OPERATION & MAINTENANCE MANUAL

Detention Vault

Manual prepared: September 2019

DFI No. D00929

Figure 1: DFI No. D00929, looking west on US101

1. Identification

Drainage Facility ID (DFI):	D00929
Facility Type:	Detention Vault – Stormwater Management StormFilter (StormFilter)
Construction Drawings:	(V-File Numbers) 49V-060
Location:	District: 1 Highway No.: 009 (US 101) Mile Post: 65.61 to 65.62, Left

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.

Facility location type: Roadway shoulder

Flow direction: West to East

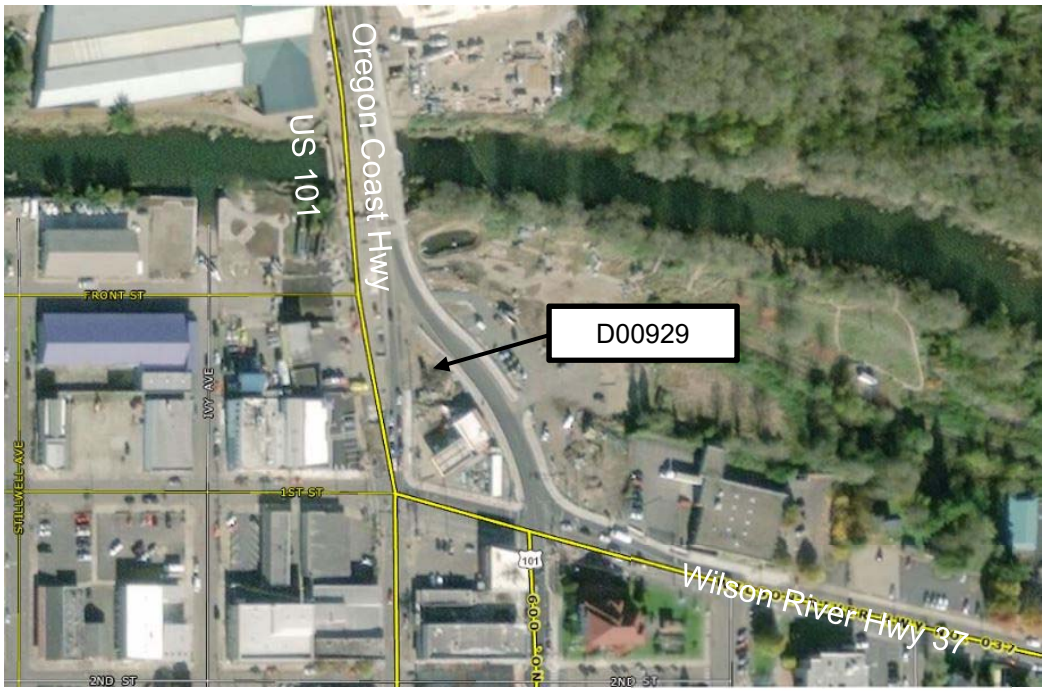


Figure 2: Facility location map

4. Facility Summary

The length, width, and depth of the detention vault are based on the dimensions referenced in Figure 3. The depth is the vertical distance measured from the bottom of the detention vault to the rim of the access opening.

The dimensions of the detention vault are:

Length (feet)	Width (feet)	Depth (feet)
16	8	6

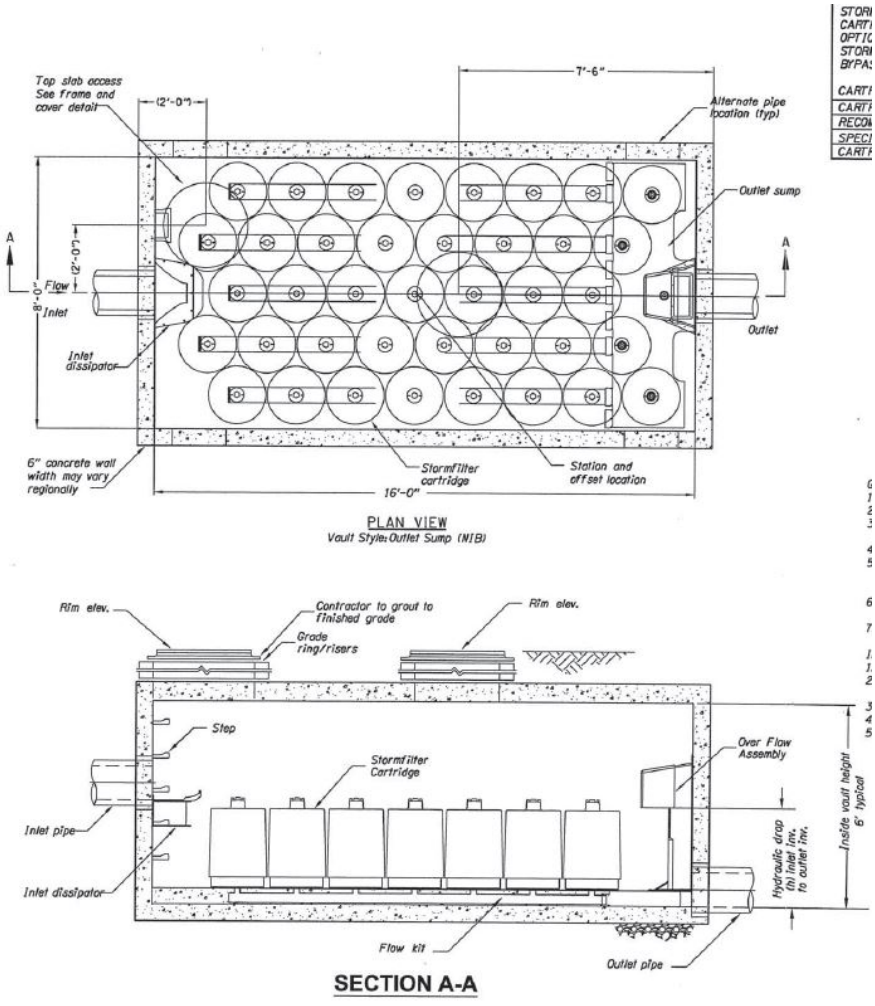


Figure 3: Reference dimensions for D00929 StormFilter

Site Specific Information: This water quality vault is an underground media filter facility designed to treat stormwater runoff. The stormwater management system is a proprietary product called StormFilter® manufactured by Contech Construction Products, Inc. The underground media filtration system provides treatment using filtration by removing target pollutants from the water via the use of rechargeable circular-shaped media filter cartridges arranged in an array alongside one another inside the vault. Through the use of a variety of sustainable media', solids, dissolved metals, oil and total nutrients are actually separated from the water by 'trapping particulate matter in the porous composition of the individual cartridge filter media.

This facility is an on-line facility designed to treat low and high flows, providing both treatment and high flow conveyance in a single facility. The facility containing 39 circular-shaped media filter cartridges inside the vault.

Unobstructed access can be obtained from the left shoulder of Oregon Pacific Hwy 9/US101. The hatch door has a locking mechanism that requires a flat-head screwdriver be placed in the keyhole to disengage the latch. Information on how to remove the pollutants and detailed drawing of the structure can be reviewed in the Appendix C.

This facility contains an Operation and Maintenance manual as prepared by the manufacturer and is provided in Appendix C.

