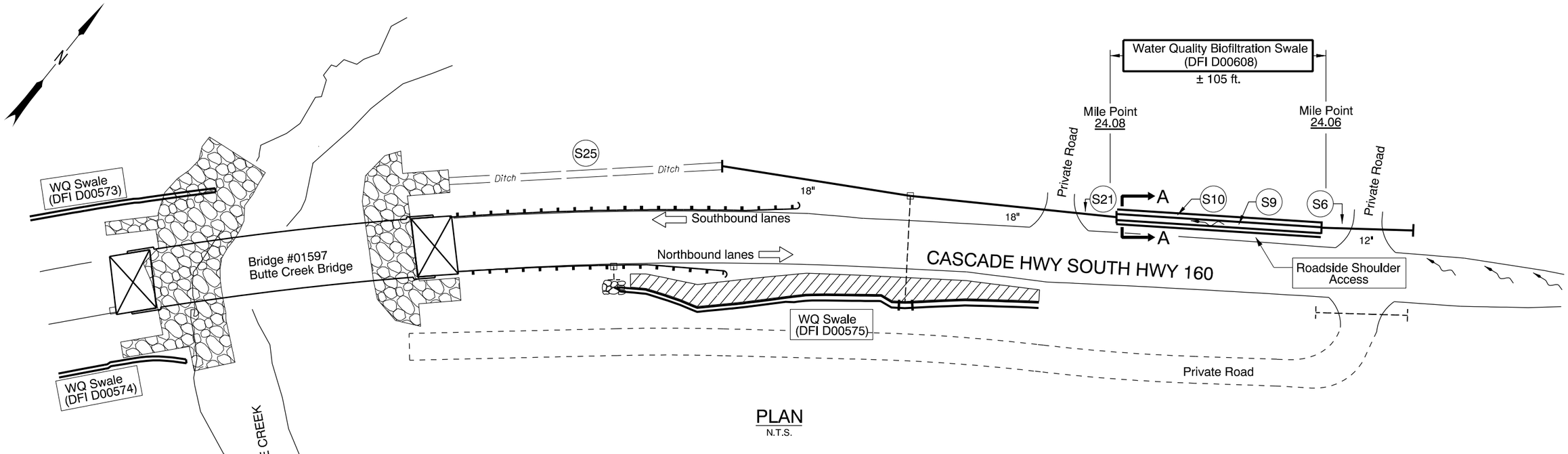
Contact any of the following for more detailed information about management of waste materials found on site:

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

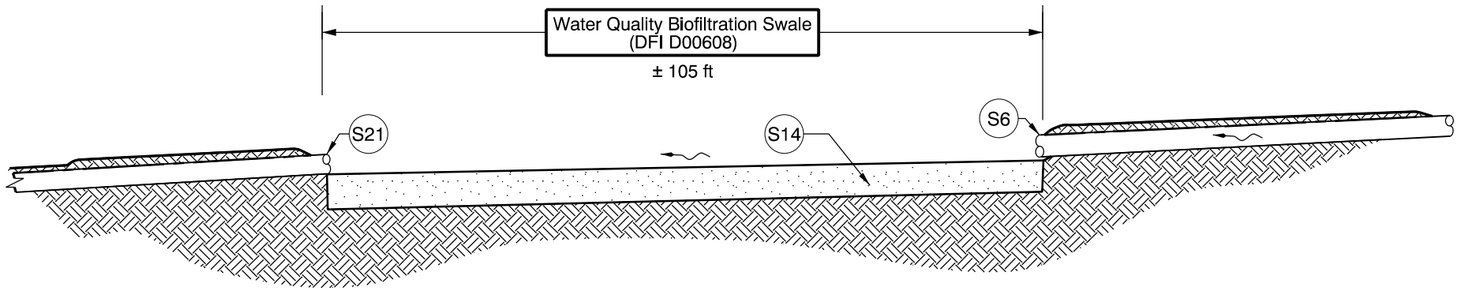
A Appendix A – Site Specific Operational Plan

Contents:

Operational Plan: DFI D00608



PLAN
N.T.S.



PROFILE
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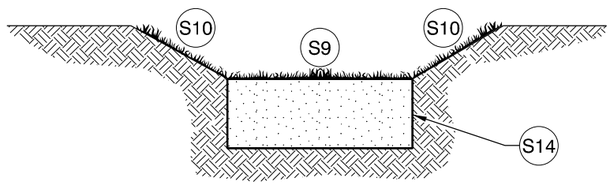


SECTION A-A
N.T.S.

LEGEND:

- S# — Table 1: Facility Components
- and/or — Manhole
- 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 D00608
MAINTENANCE DISTRICT 3 HWY 160
WATER QUALITY BIOFILTRATION SWALE
HIGHWAY MP 24.06 - 24.08
CLACKAMAS COUNTY

DFI_D00608.dgn

B Appendix B – Project Contract Plans

Contents:

Site Specific Subset of Project Contract Plan 45V-34

45V-34

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

STATE OF OREGON

DEPARTMENT OF TRANSPORTATION

PLANS FOR PROPOSED PROJECT

GRADING, STRUCTURE, PAVING & SIGNING

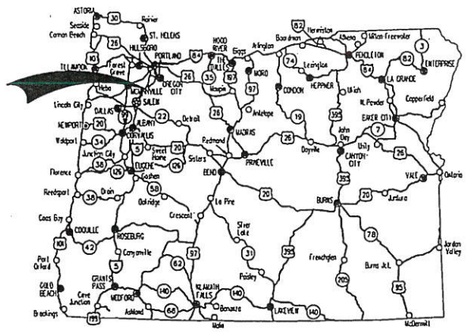
OR213: BUTTE CREEK (JACKS) BRIDGE SEC.

