OPERATION & MAINTENANCE MANUAL

Water Quality Biofiltration Swale

Manual prepared: February 2019

DFI No. D00851

Figure 1: DFI No. D00851, looking east

Identification

Drainage Facility ID (DFI):	D00851
Facility Type:	Water Quality Biofiltration Swale
Construction Drawings:	(V-File Numbers) 47V-119
Location:	District: 2B
	Highway No.: 171
	Mile Post: 7.28 - 7.32 (Right Side)

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: From road and sidewalk slopes and then to the West

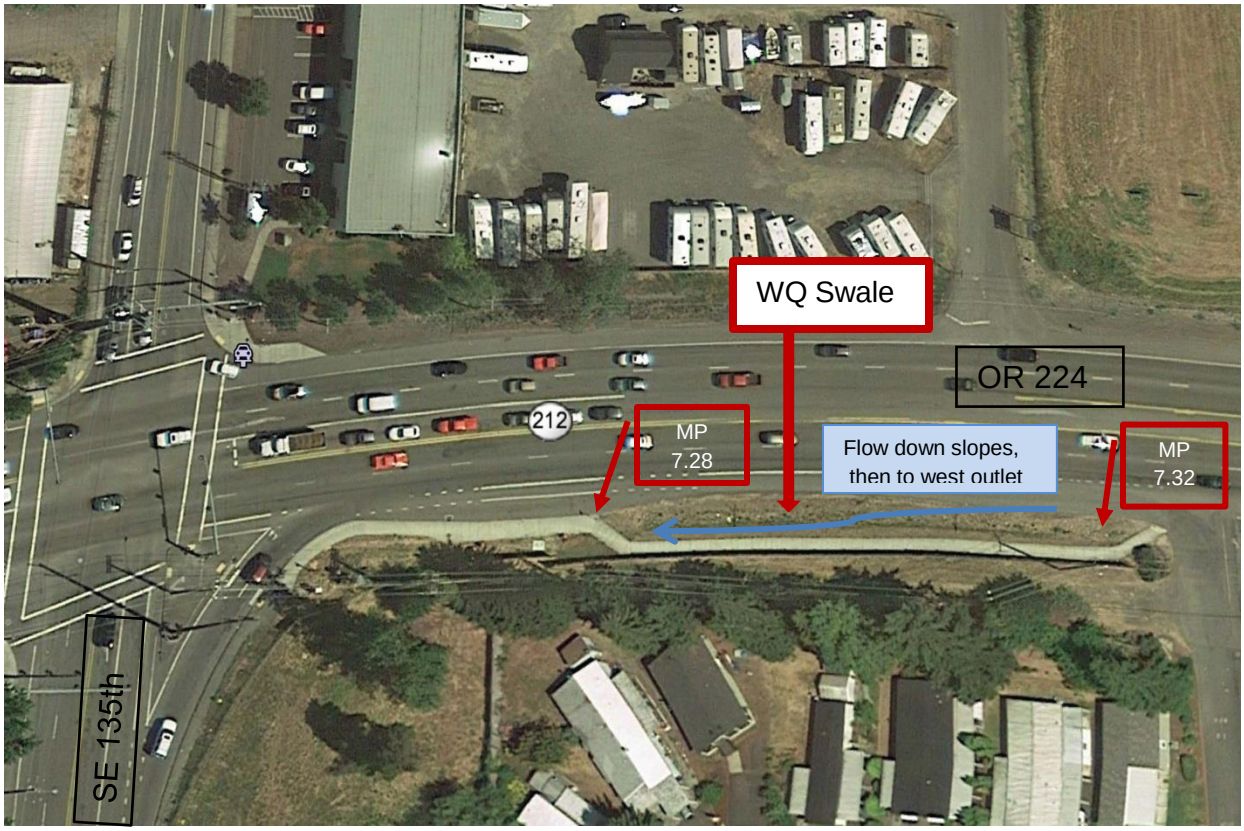


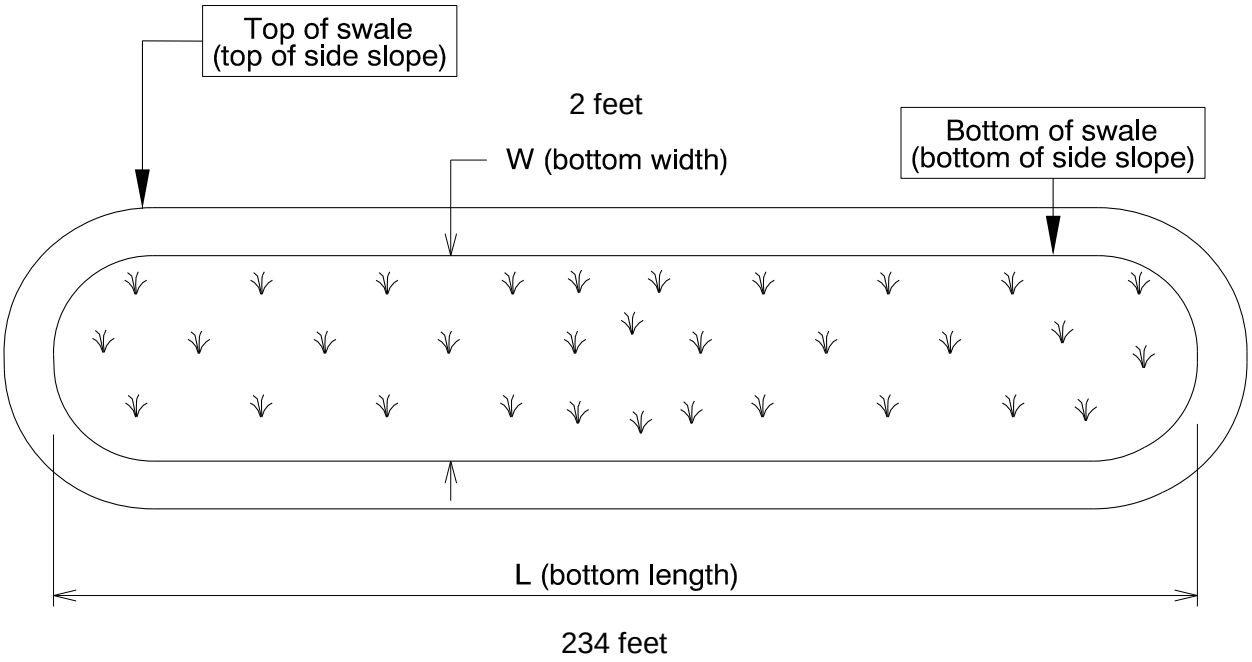
Figure 2: Facility location map

3. Facility Summary

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

The bottom length and bottom width of the swale is:

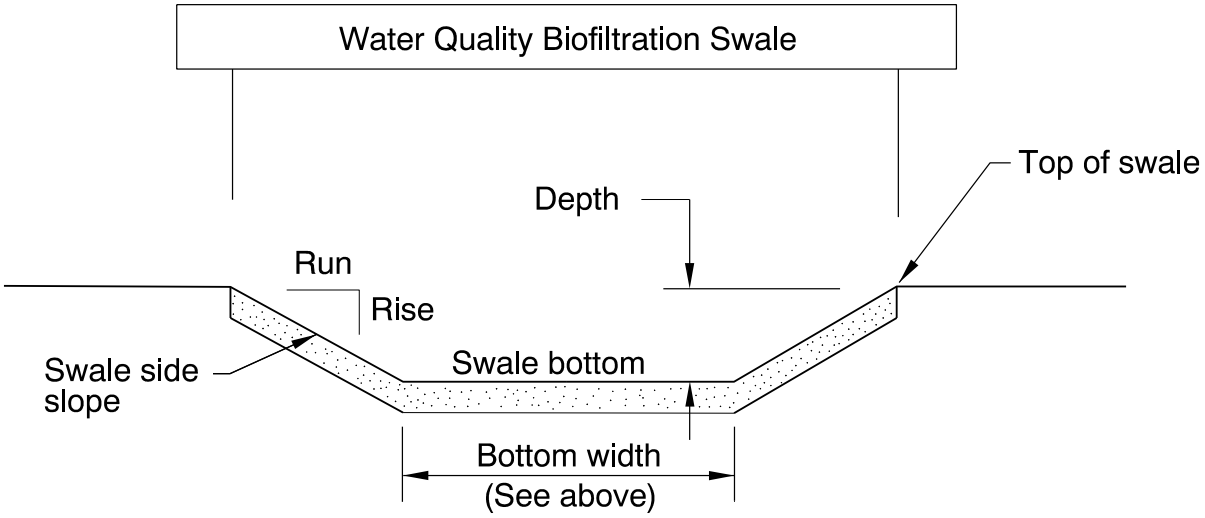
Bottom Length (feet)	Bottom Width (feet)
234	**2**


Top of swale
(top of side slope)
2 feet
W (bottom width)
Bottom of swale
(bottom of side slope)
L (bottom length)
234 feet

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)
Variable (typ. 1 ft.)	Variable	Variable



Site Specific Information:

There is a sidewalk in back of the swale. The water flows into the swale down the road (fore) and sidewalk (back) slopes, and then travels from east to west to a D inlet to a pipe. The swale is shallow (about 1 foot) and the plans were designed with variable slopes to match existing ditch grades.

4. Facility Access

Maintenance access to the facility:

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

Note: The sidewalk behind the swale also provides access for debris pick up or weeding but not for vactor truck.