5. Facility Access

Maintenance access to the facility:

☐Roadside pad	☒Roadside shoulder
☐Access road with Gate	☐Access road without Gate
☐Confined Space Entry	☐Lane Closure needed

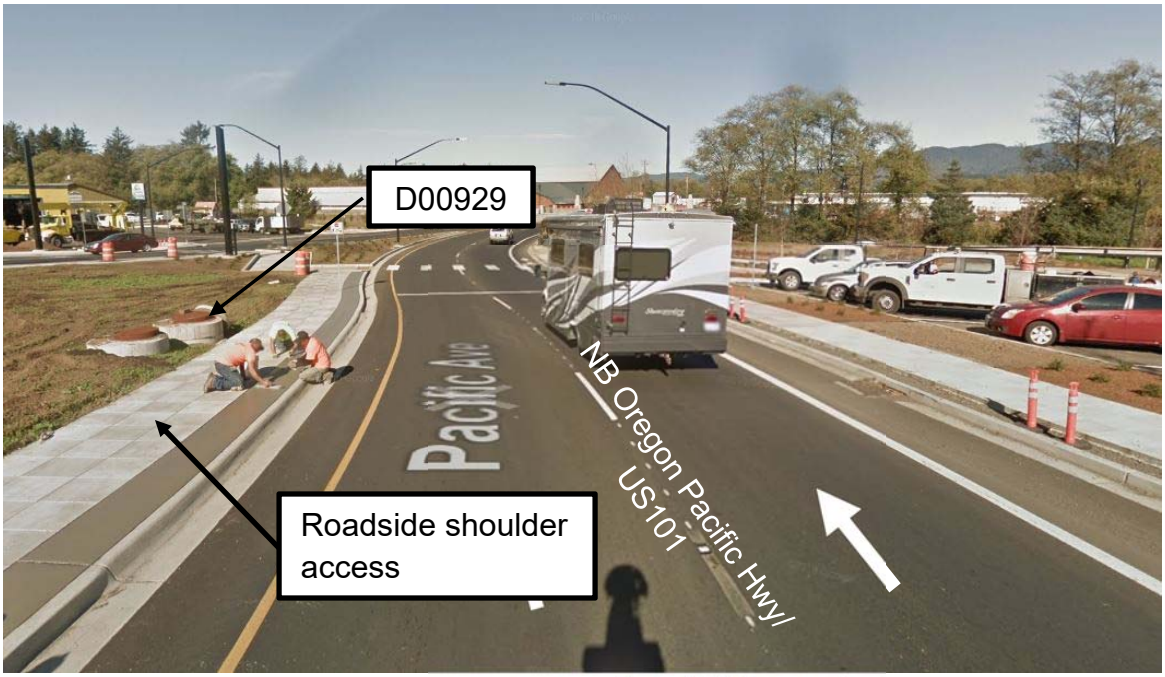


Figure 4: D00929 maintenance access from NB Oregon Pacific Hwy

6. Operational Components / Maintenance Items

Classification and Standard Operational (Op) Plan:

This facility is classified as a:

☐ **Operational Plan A** Detention Tank	☒ **Operational Plan B** Detention Vault	☐ **Operational Plan C** Manifold Detention System
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.

Key Features/Items:

☐ This facility has a bypass component (T2). T2 is a(n):

☐ **Weir type flow splitter**	☐ **Orifice type flow splitter**	☐ **Other:**

☒ This facility has a Pre-treatment Manhole (T1). T1 is a(n):

☒ **ODOT Pollution control manhole**
☐ **CDS (Continuous Deflective Separator)**
☐ **Downstream Defender**
☐ **Stormceptor**
☐ **Bayfilter**

Include manufacturer's Operaion and Maintenance manual as part of this document. Attach as Appendix C.

Operational Components

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 detention tanks/vaults, implemented October 2018, 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/

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: Detention Tank/Vault Components		ID #
Manholes		
Pre-Treatment Manhole	☒	**T 1**
Flow Splitter Manhole	☐	**T 2**
Flow Control Manhole	☐	**T 3**
Standard Manhole	☒	**T 4**
Sump	☐	**T 5**
Facility Inlet		
Inlet Pipe - 12”	☒	**T 6**
Facility Structures		
Main Tank/Vault	☒	**T 7**
Additional Back-Up Tank	☐	**T 8**
Manifold Pipe	☐	**T 9**
Connecting Pipe	☐	**T 10**
Access Opening	☒	**T 11**
Facility Outlet		
Outlet Flow Control	☐	**T 12**
Drainage Mechanism	☐	**T 13**
Outlet Pipe - 12”	☒	**T 14**
Outfall Type		
Outfall (Waterbody, **C**reek/**L**ake/**O**cean)	☒**C** ☐**L** ☐**O**	**T 15**
Ditch	☐	**T 16**
Storm Drain System	☐	**T 17**
Outfall Components		
Riprap Bank Protection	☐	**T 18**

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 in the Maintenance Guide for conditions when maintenance is needed.
c. Keep a record of inspections, maintenance, and repairs.

Maintenance Guide/Maintenance Actions

The Maintenance Guide 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 detention tanks or vaults:

- Table 1 (General Maintenance): Contains general maintenance and inspection guidelines that are applicable to all ODOT water quality and detention facilities
- Table 6 (Detention Vaults): Contains maintenance information for detention vaults
- Table 7 (Detention Tanks): Contains maintenance information for detention tanks and large diameter pipe

For this facility,

☐ **Jet Rodding is allowed**	☒ **Jet rodding in NOT allowed**

The ODOT Maintenance Guide can be viewed at the following website:
http://www.oregon.gov/ODOT/HWY/OOM/pages/mguide.aspx

The Blue Book can be viewed at the following website:
http://www.oregon.gov/ODOT/Maintenance/Documents/blue_book.pdf

8. Limitations

Care should be taken when vehicles enter the facility to prevent the creation of depressions (tire ruts) and limit damage to vegetation and structural components. Maintenance vehicles should remain upon provided access areas.

9. Waste Material Handling

Material removed from the facility is defined as waste by the Department of Environmental Quality (DEQ). Refer to the road waste section of the ODOT Maintenance Yard Environmental Management System (EMS) Policy and Procedures Manual for disposal options:

http://www.oregon.gov/ODOT/HWY/OOM/pages/ems.aspx

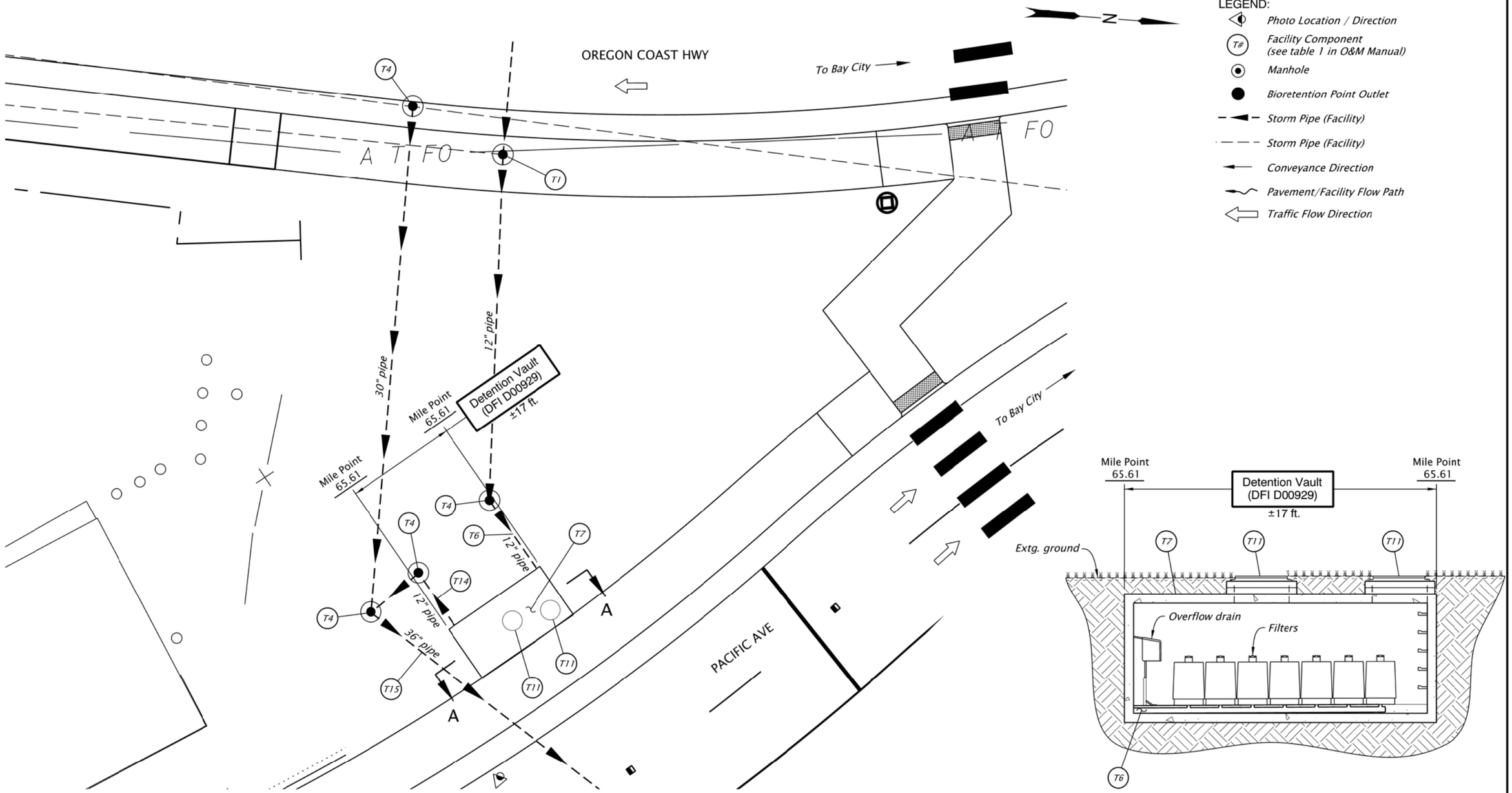
Contact any of the following for more detailed information about management of waste materials found on site:

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 D00929



PLAN
N.T.S.

OREGON DEPARTMENT OF TRANSPORTATION

Prepared By: Ramiro Perez

Drafted By: Michael Skelton

DFI D00929
MAINTENANCE DISTRICT 1 HWY 009
DETENTION VAULT
OREGON COAST HWY MP 65.61
TILLAMOOK COUNTY

D00929.dgn :: D00929_SHEET 9/16/2019 8:45:20 AM hwye31g

Rotation: 94.3569° Scale: 1"=15'

B Appendix B – Project Contract Plans

Contents:

Site Specific Subset of Project Contract Plan 49V-060

49V-060

INDEX OF SHEETS	
SHEET NO.	DESCRIPTION
1	Title Sheet
1A, 1A-2	Index Of Sheets Cont.
1A-3	Std. Drg. Nos.
1B	Plan Sheet Layout

STATE OF OREGON

DEPARTMENT OF TRANSPORTATION

PLANS FOR PROPOSED PROJECT

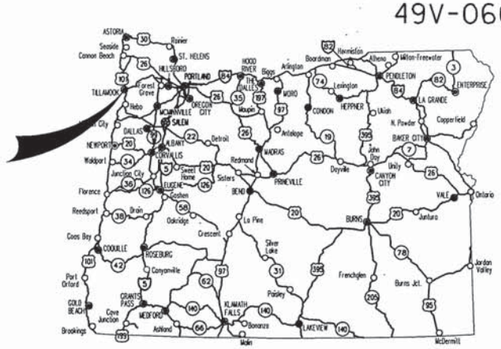
GRADING, DRAINAGE, STRUCTURES, PAVING, SIGNING, ILLUMINATION, SIGNALS, & ROADSIDE DEVELOPMENT

US101 @ OR6 (TILLAMOOK) SEC.

OREGON COAST HWY. & WILSON RIVER HWY.

TILLAMOOK COUNTY

MAY 2016



Overall Length Of Project - 0.4 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.)

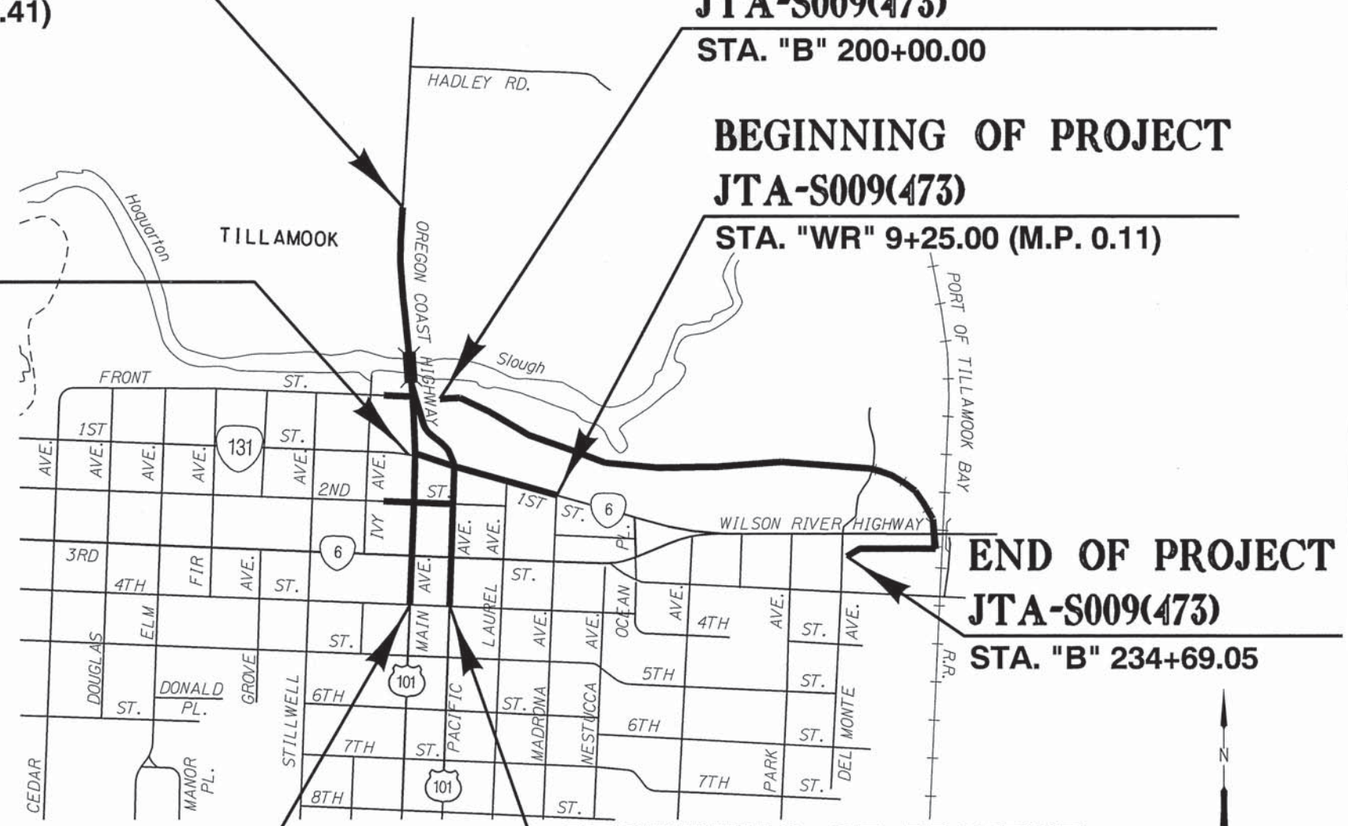
LET'S ALL WORK TOGETHER TO MAKE THIS JOB SAFE