CASCADE HIGHWAY SOUTH

MARION & CLACKAMAS COUNTIES

MAY 2012

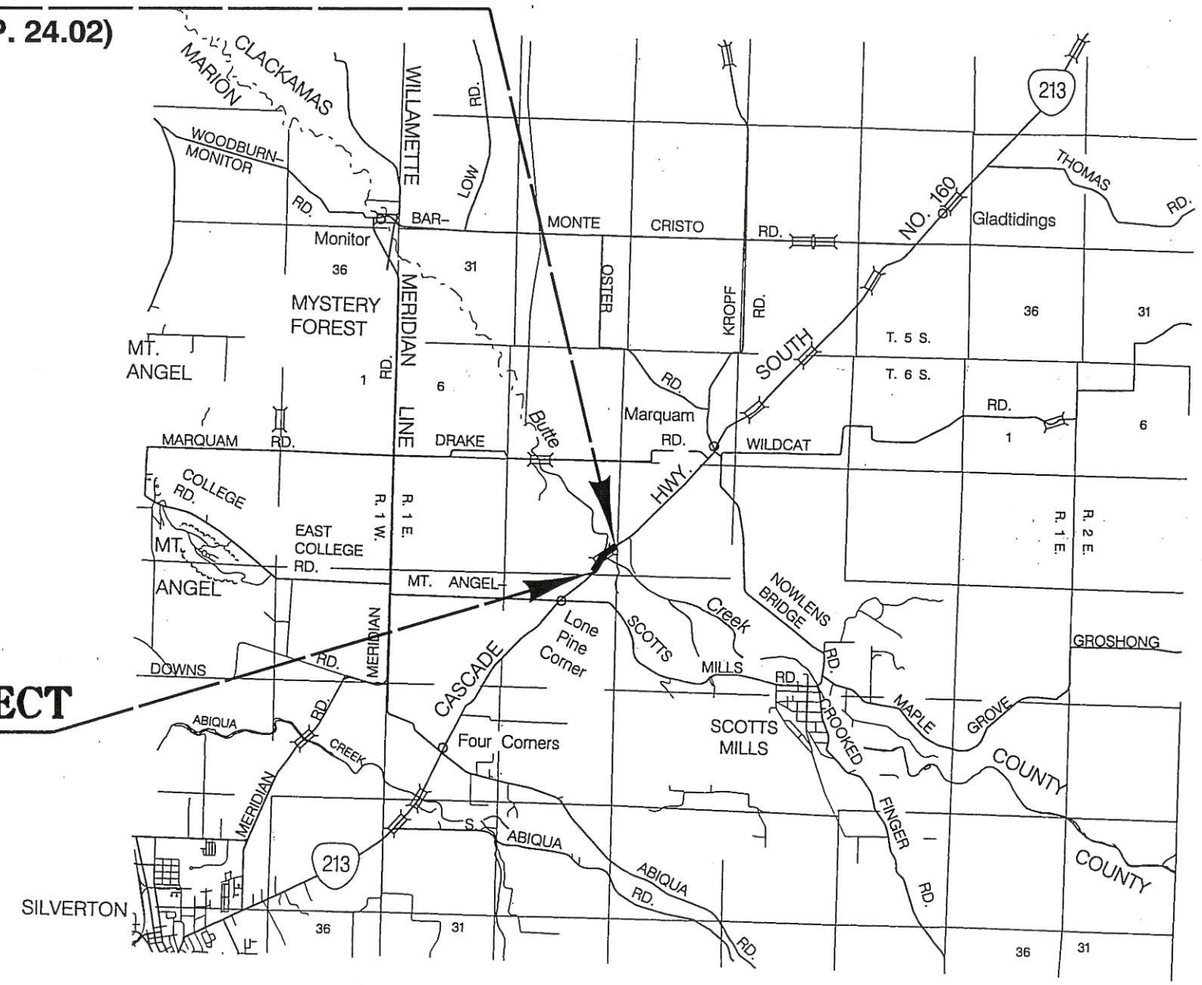
REVISED AS CONSTRUCTED
6/24/14 CONTRACT 14457
PROJ. MGR. Jean Cutt



Overall Length Of Project - 0.38 Miles

BRO-S160(051)
END OF PROJECT
STA. "L"674+50 (M.P. 24.02)

BRO-S160(051)
BEGINNING OF PROJECT
STA. "L"655+50 (M.P. 24.4)



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

Pat Egan	CHAIR
David Lohman	COMMISSIONER
Mary F. Olson	COMMISSIONER
Mark Frohnmayer	COMMISSIONER
Tammy Baney	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.

By: Angela J. Crowell 3/26/12
Signature & date

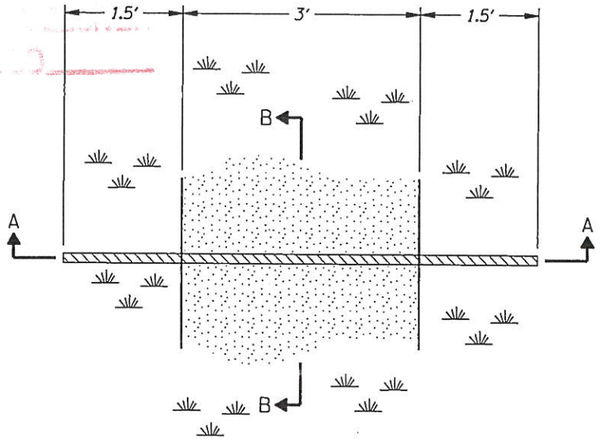
for: Carol A. Cartwright - R2 Tech Center Manager
Print name and title