Figure 3: Maintenance Access for Eastbound traffic]

5. Operational Components / Maintenance Items

Classification

This facility is classified as an:

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

Bypass Component

This facility includes a high flow bypass component:

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

Operational Components

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

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

Operational Plan

The applicable standard operational plan for this facility is:

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

See Appendix A for the site specific operational plan.

Maintenance Items

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

Table 1: Swale Components		ID #
Manholes/Structures		
Pre-treatment manhole	☐	**S1**
Weir type flow splitter/flow splitter manhole	☐	**S2**
Orifice type flow splitter/flow splitter manhole	☐	**S3**
Standard manhole	☐	**S4**
Swale Inlet		
Pavement sheet flow	☒	**S5**
Inlet Pipe (s)	☐	**S6**
Open channel inlet	☐	**S7**
Riprap pad	☐	**S8**
Ground Cover		
Grass bottom	☒	**S9**
Grass side slopes	☒	**S10**
Granular drain rock	☐	**S11**
Plantings	☐	**S12**
Underground Components		
Geotextile fabric	☒	**S13**
Water quality mix	☒	**S14**
Perforated pipe	☐	**S15**
Porous pavers (access grid)	☐	**S16**
Flow Spreader		
Rock basin (used at inlet)	☐	**S17**
Anchored board (midpoint of swale or every 50 feet along swale bottom)	☐	**S18**
Other: 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 (Choose applicable weight: no, light, med., heavy) 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