END OF PROJECT
JTA-S009(473)
STA. "L" 412+03.00 (M.P. 65.41)

BEGINNING OF PROJECT
JTA-S009(473)
STA. "B" 200+00.00

BEGINNING OF PROJECT
JTA-S009(473)
STA. "WR" 9+25.00 (M.P. 0.11)

END OF PROJECT
JTA-S009(473)
STA. "WR" 17+62.63 (M.P. 9.07)



BEGINNING OF PROJECT
JTA-S009(473)
STA. "M" 191+93.00 (M.P. 65.78)

BEGINNING OF PROJECT
JTA-S009(473)
STA. "P" 192+68.00 (M.P. 65.81)

END OF PROJECT
JTA-S009(473)
STA. "B" 234+69.05

N

T. 1 S., R. 9 W., W.M.

OREGON TRANSPORTATION COMMISSION

Tammy Baney	CHAIR
David Lohman	COMMISSIONER
Susan Morgan	COMMISSIONER
Alando Simpson	COMMISSIONER
Sean O'Hollaren	COMMISSIONER
Matthew L. Garrett	DIRECTOR OF TRANSPORTATION

PLANS PREPAIRED FOR
OREGON DEPARTMENT OF TRANSPORTATION

QUINCY ENGINEERING

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: 3/3/16
Signature & date

Jeff W. Olson, Principal
Print name and title

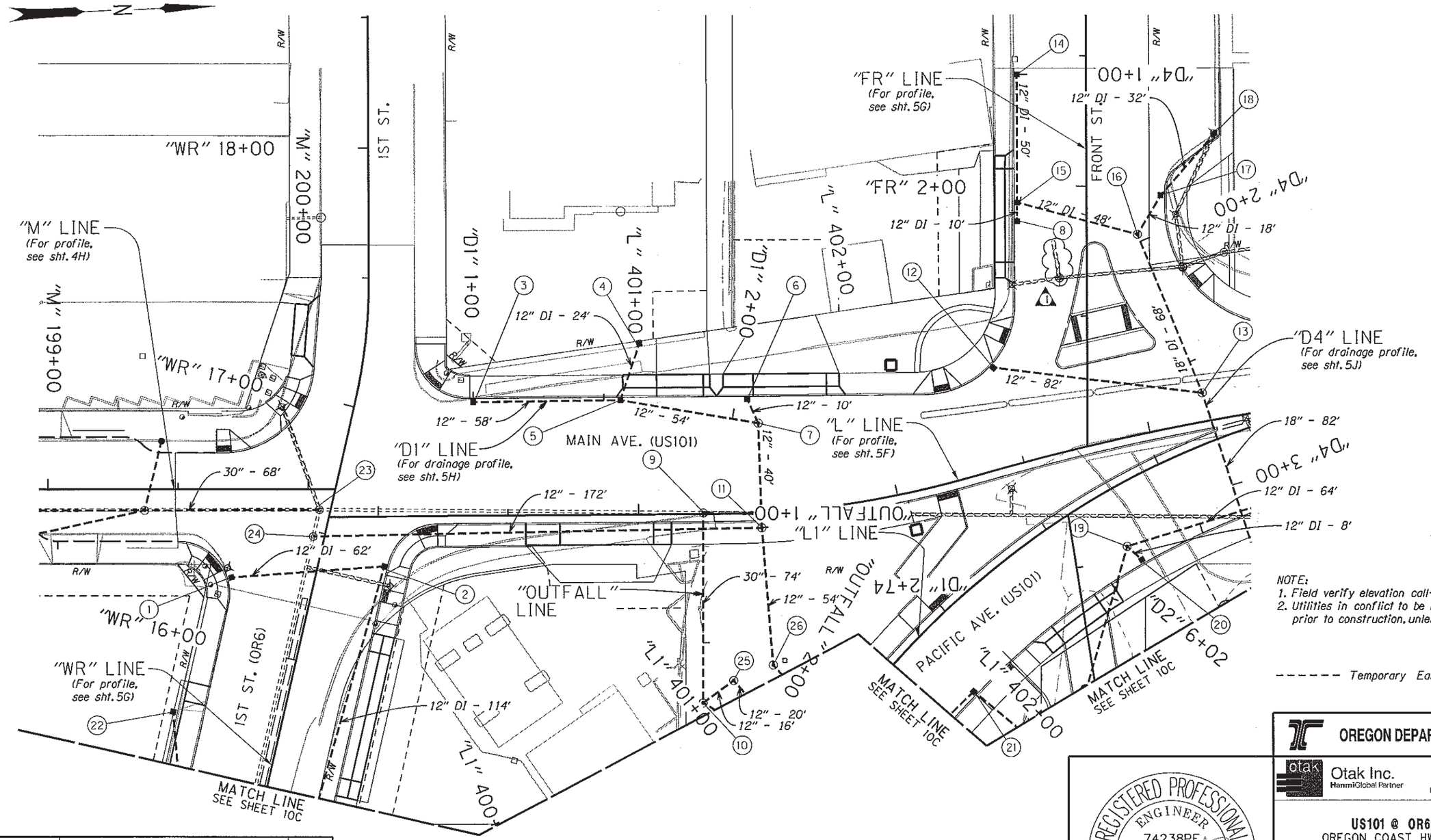
3/22/16
Concurrence by ODOT Chief Engineer

US101 @ OR6 (TILLAMOOK) SEC.
OREGON COAST HWY. & WILSON RIVER HWY.
TILLAMOOK COUNTY

FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	JTA-S009(473)	1

Sec. 30, T. 1 S., R. 9 W., W.M.
TILLAMOOK

49V-060



NOTE:
1. Field verify elevation call-outs noted with "±".
2. Utilities in conflict to be relocated by others prior to construction, unless otherwise noted.

------ Temporary Easement

No.	DATE	REVISIONS	BY
1	05-03-16	Identified addtional abandoned pipe	A.M.C.