Concurrence by ODOT Chief Engineer

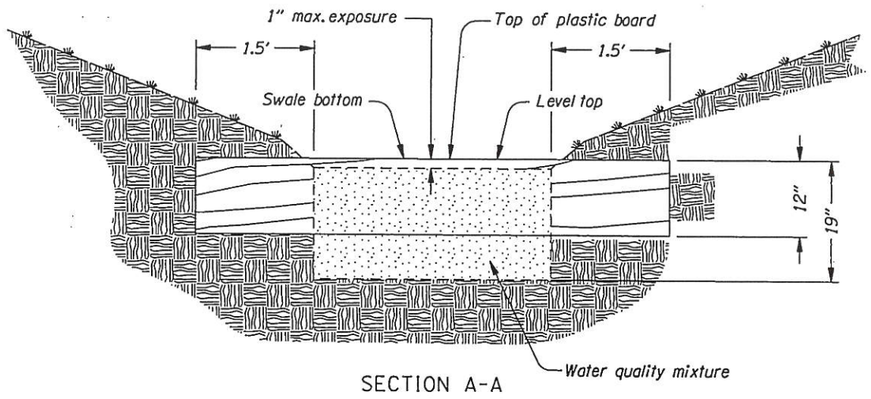
OR213: BUTTE CREEK (JACKS) BRIDGE SEC.
CASCADE HIGHWAY SOUTH
MARION & CLACKAMAS COUNTIES

FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	BRO-S160(051)	1

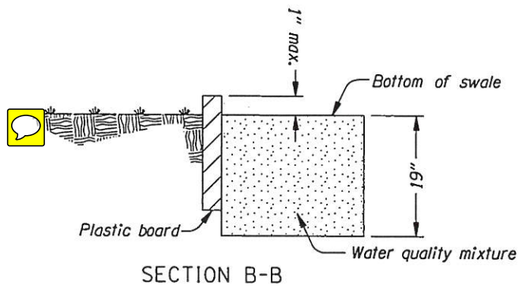
PE001452



PLAN

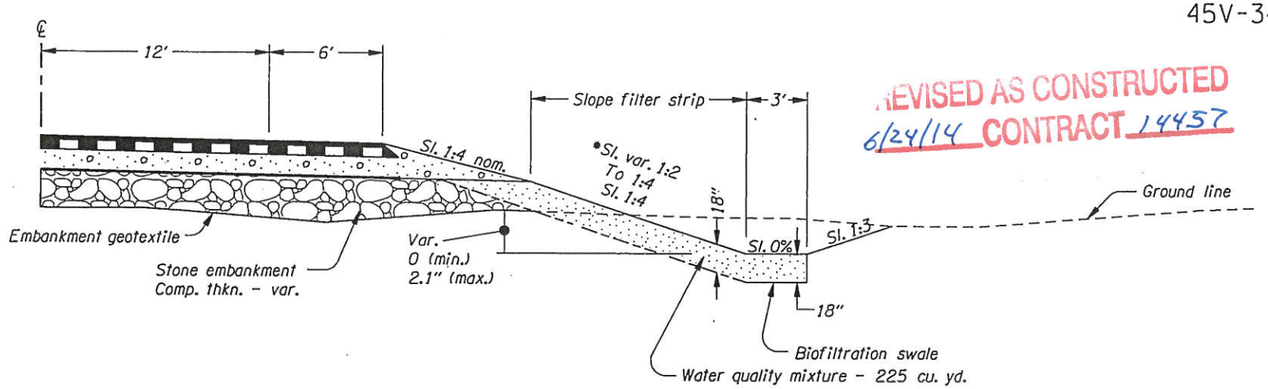


SECTION A-A



SECTION B-B

PLASTIC BOARD FLOW SPREADER

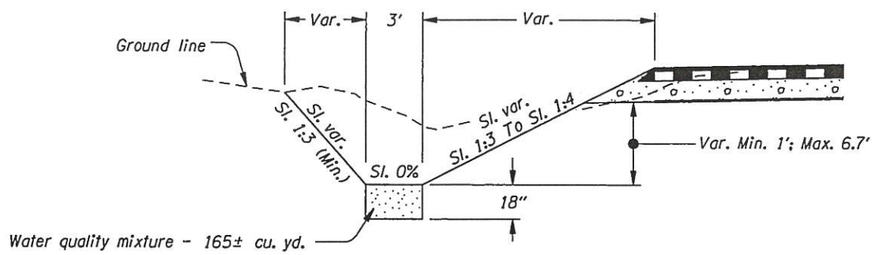


REVISED AS CONSTRUCTED
6/24/14 CONTRACT 14457

(For surfacing details not shown, see typical sections)

WATER QUALITY BIOFILTRATION SWALE AND SLOPE FILTER STRIP

* STA. "L"667+42 To STA. "L"668+03, Rt.
STA. "L"668+03 To STA. "L"670+60, Rt.



(For surfacing details not shown, see typical sections)

FLAT BOTTTOM WATER QUALITY BIOFILTRATION SWALE

STA. "L"661+05 To STA. "L"664+50, Lt.
STA. "L"661+10 To STA. "L"664+10, Rt.
STA. "L"670+60 To STA. "L"672+60, Rt.
STA. "L"671+15 To STA. "L"672+60, Lt.