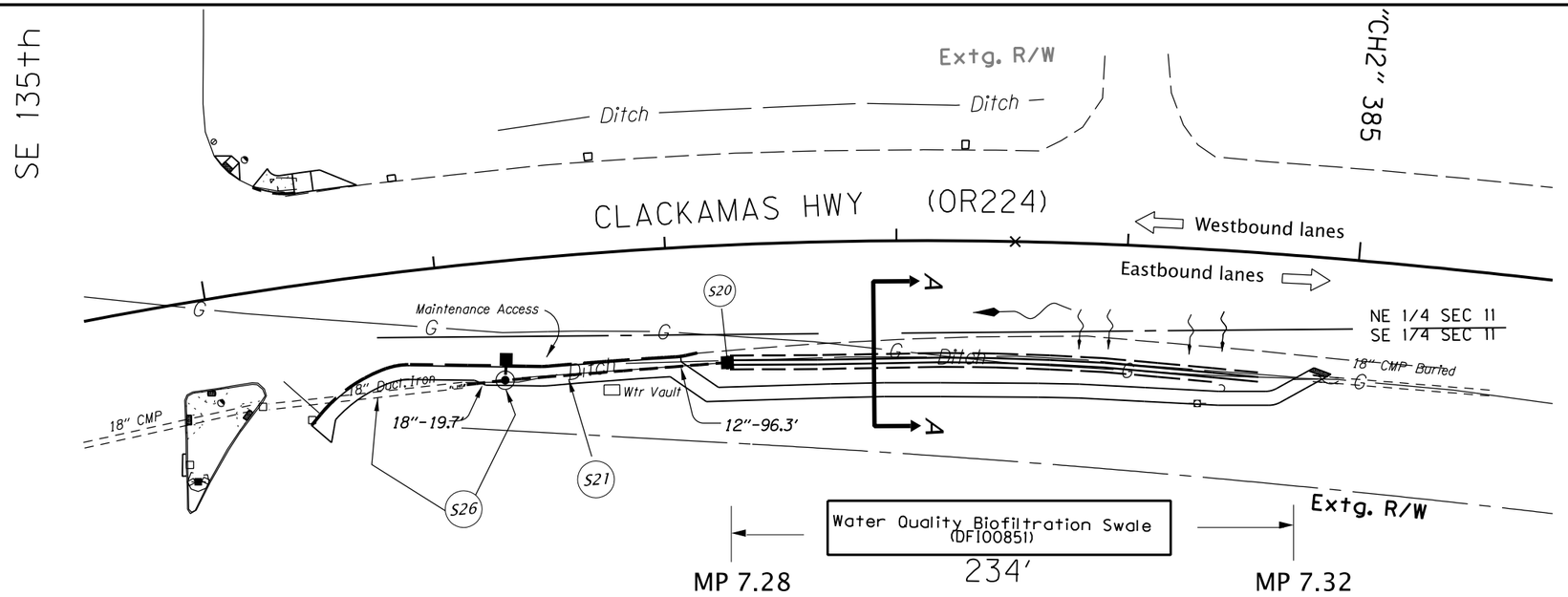
Contact any of the following for more detailed information about management of waste materials found on site:

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:

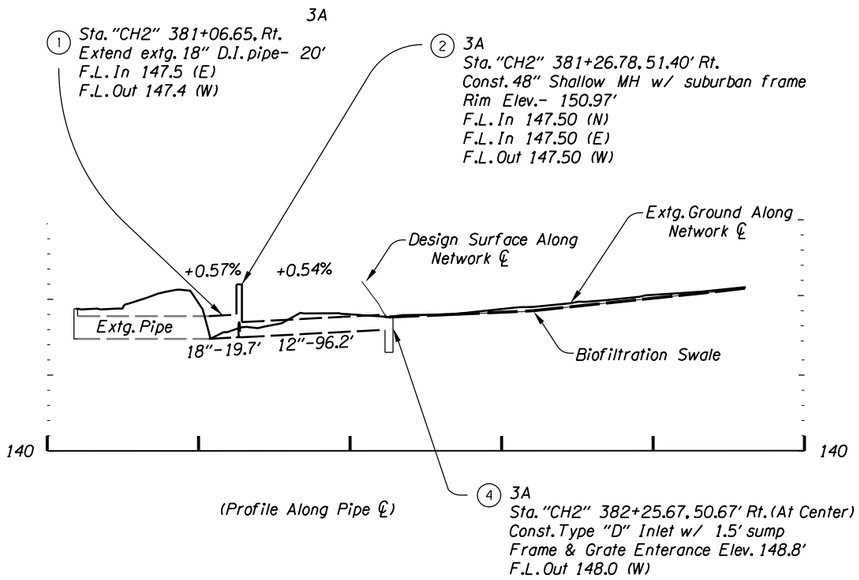
Operational Plan: DFI D00851



PLAN
N.T.S.