Abandon pipe shown thus:
Remove inlet shown thus:
Remove manhole shown thus:

REGISTERED PROFESSIONAL ENGINEER
74238PE
OREGON
JAN 8, 2009
ASHLEY M. CANTLON
RENEWS: 12/31/2017

OREGON DEPARTMENT OF TRANSPORTATION

Otak Inc.
HanmiGlobal Partner
700 Washington St. Ste. 401
Vancouver, WA 98660
Phone: 360.373.9813 Fax: 360.737.9651

US101 @ OR6 (TILLAMOOK) SEC.
OREGON COAST HWY. & WILSON RIVER HWY.
TILLAMOOK COUNTY

Reviewed By - T Kraft
Designed By - A Cantlon
Drafted By - A Cobb/M McCandless

DRAINAGE PLAN

SHEET NO. 5C

(1) Sta "WR" 16+25.60', 31.22' Lt.
Const. type G-2 inlet with sump
Rim 27.33
I.E. Out= 24.10 (12" N)

(2) Sta "WR" 16+42.84, 24.81' Rt.
Const. type G-2 inlet with sump
Rim 26.96
I.E. In= 23.83 (12" S)
I.E. Out= 23.83 (12" E)
Install 12" DI storm sew. pipe - 62'
5' depth

(3) Sta. "L" 400+37.12, 45.00' Lt.
Const. type G-2 inlet with sump
Rim 24.79
I.E. Out= 21.80 (12" N)

(4) Sta. "L" 401+01.05, 65.50' Lt.
Const. type G-2 inlet with sump
Rim 22.17
I.E. Out= 18.72 (12" E)

(5) Sta. "L" 400+93.51, 43.88' Lt.
Const. type G-2 inlet with sump
Rim 22.65
I.E. In= 18.60 (12" W)
I.E. In= 18.60 (12" S)
I.E. Out= 18.50 (12" N)
Inst. 12" storm sew. pipe - 58'
5' depth
Inst. 12" DI storm sew. pipe - 24'
5' depth

(6) Sta. "L" 401+43.79, 43.69' Lt.
Const. type G-2 inlet with sump
Rim 20.17
I.E. Out= 16.90 (12" E)

(7) Sta. "L" 401+47.90, 34.32' Lt.
Const. shallow storm sew. pollution control manhole
Rim 20.16
I.E. In= 15.53 (12" W)
I.E. In= 15.53 (12" S)
I.E. Out= 15.43 (12" E)
(See drg. no. RD340 and RD342)
Inst. 12" storm sew. pipe - 64'
5' depth

(8) Sta. "FR" 1+86.56, 26.88 Lt.
Const. type G-2 inlet with sump
Rim 14.78
I.E. Out= 11.94

(9) Sta. "L" 401+25.04, 0.37' Lt.
Const. large precast manhole, 60" dia.
Rim 22.50
I.E. In= 8.18 (30" S) extg.
I.E. Out= 8.04 (30" E)
Connect to extg. storm sew. pipe

(10) Sta. "L 1" 401+04.34, 39.57' Lt.
Const. large precast manhole, 72" dia.
Rim 22.89
I.E. In= 11.24 (12" N)
I.E. In= 7.50 (30" W)
I.E. Out= 6.25 (36" NE)
Inst. 12" storm sew. pipe - 16'
20' depth
Inst. 30" storm sew. pipe - 74'
20' depth

(11) Sta. "L" 401+47.07, 5.91' Rt.
Const. storm sew. pollution control manhole
Rim 21.49
I.E. In= 15.23 (12" W)
I.E. In= 15.03 (12" S)
I.E. Out= 15.21 (12" E)
Inst. 12" storm sew. pipe - 212'
10' depth

(12) Sta. "L" 402+48.11, 38.06' Lt.
Const. type G-2 inlet with sump
Rim 17.00
I.E. Out= 13.00 (12" N)

(13) Sta. "L" 403+22.36, 10.95' Lt.
Const. shallow storm sew. pollution control manhole
Rim 17.06
I.E. In= 12.50 (12" S)
I.E. In= 11.28 (18" W)
I.E. Out= 11.18 (18" E)
Inst. 12" storm sew. pipe - 82'
5' depth
Inst. 18" DI storm sew. pipe - 68'
10' depth

(14) Sta. "FR" 2+42.86, 26.76' Lt.
Const. type G-2 inlet with sump
Rim 14.53
I.E. Out= 12.11 (12" E)

(15) Sta. "FR" 1+93.72, 26.57' Lt.
Const. type G-2 inlet with sump
Rim 14.70
I.E. In= 11.89 (12" W)
I.E. In= 11.89 (12" E)
I.E. Out= 11.89 (12" N)
Inst. 12" DI storm sew. pipe - 60'
5' depth

(16) Sta. "FR" 1+81.46, 19.52' Rt.
Const. shallow manhole
Rim 15.52
I.E. In= 11.56 (12" NW)
I.E. In= 11.56 (12" S)
I.E. Out= 11.46 (18" E)
Inst. 12" DI storm sew. pipe - 66'
5' depth

(17) Sta. "FR" 1+96.53, 28.44' Rt.
Const. type G-2 inlet with sump
Rim 15.05
I.E. In= 11.54 (12" NW)
I.E. Out= 11.54 (12" SE)
Inst. 12" DI storm sew. pipe - 32'
5' depth

(18) Sta. "FR" 2+19.84, 48.90' Rt.
Const. type G-2 inlet with sump
Rim 15.05
I.E. Out= 11.68 (12" SE)

(19) Sta. "L 1" 402+73.72, 22.23' Rt.
Const. large precast shallow manhole, 60" dia.
Rim 16.55
I.E. In= 13.36 (12" N)
I.E. In= 13.36 (12" NE)
I.E. Out= 13.26 (12" E)
Inst. 12" DI storm sew. pipe - 72'
5' depth

(20) Sta. "L 1" 402+76.20, 29.49' Lt.
Const. type G-2 inlet with sump
Rim 16.40
I.E. Out= 13.40 (12" SW)

(21) Sta. "L 1" 401+85.02, 29.51' Rt.
Const. type G-2 inlet with sump
Rim 17.33
I.E. In= 14.30 (12" SE)
I.E. Out= 14.30 (12" NE)
Inst. 12" DI storm sew. pipe - 72'
5' depth

(22) Sta. "WR" 15+69.98, 41.74' Lt.
Const. type G-2 inlet with sump
Rim 27.00
I.E. Out= 24.00 (12" NE)

(23) Sta. "WR" 16+58.50, 4.12' Lt.
Minor adjust MH
Connect to extg. MH
I.E. In= 20.14 (18" SE) extg.
I.E. In= 19.04 (12" SW) extg.
I.E. In= 9.44 (30" S)
I.E. Out= 9.44 (30" N) extg.
Inst. 30" storm sew. pipe - 68'
Over 20' depth

(24) Sta. "WR" 16+47.98, 4.17' Lt.
Const. diversion manhole, 60"
Rim 27.39
I.E. In= 20.24 (18" E) extg.
I.E. Out= 20.20 (18" W) extg.
I.E. Out= 20.20 (12" N)
Connect to extg. storm sew. pipe
(For details, see sht. GJ-15)