REGISTERED PROFESSIONAL ENGINEER
56,134
Eliseo Lemus Magaña
OREGON
JUNE 14, 2007
ELISEO LEMUS MAGAÑA

RENEWS: 12-31-2012

OREGON DEPARTMENT OF TRANSPORTATION

REGION 2 TECH CENTER

OR213: BUTTE CREEK (JACKS) BRIDGE SEC.
CASCADE HIGHWAY SOUTH
MARION & CLACKAMAS COUNTIES

Design Team Leader - Edward W. Cantrell
Designed By - Eliseo Lemus Magaña
Drafted By - D. Gentner-Day

DETAILS

SHEET NO. 2B-4

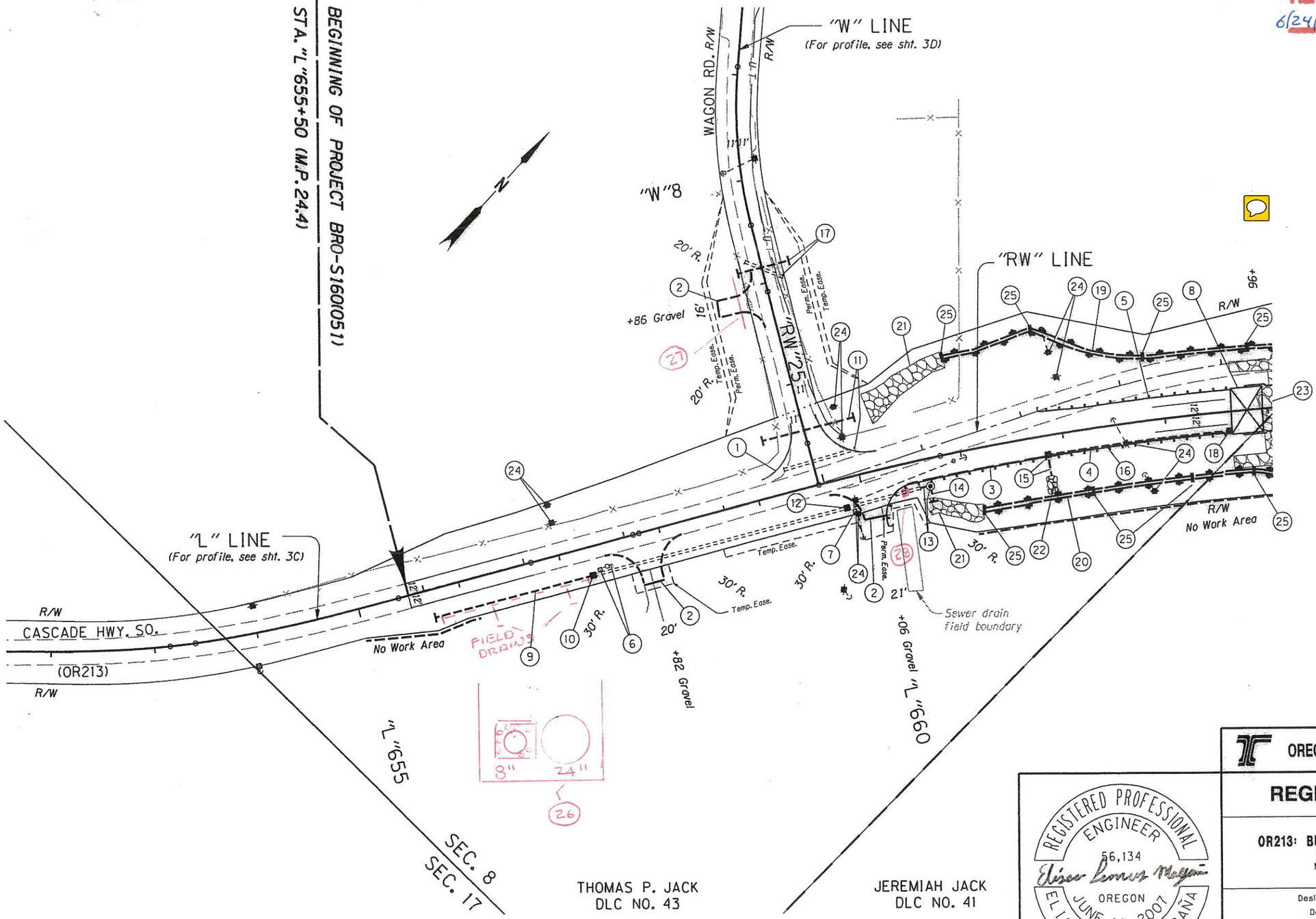
T. 6 S., R. 1 E., W.M.

45V-34

REVISED AS CONSTRUCTED
6/24/14 CONTRACT 14457

STRUCTURAL DETAILS CHECKED

BEGINNING OF PROJECT BRO-S160(051)
STA. "L" 655+50 (M.P. 24.4)



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MARION & CLACKAMAS COUNTIES

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Designed By - Eliseo Lemus Magaña
Drafted By - D. Gentner-Day

GENERAL CONSTRUCTION

SHEET NO. 3A

STRUCTURAL DETAILS CHECKED _ _ _ _ _ _ _ _ _ _

(1) Const. road connection

(2) Const. approach - 3
(See drg. no. RD715)

(3) Sta. "L"660+17.21 To Sta. "L"663+63, Rt.
Const. guardrail - 281.5' (Type 2A)
- 37.5' (Type 2A) (30' radius)
- 12.5' (Type 3)
Const. anchor - 2 (Type 1 mod.)
Inst. end piece (Type B)
(See drg. nos. RD400, RD415, RD440, RD450 & RD470)

(4) Sta. "L"660+40 To Sta. "L"663+63, Rt.
Const. drainage curb
(See drg. no. RD701)

(5) Sta. "L"661+84.9 To Sta. "L"663+65, Lt.
Const. guardrail - 112.5' (Type 2A)
- 12.5' (Type 3)
Flare rate=0, W=3', E=2'
Const. guardrail terminal, flared
(See drg. nos. RD420)