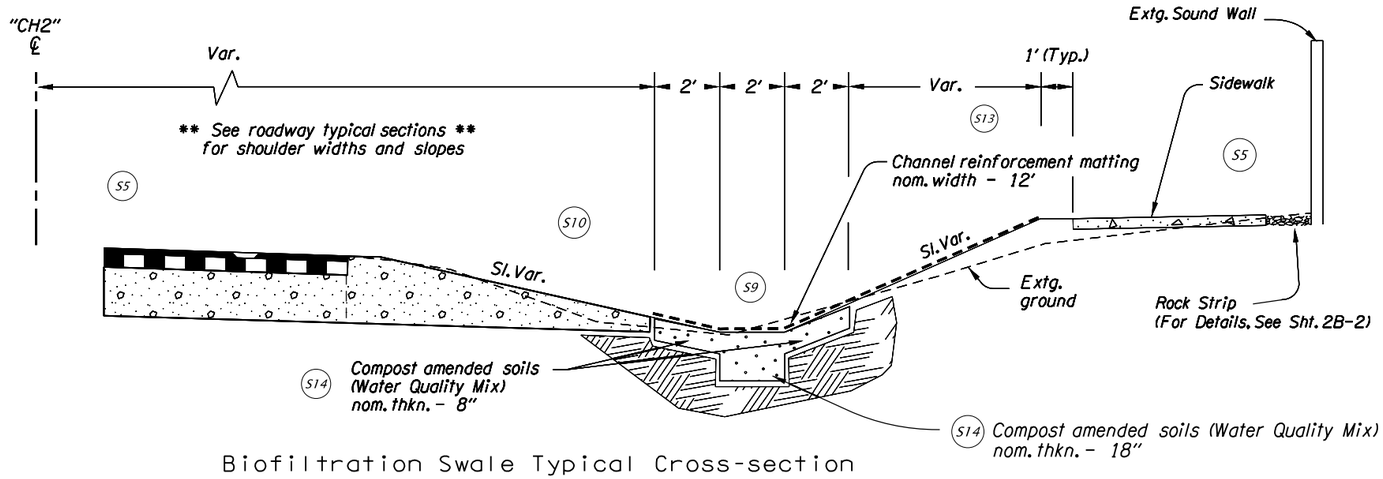
LEGEND:

- X# — *Facility Component (see table 1 in O&M Manual)*
- and/or — *Manhole*
- and/or — *Inlet*
- *Storm Pipe (Facility)*
- *Storm Pipe*
- *Conveyance Direction*
- *Pavement / Facility Flow Path*
- *Traffic Flow Direction*



(Profile Along Pipe ℄)

PROFILE
N.T.S.



Biofiltration Swale Typical Cross-section

SECTION A-A
N.T.S.

OREGON DEPARTMENT OF TRANSPORTATION

Sht. 01 of 01

Prepared By: *Elaine Jinx Kuehn*

Drafted By: *Elaine Jinx Kuehn*

DFI D00851
MAINTENANCE DISTRICT 2C HWY 171
BioSwale
Clackamas Hwy MP 7.28 - 7.32
Clackamas County

B Appendix B – Project Contract Plans

Contents:

Site Specific Subset of Project Contract Plan 47V-119

47V-119

INDEX OF SHEETS	
SHEET NO.	DESCRIPTION
1	Title Sheet, Index of Sheets & Std. Drg. Nos.
1A	Index Of Sheets Cont. & Std. Drg. Nos.

STATE OF OREGON

DEPARTMENT OF TRANSPORTATION

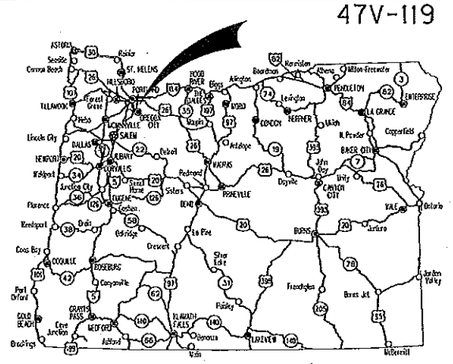
PLANS FOR PROPOSED PROJECT

GRADING, DRAINAGE, PAVING, SIGNING, ILLUMINATION & SIGNALS

OR224: SE 135th AVE SEC.