(25) Sta. "L 1" 401+20.63, 38.95' Lt.
Const. manhole
Rim 21.49
I.E. In = 11.52 (12" E)
I.E. Out= 11.32 (12" S)
Inst. 12" storm sew. pipe - 20'
10' depth

(26) Sta. "L 1" 401+37.53, 33.29' Lt.
Const. manhole
Rim 21.49
I.E. In = 14.94 (12" W)
I.E. Out= 14.74 (12" E)
Inst. 12" storm sew. pipe - 54'
10' depth

REGISTERED PROFESSIONAL ENGINEER
74238PE
OREGON
JAN 8, 2009
ASHLEY M. CANTLON
3-14-16
RENEWS: 12/31/2017

OREGON DEPARTMENT OF TRANSPORTATION

otak Otak Inc.
HanmiGlobal Partner
700 Washington St, Ste. 401
Vancouver, WA 98660
Phone: 360.373.9613 Fax: 360.737.9651

US101 @ OR6 (TILLAMOOK) SEC.
OREGON COAST HWY. & WILSON RIVER HWY.
TILLAMOOK COUNTY

Reviewed By - T Kraft
Designed By - A Cantlon
Drafted By - A Cobb/M McCandless

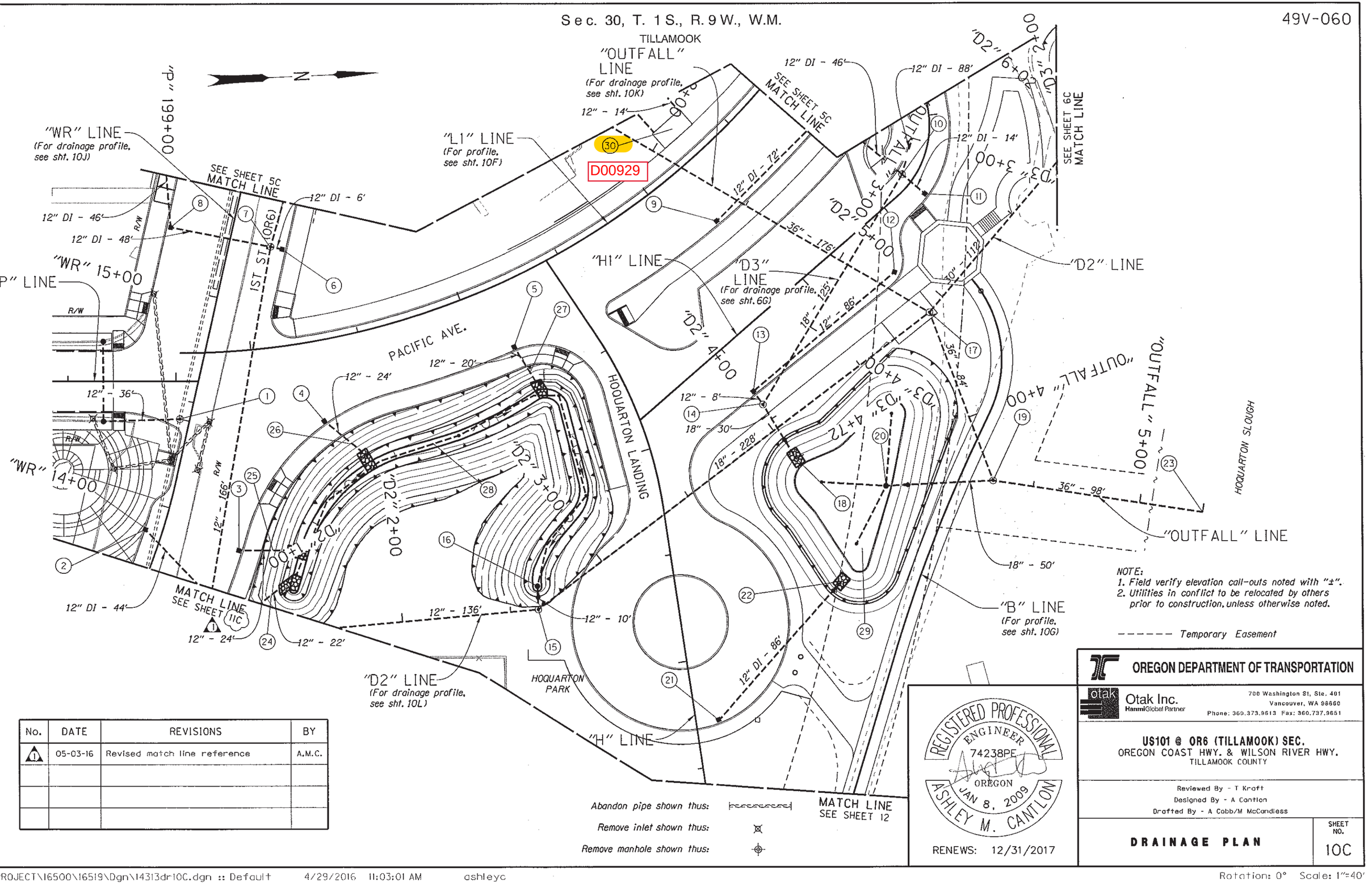
DRAINAGE NOTES

SHEET NO. 5D

49V-060

Sec. 30, T. 1 S., R. 9 W., W.M.

TILLAMOOK



NOTE:
1. Field verify elevation call-outs noted with "±".
2. Utilities in conflict to be relocated by others prior to construction, unless otherwise noted.

------ Temporary Easement

Abandon pipe shown thus:

Remove inlet shown thus:

Remove manhole shown thus:

No.	DATE	REVISIONS	BY
1	05-03-16	Revised match line reference	A.M.C.

REGISTERED PROFESSIONAL ENGINEER
74238PE
OREGON
JAN 8, 2009
ASHLEY M. CANTLON
RENEWS: 12/31/2017

OREGON DEPARTMENT OF TRANSPORTATION

otak Otak Inc. HanmiGlobal Partner
700 Washington St, Ste. 401
Vancouver, WA 98660
Phone: 360.373.9613 Fax: 360.737.9651

US101 @ OR6 (TILLAMOOK) SEC.
OREGON COAST HWY. & WILSON RIVER HWY.
TILLAMOOK COUNTY

Reviewed By - T Kraft
Designed By - A Cantlon
Drafted By - A Cobb/M McCandless

DRAINAGE PLAN

SHEET NO. 10C

(1) Sta. "WR" 14+41.12, 4.51' Rt.
Const. shallow manhole
Rim 27.39
I.E. In= 21.08 (18" E) extg.
I.E. In= 21.13 (12" S)
I.E. Out= 21.08 (18" W) extg.
Connect to extg. storm sew. pipe
Inst. 12" storm sew. pipe - 36'
10' depth

(2) Sta. "WR" 13+86.98, 7.84' Lt.
Const. type G-2 inlet with sump
Rim 27.60
I.E. Out= 24.27 (12" NE)

(3) Sta. "WR" 13+90.56, 36.55' Lt.
Const. type G-2 inlet with sump
Rim 27.00
I.E. Out= 23.00 (12" N)

(4) Sta. "L 1" 399+27.64, 37.16' Rt.
Const. type G-2 inlet with sump
Rim 24.79
I.E. Out= 20.00 (12" NE)

(5) Sta. "L 1" 400+13.98, 29.53' Rt.
Const. type G-2 inlet with sump
Rim 23.60
I.E. Out= 19.60 (12" NE)