(6) Sta. "L"657+27, Rt.
Remove extg. mailbox support
Inst. single mailbox support
(See drg. nos. RD100 & RD101)

(7) Sta. "L"559+88, Rt.
Inst. single mailbox support

(8) Structure no. 21281
Const. structure
Roadway width - 40'
and reinforced panel at bridge ends
(For drg. nos. see sht. 1A)

(9) Sta. "L"655+70 To Sta. "L"657+27, Rt.
Inst. 24" culv. pipe - 157'
5' Depth
Const. slope end
(See drg. nos. RD300, RD316, RD318, RD326, RD380 & RD386)

REVISED AS CONSTRUCTED
6/24/14 CONTRACT 14457

(10) Sta. "L"657+27, 27.4' Rt.
Const. type "D" inlet
(See drg. no. RD370)

(11) Sta. "L"659+17.79 To Sta. "L"660+08.79, 53.9' Lt.
Remove extg. pipe - 78.8'
Inst. 18" culv. pipe - 91'
5' Depth
Const. slope end - 2

(12) Sta. "L"659+81.2, 27.8' Rt.
Remove extg. pipe -3'
Const. type "D" inlet

(13) Sta. "L"660+57, 26.3' Rt.
24" culv. pipe (In pl.)
Extend - 9' Rt., 5' depth
Const. storm sew. manhole
(See drg. nos. RD336, RD344 & RD346)

(14) Sta. "L"660+65, Rt.
Inst. 24" culv. pipe - 13'
5' Depth

(15) Sta. "L"661+82.7, 18.3' Rt.
Const. type "G-2" inlet
Inst. 12" storm sew. pipe - 17.5'
10' Depth
(See drg. no. RD364)

(16) Sta. "L"661+83.9 To Sta. "L"663+60.2, Rt.
Inst. 12" storm sew. pipe - 175'
10' Depth

(17) Sta. "W"7+15
Remove extg. culv. pipe - 39'
Inst. 18" culv. pipe - 60'
5' Depth
Const. slope end - 2

(18) Sta. "L"663+48, 18.3' Rt.
Const. type "G-2" inlet

(19) Sta. "L"661+05 To Sta. "L"664+50, Lt.
Const. No. 00573 water quality biofiltration swale
(For details, see sht. 2B-4)

(20) Sta. "L"661+10 To Sta. "L"664+10, Rt.
Const. No. 00574 water quality biofiltration swale
(For details, see sht. 2B-4)

(21) Const. ditch protection
Const. loose riprap (Class 50) - 100 cu. yd.
(For details, see sht. 2B-2)

(22) Const. slope protection
Const. loose riprap (Class 50) - 4 cu. yd.
(For details, see sht. 2B-3)

(23) Const. bank protection
(For drg. nos., see sht. 1A)

(24) Remove extg. power pole - 5
Inst. power pole - 5
(By others)

(25) Inst. plastic board flow spreader - 8
(For details, see sht. 2B-4)

(26) INSTALL 8" DRAIN PIPE
STA 655+80 TO 657+27 RT
TIE INT TYP "D" INLET
TIE 2 FIELD DRAIN
INTO 8" PIPE

(27) "W" 6+55 - 7+15
INST 12 CULV PIPE -
60' CONST. SLOPE END 2

(28) STA "L" 660+40 26.6 RT
CONST TYPE "D" INLET.
REMOVE EXTG PIPE-3'

OREGON DEPARTMENT OF TRANSPORTATION

REGISTERED PROFESSIONAL ENGINEER
56,134
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RENEWS: 12-31-2012

REGION 2 TECH CENTER

OR213: BUTTE CREEK (JACKS) BRIDGE SEC.
CASCADE HIGHWAY SOUTH
MARION & CLACKAMAS COUNTIES

Design Team Leader - Edward W. Cantrell
Designed By - Eliseo Lemus Magaña
Drafted By - D. Gentner-Day