CLACKAMAS HIGHWAY

CLACKAMAS COUNTY
OCTOBER 2014

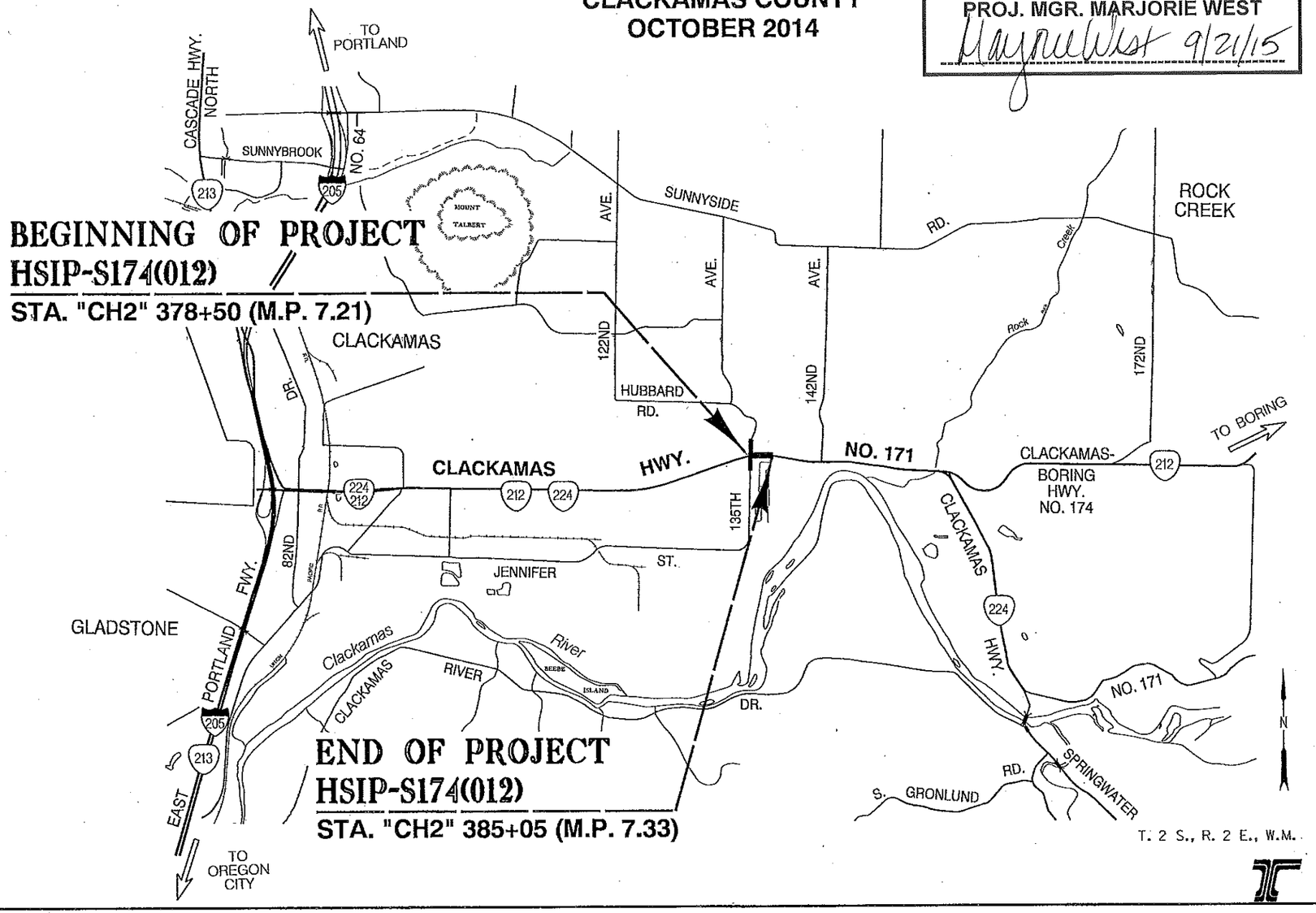


Overall Length Of Project - 0.13 Miles

NOT REVISED AS CONSTRUCTED
30 JUN 2015 CONTRACT 14740
PROJ. MGR. MARJORIE WEST
Marjorie West 9/21/15

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



BEGINNING OF PROJECT
HSIP-S174(012)
STA. "CH2" 378+50 (M.P. 7.21)

END OF PROJECT
HSIP-S174(012)
STA. "CH2" 385+05 (M.P. 7.33)

T. 2 S., R. 2 E., W.M.

OREGON TRANSPORTATION COMMISSION

Catherine Mater	CHAIR
David Lohman	COMMISSIONER
Tammy Baney	COMMISSIONER
Susan Morgan	COMMISSIONER
Alando Simpson	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: Tamira Clark
Tamira J. Clark
Technical Center Manager, Region 1

B Johnson
Concurrence by ODOT Chief Engineer

OR224: SE 135TH AVE SEC.
CLACKAMAS HIGHWAY
CLACKAMAS COUNTY

FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	HSIP-S174(012)	1

PE002127 000

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INDEX OF SHEETS, CONT.

SHEET NO.	DESCRIPTION
2, 2A & 2A-2	Typical Sections
2B, 2B-2 & 2B-3	Details
2C	Pipe Data Sheet
3	Alignment & General Construction
3A	Drainage & Utility Plan & Details
3A-2 & 3A-3	Drainage & Utilities Details
3B	Profile
GEO/HYDRO	
GA	Erosion Control Plan
GA-2 & GA-3	Erosion Control Details
GB	Geotechnical Data
GJ	Water Quality Details
PERMANENT PAVEMENT MARKINGS	
ST thru ST-3	Striping Plan
PERMANENT SIGNING	
S-14623 thru S-14627	Permanent Signing
SIGNALS	
17749	Legend
17750	Removal Plan
17751	Signal Plan
17752	Detector Plan
17753	Existing Utilities
17754 thru 17756	Details

NOT REVISED AS CONSTRUCTED
30 JUN 2015 CONTRACT 14740
PROJ. MGR. MARJORIE WEST
Marjorie West 9/21/15

Standard Drg. Nos.