(6) Sta. "WR" 15+28.45, 24.46' Lt.
Const. type G-2 inlet with sump
Rim 27.02
I.E. Out= 23.90 (12" S)

(7) Sta. "WR" 15+28.42, 19.01' Lt.
Const. shallow manhole
Rim 27.13
I.E. In= 23.56 (12" N)
I.E. In= 23.32 (12" W)
I.E. In= 23.56 (12" S)
I.E. Out= 23.22 (12" E)
Connect to extg. storm sew. pipe
Inst. 12" DI storm sew. pipe - 168'
5' depth

(8) Sta. "WR" 15+26.93, 28.15' Rt.
Const. type G-2 inlet with sump
Rim 27.00
I.E. In= 23.80 (12" W)
I.E. Out= 23.80 (12" N)
Inst. 12" DI storm sew. pipe - 46'
5' depth

(9) Sta. "L 1" 401+16.50, 29.32' Lt.
Const. type G-2 inlet with sump
Rim 19.20
I.E. Out= 15.20 (12" NW)

(10) Sta. "L 1" 401+89.32, 74.81' Lt.
Const. shallow manhole
Rim 16.85
I.E. In= 12.85 (12" SW)
I.E. In= 12.85 (12" W)
I.E. In= 12.85 (12" NE)
I.E. Out= 12.77 (18" SE)
Inst. 12" DI storm sew. pipe - 148'
5' depth

(11) Sta. "L 1" 401+90.75, 88.66' Lt.
Const. type G-2 inlet with sump
Rim 16.80
I.E. Out= 12.92 (12" SW)

(12) Sta. "L 1" 01+53.65, 02.79' Lt.
Const. type G-2 inlet with sump
Rim 18.07
I.E. Out= 13.90 (12" SE)

(13) Sta. "L 1" 400+87.07, 102.29' Lt.
Const. type G-2 inlet with sump
Rim 19.00
I.E. In= 13.52 (12" NW)
I.E. Out= 13.52 (12" NE)
Inst. 12" storm sew. pipe - 86'
10' depth

(14) Sta. "L 1" 400+87.14, 109.31' Lt.
Const. storm sew. pollution control manhole
Rim 19.0
I.E. In= 11.13 (18" NW)
I.E. In= 13.49 (12" SW)
I.E. Out= 11.03 (18" NE)
Inst. 12" storm sew. pipe - 8'
10' depth
Inst. 18" storm sew. pipe - 125'
10' depth

(15) Sta. "L 1" 399+86.75, 146.95' Lt.
Const. std. manhole
Rim 20.0
I.E. In= 14.22 (12" S)
I.E. In= 12.75 (12" W)
I.E. Out= 11.05 (18" NW)
Inst. 12" storm sew. pipe - 146'
10' depth

(16) Sta. "L 1" 399+88.88, 136.56' Lt.
Const. ditch inlet
Rim 15.47
I.E. In= 12.97 (6" W)
I.E. Out= 12.77 (12" E)

(17) Sta. "L 1" 401+52.07, 127.48' Lt.
Const. manhole, 72" dia.
Rim 17.00
I.E. In= 7.00 (18" SE)
I.E. In= 6.02 (36" SW)
I.E. In= 6.36 (30" NW)
I.E. Out= 5.92 (36" E)
Inst. 18" storm sew. pipe - 228'
10' depth
Inst. 30" storm sew. pipe - 112'
20' depth
Inst. 36" storm sew. pipe - 176'
20' depth

(18) Sta. "L 1" 400+85.68, 139.17' Rt.
Const. storm outfall class 50 riprap
I.E. Out= 10.88 (18" W)
(For details, see sht. GJ-14)
Inst. 18" storm sew. pipe - 30'
10' depth

(19) Sta. "L 1" 401+29.51, 203.86' Lt.
Const. shallow manhole, 72" dia.
Rim 13.00
I.E. In= 5.84 (36" W)
I.E. In= 7.43 (18" S)
I.E. Out= 5.74 (36" N)
Inst. 18" storm sew. pipe - 50'
10' depth
Inst. 36" storm sew. pipe - 84'
20' depth

(20) Sta. "L 1" 400+03.58, 173.81' Rt.
Const. beehive inlet
Rim 11.55
I.E. Out= 7.68 (18" N)
(For details, see sht. GJ-12)

(21) Sta. "L 1" 400+24.51, 225.73' Lt.
Const. type G-2 inlet with sump
Rim 15.17
I.E. Out= 11.35 (12" NW)

(22) Sta. "L 1" 400+75.47, 197.79' Rt.
Const. storm outfall class 50 riprap
I.E. Out= 10.88 (12" S)
(For details, see sht. GJ-14)
Inst. 12" storm sew. pipe - 86'
5' depth

(23) Sta. "L" 400+64.30, 282.66' Lt.
Const. storm outfall Class 100 riprap, with tidegate
I.E. Out= 5.64 (36" S)
(For details, see sht. GJ-14)
Inst. 36" storm sew. pipe - 98'
10' depth

(24) Sta. "WR" 13+77.53, 57.30' Lt.
Const. storm outfall class 50 riprap
I.E. Out= 22.0 (12" S)
(For details, see sht. GJ-14)
Inst. 12" storm sew. pipe - 22'
5' depth

(25) Sta. "WR" 13+94.57, 51.69' Lt.
Const. storm outfall class 50 riprap
I.E. Out= 22.0 (12" SE)
(For details, see sht. GJ-14)
Inst. 12" storm sew. pipe - 24'
5' depth

(26) Sta. "L 1" 399+37.41, 50.07' Rt.
Const. storm outfall class 50 riprap
I.E. Out= 21.0 (12" SE)
(For details, see sht. GJ-14)
Inst. 12" storm sew. pipe - 24'
5' depth

(27) Sta. "L 1" 400+16.05, 43.08' Rt.
Const. storm outfall class 50 riprap
I.E. Out= 19.0 (12" W)
(For details, see sht. GJ-14)
Inst. 12" storm sew. pipe - 20'
5' depth

(28) Sta. "L 1" 399+57.24 to Sta. "L 1" 401+33.00, Rt.
Const. Water Quality Swale D00930- 258'
(For details, see sht. GJ-5)

(29) Sta. "L 1" 401+67.40 to Sta. "L 1" 402+27.95, Rt.
Const. Bioretention Pond D00927- 6,600 Sq. Ft.
(For details, see sht. GJ-8)

(30) Sta. "L 1" 401+28.70, 16.19' Lt.
Const. water quality structure D00929
Rim 21.49
I.E. In= 14.67 (12" SW)
I.E. Out= 11.62 (12" SW)
Inst. 12" storm sew. pipe - 14'
10' depth
(For details, see sht. GJ-6)