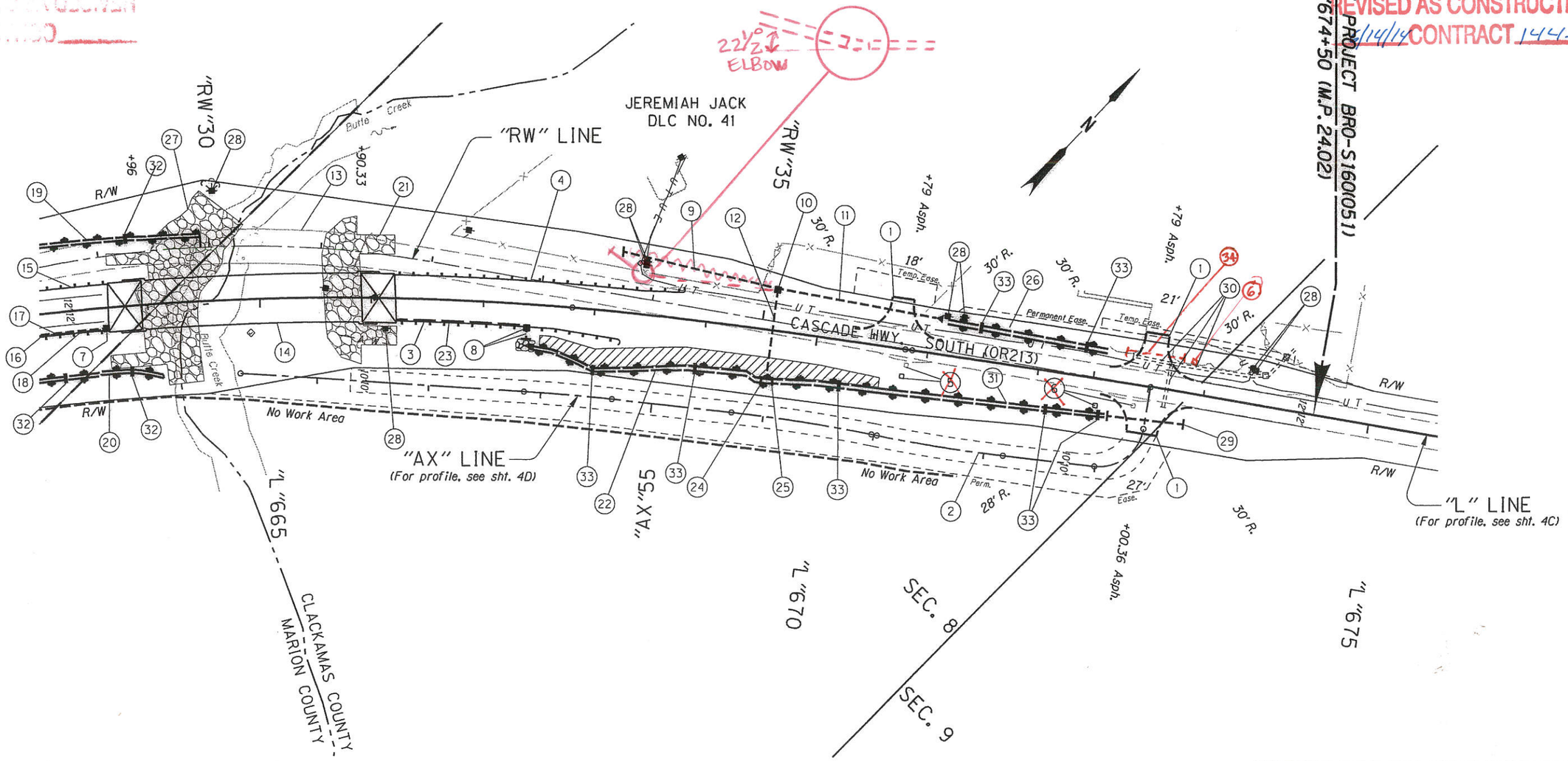
NOTES

SHEET NO. 3A-2

Sec. 8, T. 6 S., R. 1 E., W.M.

45V-34

STRUCTURAL DETAILS CHECKED



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OR213: BUTTE CREEK (JACKS) BRIDGE SEC.
CASCADE HIGHWAY SOUTH
MARION & CLACKAMAS COUNTIES

Design Team Leader - Edward W. Cantrell
Designed By - Eliseo Lemus Magaña
Drafted By - D. Gentner-Day

GENERAL CONSTRUCTION

SHEET NO. 4A

(1) Const. approach - 3

(2) Const. access road
(For details, see sht. 2A-2)

(3) Sta. "L"666+23.1 To Sta. "L"668+07.4, Rt.
Const. guardrail - 112.5' (Type 2A)
- 12.5' (Type 3)
Flare rate=0, W=3', E=2'
Const. guardrail terminal, flared
Const. guardrail to bridge transition
(See drg. nos. RD410, BR208 & BR209)

(4) Sta. "L"666+20.55 To Sta. "L"668+76.8, Lt.
Const. guardrail - 187.5' (Type 2A)
- 12.5 (Type 3)
Flare rate=0, W=3', E=2'
Const. guardrail terminal, non-flared
Const. guardrail to bridge transition

(5) Sta. ~~"L"670+80, Rt.~~ RELOCATE MAILBOX TO STA. "L" 673+35 LEFT
Remove extg. mailbox support
Inst. single mailbox support

(6) Sta. ~~"L"672+80, Rt.~~ RELOCATE "L" 673+35 LEFT
Remove extg. mailbox support @ "L" 672+85 Rt.
Inst. single mailbox support
MULT,

(7) See sht. 3A-2, note 18
Const. inlet

(8) Sta. "L"667+40, 18.3' Rt.
Const. type "G-2" inlet
Inst. 12" culv. pipe - 10'
5' Depth
Const. culvert slope protection
Const. loose riprap (Class 50) - 1.5 cu. yd.
(For details, see sht. 2B-3)

(9) Sta. "L"668+19.6 To Sta. "L"669+59, Lt.
Inst. 18" storm sew. pipe - 140.5'
5' Depth SEE DETAIL @ LEFT

(10) Sta. "L"669+60, 37.5'Lt.
Const. type "D" inlet

(11) Sta. "L"679+61 To Sta. 671+03.3, Lt.
Inst. 18" storm sew. pipe - 142.5'
5' Depth
Const. slope end - 2

(12) Sta. "L"669+60
Inst. 18" storm sew. pipe - 79.8'
5' Depth
Const. slope end, Rt.

(13) Remove extg. structure
(For drg. nos. see sht. 1A)

(14) See sht. 3A-2, note 8
Const. structure

(15) See sht. 3A-2, note 5
Const. guardrail
Const. guardrail to bridge transition

(16) See sht. 3A-2, note 3
Const. guardrail
Const. guardrail to bridge transition

(17) See sht. 3A-2, note 4
Const. drainage curb

(18) See sht. 3A-2, note 16
Inst. storm sew. pipe

(19) See sht. 3A-2, note 19
Const. water quality biofiltration swale

(20) See sht. 3A-2, note 20
Const. water quality biofiltration swale

(21) Const. bank protection
(For drg. nos., see sht. 1A)

(22) Sta. "L"667+42 To Sta. "L"670+60, Rt.
Const. No. 00575 water quality biofiltration swale
Const. water quality filtration strip
Shown thus: ////////

(For details, see sht. 2B-4)