RD150	- Slope Rounding
RD700	- Curbs
RD720	- Sidewalks
RD755	- Sidewalk Ramp Details
RD756	- Sidewalk Ramp Placement Options Curb Radii ≤15'
RD757	- Sidewalk Ramp Placement Options Curb Radii >15'
RD759	- Truncated Dome Detectable Warning Surface Details & Locations
RD1000	- Construction Entrances
RD1010	- Inlet Protection (Type 1, 2 & 3)
RD1015	- Inlet Protection (Type 4) Biofilter Bags
RD1030	- Sediment Barrier (Type 2 & 4) Biofilter Or Sandbags
RD1040	- Sediment Fence, Supported Sediment Fence, Unsupported
RD1055	- Matting
TM570	- Traffic Delineators
TM576	- Traffic Delineator Installation For Non-Freeways
RD300	- Trench Backfill, Bedding, Pipe Zone And Mult. Installations
RD319	- Miscellaneous Culvert Details
RD335	- Standard Storm Sewer Manhole
RD336	- Standard Storm Sewer Manhole
RD342	- Shallow Manholes
RD344	- Standard Manhole Base Section
RD356	- Manhole Covers And Frames
RD363	- Manhole Frame Adjustment
RD364	- Concrete Inlets Type G-1, G-2, G-2M & G-2MA
RD365	- Frames & Grates For Concrete Inlets
RD370	- Ditch Inlet Type D
RD376	- Miscellaneous Drainage Structures Siphon Box, Inlet Cap & Inlet Adjustment
RD386	- Fill Height Tables For Circular Concrete Pipe
RD388	- Fill Height Tables For PVC Pipe
RD390	- Fill Height Tables For Corrugated HDPE Pipe
RD399	- Stormwater Treatment And Storage Facility Field Markers
TM200	- Sign Installation Details
TM201	- Miscellaneous Sign Placement Details
TM212	- Signing Details Oregon Route Signs
TM223	- Conventional Roads Directional Sign Layout Street Name Signs
TM450	- Mast Arm Pole Details
TM457	- Vehicle, Pedestrian Signal And Push Button Mounting Option Details
TM458	- Pedestrian Ramp Placement Details
TM460	- Vehicle Signal Details
TM462	- Adjustable Signal Head Mounting Details
TM465	- Overhead Sign, Fire Preemption And Photoelectronic Control Details
TM467	- Pedestrian Signal And Pedestrian Push Button Details
TM470	- Color Code Charts
TM472	- Traffic Signal Junction Boxes/Hand Holes
TM475	- Loop Details
TM480	- Loop Entrance Details
TM485	- Service Cabinets And Service Cabinet Wiring Details
TM500	- Pavement Marking Standard Detail Blocks
TM501	- Pavement Marking Standard Detail Blocks
TM503	- Pavement Marking Standard Detail Blocks
TM521	- Durable Pavement Markings Method "A" & Method "B" Surface & Groove Installed Non-Profiled
TM530	- Intersection Pavement Markings (Crosswalk, Stop Bar & Bike Lane Stencil)
TM531	- Turn Arrow Marking Details
TM570	- Traffic Delineators
TM576	- Traffic Delineator Installation For Non-Freeways
TM650	- Traffic Signal Supports General Details & Design Criteria
TM651	- Traffic Signal Supports Notes And Reactions
TM652	- Traffic Signal Supports Steel Details
TM653	- Traffic Signal Supports Foundation Requirements
TM670	- Wood Post Sign Supports
TM671	- 3 Second Gust Wind Speed Map
TM676	- Sign Attachments
TM677	- Sign Mounts
TM679	- Signal Mast Arm Street Name Sign Mounts
TM681	- Perforated Steel Square Tube (PSST) Sign Support Installation
TM687	- Perforated Steel Square Tube (PSST) Anchor Foundation
TM688	- Perforated Steel Square Tube (PSST) Slip Base Foundation
TM800	- Tables, Abrupt Edge And PCMS Details
TM810	- Temporary Pavement Markings
TM820	- Temporary Barricades
TM821	- Temporary Sign Supports
TM840	- Closure Details
TM841	- Intersection Work Zone Details
TM842	- Signalized Intersection Details
TM843	- Multi-Lane Signalized Intersection Details
TM844	- Temporary Pedestrian Access Routing
TM850	- 2-Lane, 2-Way Roadways
TM851	- Non-Freeway Multi-Lane Sections

R/W Map No. 1R-3-1796

Horizontal Datum: NAD-83 (COR 96) EPOCH 2002
Coordinates: OCRS PDX (Portland Zone)
Vertical Datum: North American Vertical Datum of 1988 (NAVD88)

Standard Drawings located on the web at:
http://www.oregon.gov/ODOT/HWY/ENGSERVICES/pages/standard drawings home.aspx

OR224: SE 135TH AVE SEC.
CLACKAMAS HIGHWAY
CLACKAMAS COUNTY

FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	HSIP-S174(012)	1A

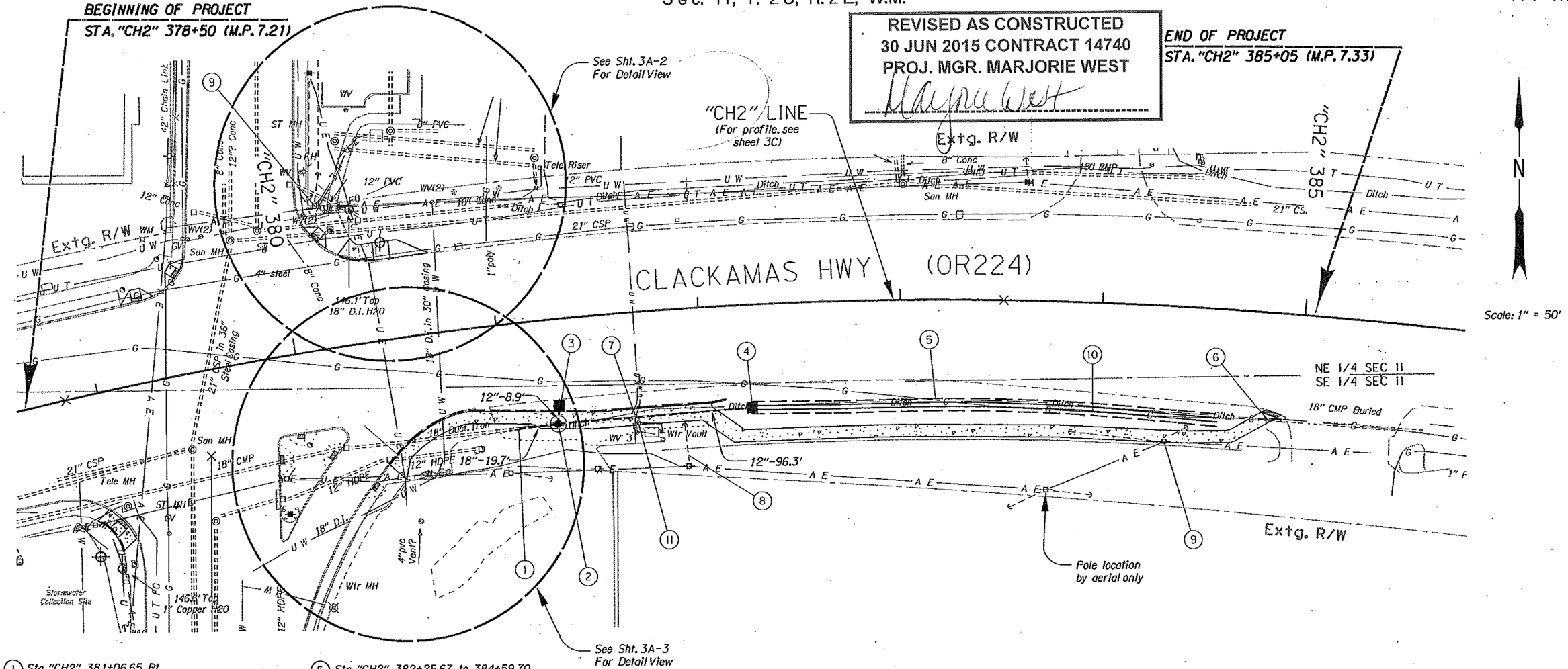
47V-119

Sec. 11, T. 2S, R. 2E, W.M.