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(23) Sta. "L"666+22.9 To Sta. "L"667+38.8, Rt.
Const. drainage curb

(24) Sta. "L"699+55, 45.4' Rt.
Inst. steel plate
(For details, see sht. GJ)

(25) Sta. "L"699+65, 44.9' Rt.
Inst. steel plate
(For details, see sht. GJ)

(26) Sta. "L"671+15 To Sta. "L"672+60, Lt.
Const. No. 00608 water quality biofiltration swale
(For details, see sht. 2B-4)

(27) See sht. 3A-2, note 23
Const. bank protection

(28) Remove extg. power pole - 3
Inst. power pole - 3
(By others)

(29) Sta. "L"672+67.4 To Sta. 673+36, Rt.
Inst. 12" culv. pipe - 68.5'
5' Depth
Const. slope end - 2

(30) Remove extg. pipe - 127'

(31) Sta. "L"670+60 To Sta. "L"672+60, Rt.
Const. No. 00575 water quality biofiltration swale
(For details, see sht. 2B-4)

(32) See sht. 3A-2, note 25

(33) Inst. plastic board flow spreader - 8
(For details, see sht. 2B-4)

(34) INSTALLED 12" X 60' DUCTILE IRON

REGISTERED PROFESSIONAL ENGINEER
56,134
Eliseo Lemus Magaña
OREGON
JUNE 14, 2007
ELISEO LEMUS MAGAÑA

RENEWS: 12-31-2012

OREGON DEPARTMENT OF TRANSPORTATION

REGION 2 TECH CENTER

OR213: BUTTE CREEK (JACKS) BRIDGE SEC.
CASCADE HIGHWAY SOUTH
MARION & CLACKAMAS COUNTIES

Design Team Leader - Edward W. Cantrell
Designed By - Eliseo Lemus Magaña
Drafted By - D. Gentner-Day

NOTES

SHEET NO. 4A-2

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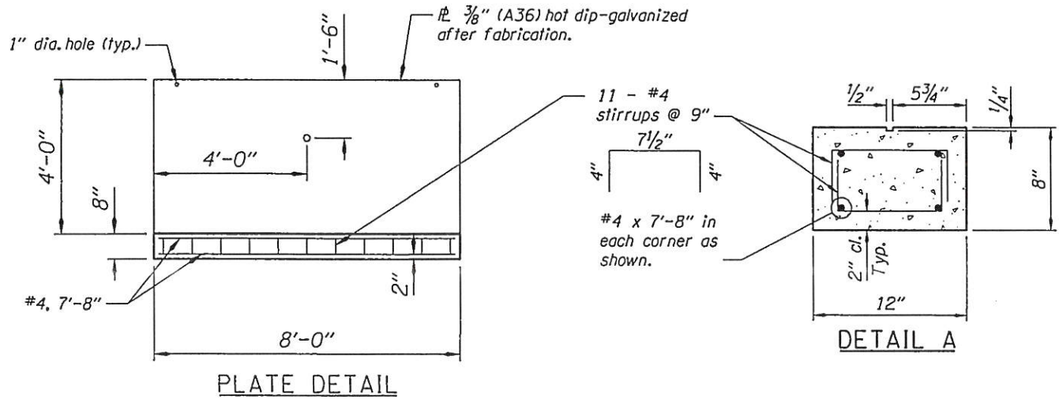
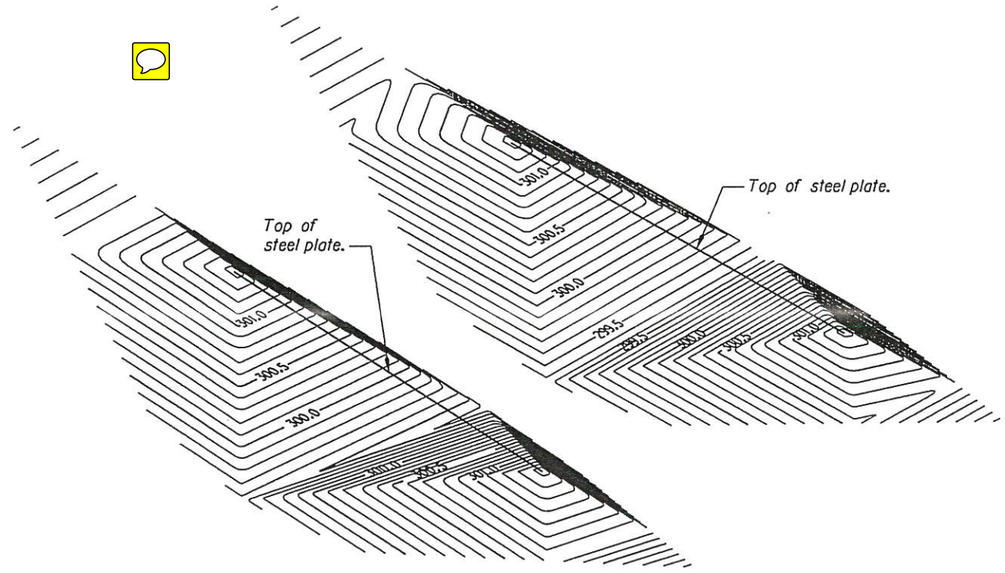
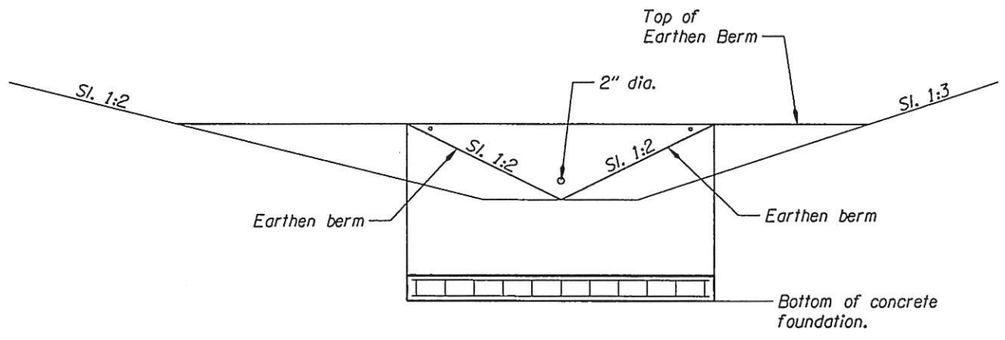
6/24/14 CONTRACT 14457





ISOMETRIC EARTHEN BERM
AROUND STEEL PLATES



BERM ELEVATION

Plate Elevation Table

Station	Bottom of concrete foundation	Top of steel plate and berm
"L"669+55	296.81	301.48
"L"669+65	296.69	301.36

REGISTERED PROFESSIONAL ENGINEER
17807
OREGON
JULY 25, 1995
CHRIS CARMAN
RENEWS: 12-31-2013

OREGON DEPARTMENT OF TRANSPORTATION

REGION 2 TECH CENTER

OR213: BUTTE CREEK (JACKS)
BRIDGE NO. 01597 SEC.
CASCADE HIGHWAY SOUTH
MARION & CLACKAMAS COUNTIES

Reviewed By Bruce Carmichael, P.E.
Designed By - Chris Carman, P.E.
Drafted By - Michael Skelton

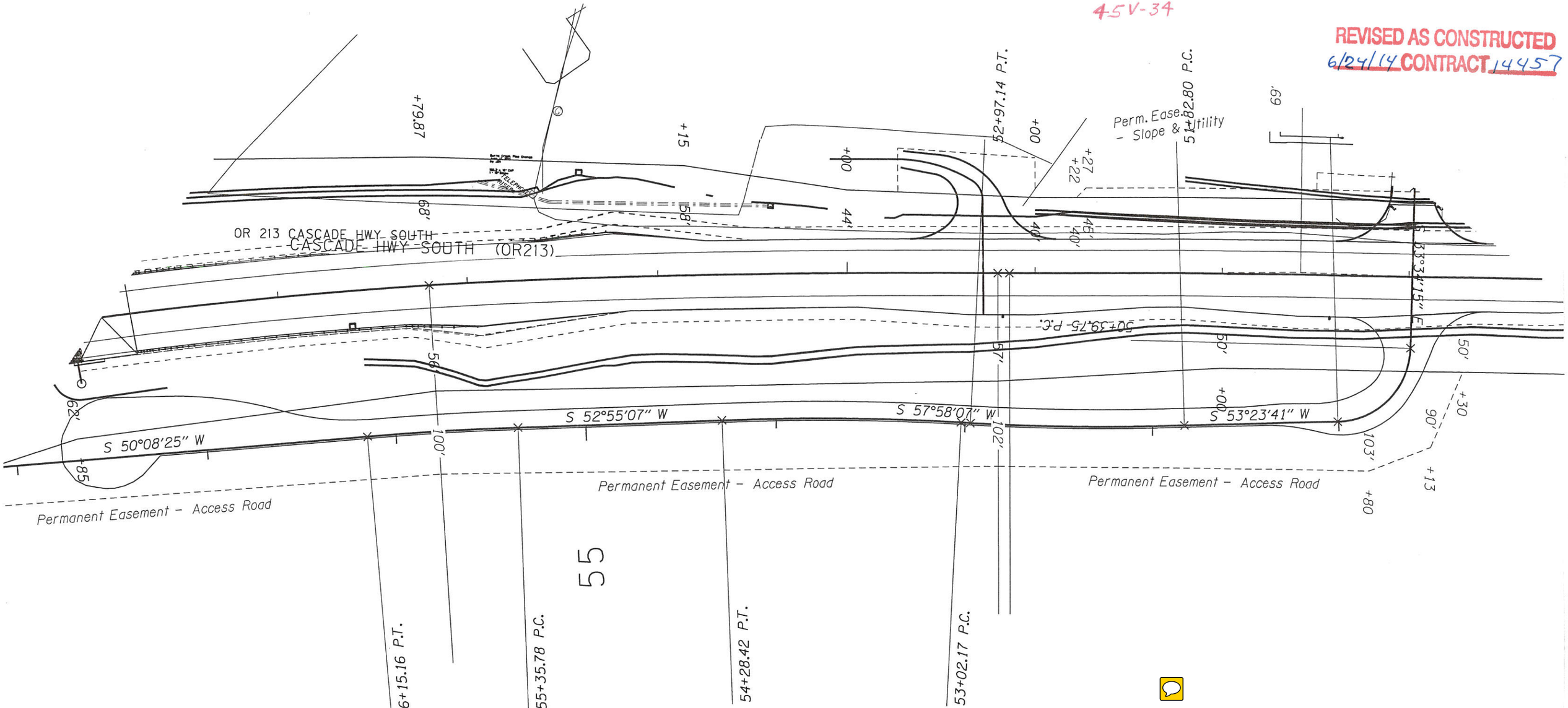
STORMWATER

SHEET NO. GJ

C14457 CONTRACT PLANS - SUPPLEMENTAL

45V-34

REVISED AS CONSTRUCTED
6/24/14 CONTRACT 14457



ODOT

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CASCADE HIGHWAY SOUTH
MARION AND CLACKAMAS COUNTIES

"AX" ALIGNMENT - PLAN SHEET 4 - SUPPL.