REVISED AS CONSTRUCTED
30 JUN 2015 CONTRACT 14740
PROJ. MGR. MARJORIE WEST
Marjorie West

BEGINNING OF PROJECT
STA. "CH2" 378+50 (M.P. 7.21)

END OF PROJECT
STA. "CH2" 385+05 (M.P. 7.33)



(1) Sta. "CH2" 381+06.65, Rt.
Extend extg. 18" storm sewer pipe – 20'
5' depth
(See drg. nos. RD300, & RD319)

(2) Sta. "CH2" 381+26.78, 51.40' Rt.
Const. shallow MH w/ sub. frame & nonslip cover
Rim elev.- ~~151.18'~~ → 150.97'
Inst. 12" storm sew. pipe – 9'
5' depth
Inst. 12" storm sew. pipe – 96'
5' depth
Increase sidewalk section around manhole and place subgrade geotextile between manhole and sidewalk
(See drg. nos. RD335, RD336, RD342, RD344, RD356, RD360, RD386, RD388, & RD390)

(3) Sta. "CH2" ~~382+27.29, Rt.~~ → 381+27.79
Const. Type "G2" inlet w/ 1.5' sump
(See drg. nos. RD364, RD365, & RD376)

(4) Sta. "CH2" 382+25.67, 50.67' Rt.
Const. Type "D" inlet w/ 1.5' sump
F.L. Rim Elev.- 148.8'
(See drg. no. RD370)

(5) Sta. "CH2" 382+25.67 to 384+59.70,
Const. Water Quality Biofiltration Swale– 230'
Inst. water quality facility ID marker– 2
(For details see shts. GJ & GA)
(See drg. no. RD399)

(6) Sta. "CH2" 384+80.28, 54.53' Rt.
Plug & abandon extg. 18" culvert pipe

(7) Preserve and protect potable water line

(8) Relocate utility pole anchor (By others)

(9) Relocate utility pole (By others)

(10) Preserve and protect underground gas line

(11) Adjust water valve (By others)

LEGEND
(not all items shown are on this sheet)

- Remove manhole:
- Adjust manhole:
- Const. manhole:
- Remove inlet:
- Adjust inlet:
- Const. inlet:
- Infiltration ditch:
- Const. pipe
- Plug and abandon pipe:

REGISTERED PROFESSIONAL ENGINEER
19,156
OREGON
JULY 15, 1997
BRUCE S. COUNCIL
RENEWS: 12-31-2015

OREGON DEPARTMENT OF TRANSPORTATION

REGION 1 - Geo/Hydro/HazMat Unit

OR224: SE 135TH AVE SEC.
CLACKAMAS HIGHWAY
CLACKAMAS COUNTY

Reviewed by - Bruce Council
Designed by - David McDonald
Drafted by - David McDonald

DRAINAGE & UTILITIES

SHEET NO. 3A

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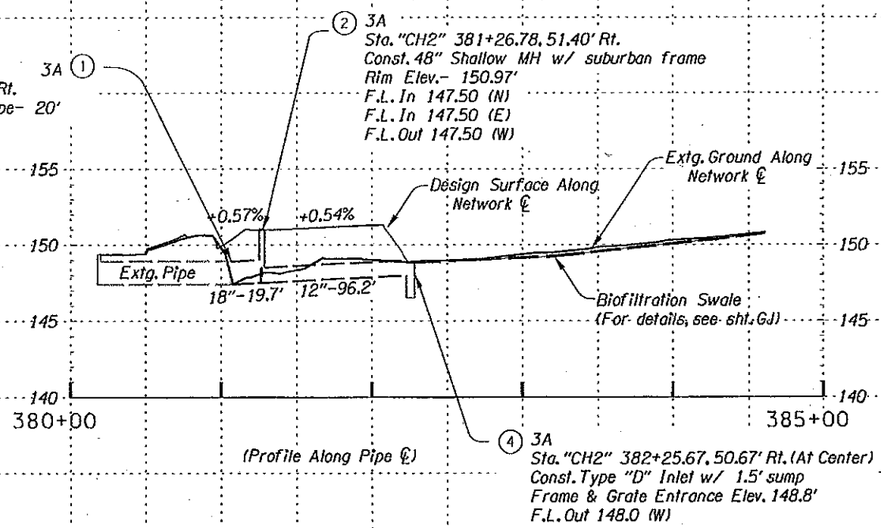
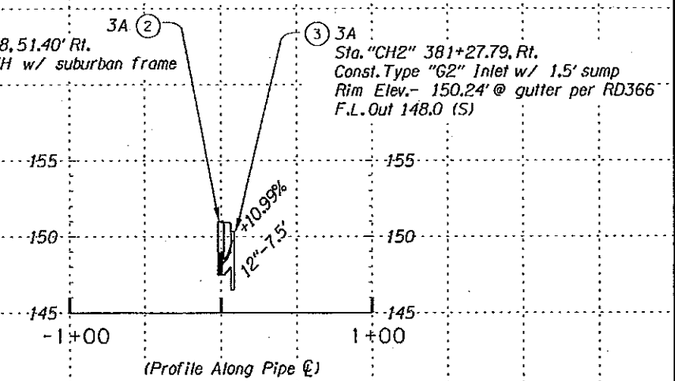
47V-119

REVISED AS CONSTRUCTED
30 JUN 2015 CONTRACT 14740
PROJ. MGR. MARJORIE WEST
Marjorie West 9/24/15





"CH2" Line

Water Quality Ditch Exc. = 50 cu yds

Water Quality Back Fill = 50 cu yds

** Match ditch flow line for type D inlet rim elevation. **
Fine grade soil to match top elevation on back side.

Vertical Datum (NAVD88)

REGISTERED PROFESSIONAL ENGINEER
19,156
OREGON
JULY 15, 1997
BRUCE S. COUNCIL
RENEWS: 12-31-2015

OREGON DEPARTMENT OF TRANSPORTATION

REGION 1 - Geo/Hydro/HazMat Unit

OR224: SE 135TH AVE SEC.
CLACKAMAS HIGHWAY
CLACKAMAS COUNTY

Reviewed By - Bruce Council
Designed By - David McDonald
Drafted By - David McDonald

PROFILE

SHEET NO. 3B

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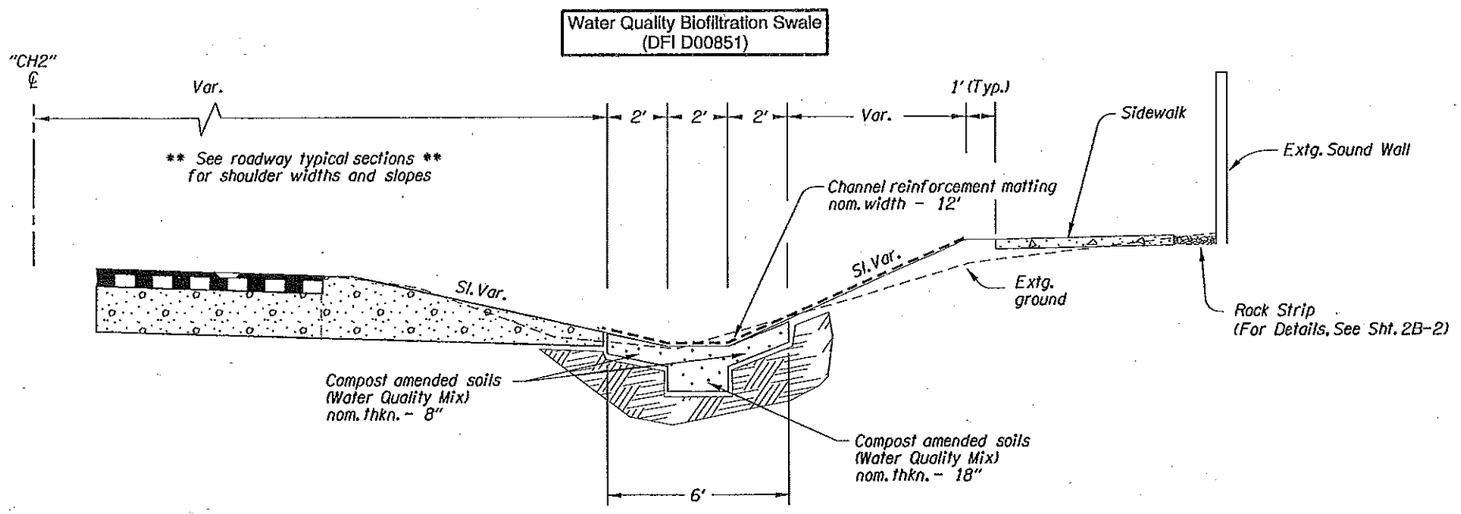
47V-119

REVISED AS CONSTRUCTED
30 JUN 2015 CONTRACT 14740
PROJ. MGR. MARJORIE WEST
Marjorie West 9/21/15



*STA. 382+25.67 To STA. 384+59.70 Rt.

Biofiltration Swale Typical Cross-section

GENERAL NOTES:

1. Create a suitable water quality mix by amending existing soils or installing an engineer approved water quality soil mixture. (See ODOT hydraulics Manual 14-E-1)
2. Amend existing soil by placing 6" of compost material and mechanically combine into 12" of soil. (total 18" of amended soil) or 3" of compost material and mechanically combine into 5" of soil. (total 8" of amended soil).
3. Sound wall height and location will vary.
4. See shts. GA & GA-2 for seeding and matting information not shown on this sheet.

STORMWATER FIELD MARKER TABLE

FACILITY LOCATION		DFI #	TYPE S2 MARKER LOCATION		TYPE S1 MARKER	
STATION "CH2"	MP		BEGIN	END	RED	GREEN
382+25.67, Rt.	7.26	D00851	✓			
384+59.70, Rt.	7.28	D00851		✓		

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

REGISTERED PROFESSIONAL ENGINEER
19156
OREGON
JULY 15, 1997
BRUCE S. COUNCIL
RENEWS: 12-31-2015

OREGON DEPARTMENT OF TRANSPORTATION

REGION 1 - Geo/Hydro/HazMat Unit

OR224: SE 135TH AVE SEC.
CLACKAMAS HIGHWAY
CLACKAMAS COUNTY

Reviewed By - Bruce Council
Designed By - David McDonald
Drafted By - David McDonald

WATER QUALITY DETAILS

SHEET NO. GJ