REGISTERED PROFESSIONAL ENGINEER
74238PE
OREGON
JAN 8, 2009
ASHLEY M. CANTLON
3-14-16
RENEWS: 12/31/2017

OREGON DEPARTMENT OF TRANSPORTATION

otak Otak Inc.
HanmiGlobal Partner
700 Washington St, Ste. 401
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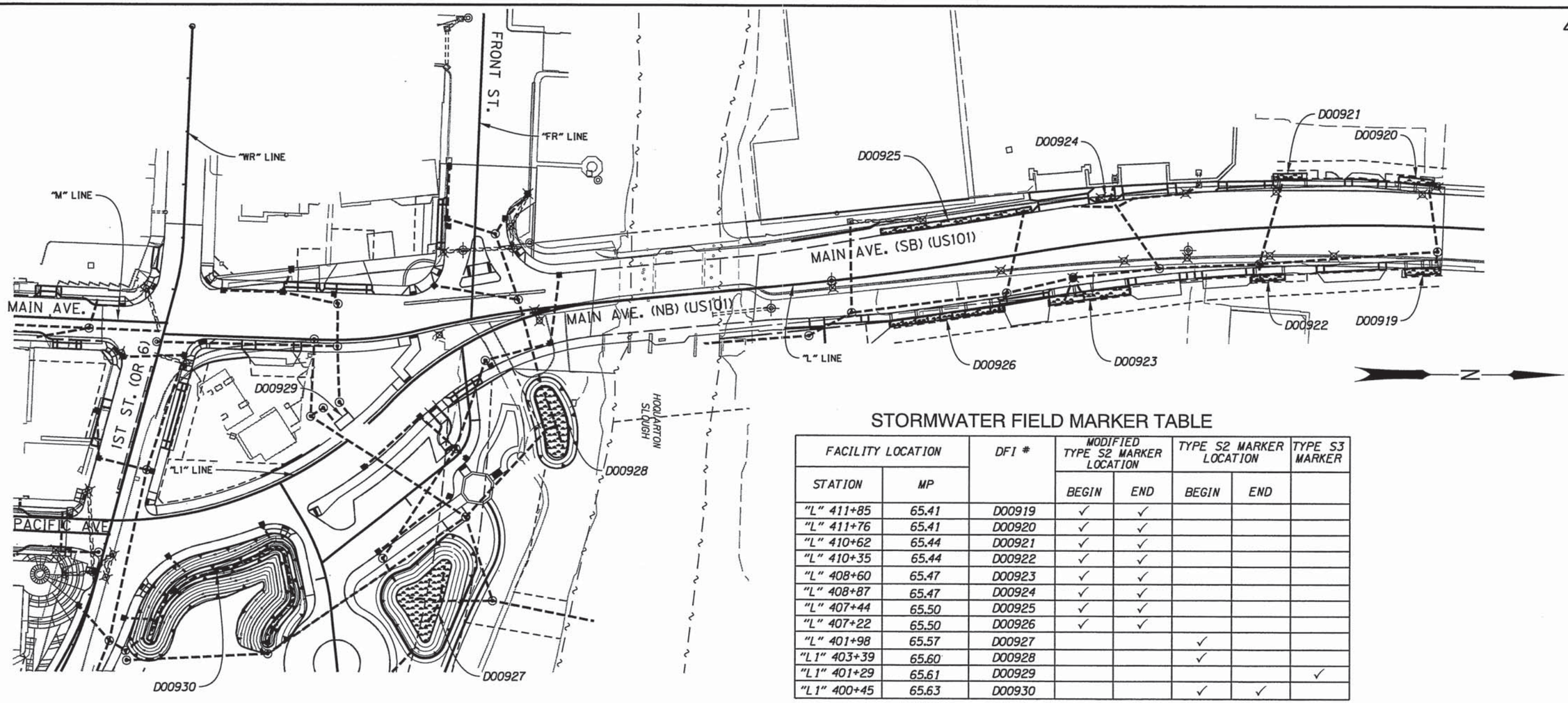
US101 @ OR6 (TILLAMOOK) SEC.
OREGON COAST HWY. & WILSON RIVER HWY.
TILLAMOOK COUNTY

Reviewed By - T Kraft
Designed By - A Cantlon
Drafted By - A Cobb/M McCandless

DRAINAGE NOTES

SHEET NO. 10D

49V-060



PLAN
No Scale

STORMWATER FIELD MARKER TABLE

FACILITY LOCATION		DFI #	MODIFIED TYPE S2 MARKER LOCATION		TYPE S2 MARKER LOCATION		TYPE S3 MARKER
STATION	MP		BEGIN	END	BEGIN	END	
"L" 411+85	65.41	D00919	✓	✓			
"L" 411+76	65.41	D00920	✓	✓			
"L" 410+62	65.44	D00921	✓	✓			
"L" 410+35	65.44	D00922	✓	✓			
"L" 408+60	65.47	D00923	✓	✓			
"L" 408+87	65.47	D00924	✓	✓			
"L" 407+44	65.50	D00925	✓	✓			
"L" 407+22	65.50	D00926	✓	✓			
"L" 401+98	65.57	D00927			✓		
"L1" 403+39	65.60	D00928			✓		
"L1" 401+29	65.61	D00929					✓
"L1" 400+45	65.63	D00930			✓	✓	

See Drg. No. RD399 for facility marker details.

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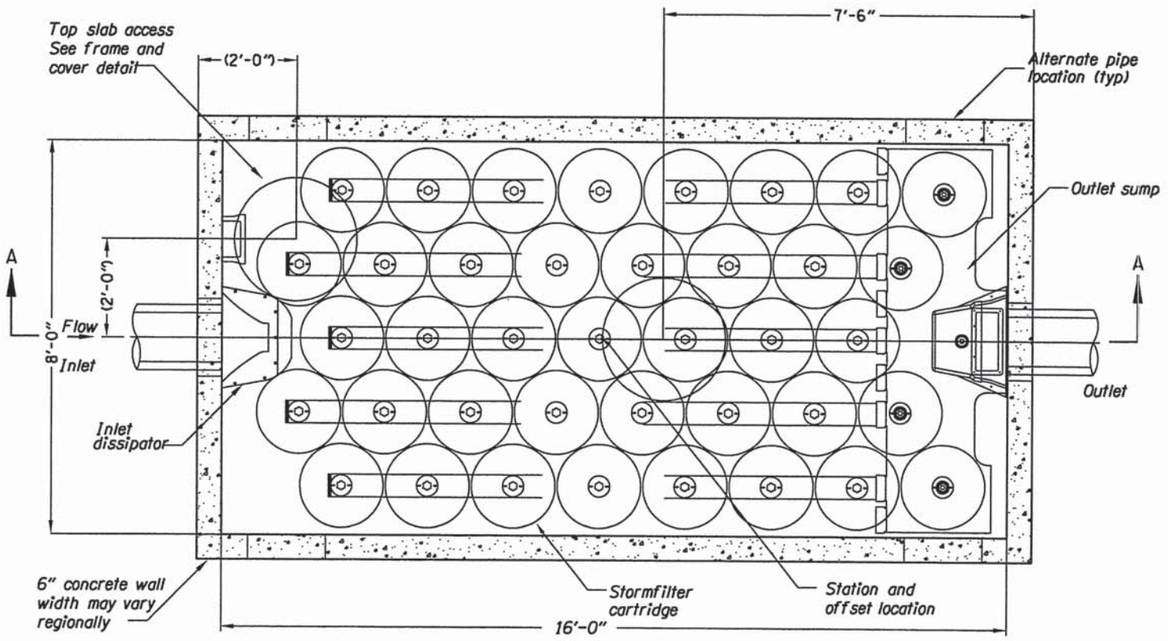
OREGON COAST HWY. & WILSON RIVER HWY.
TILLAMOOK COUNTY

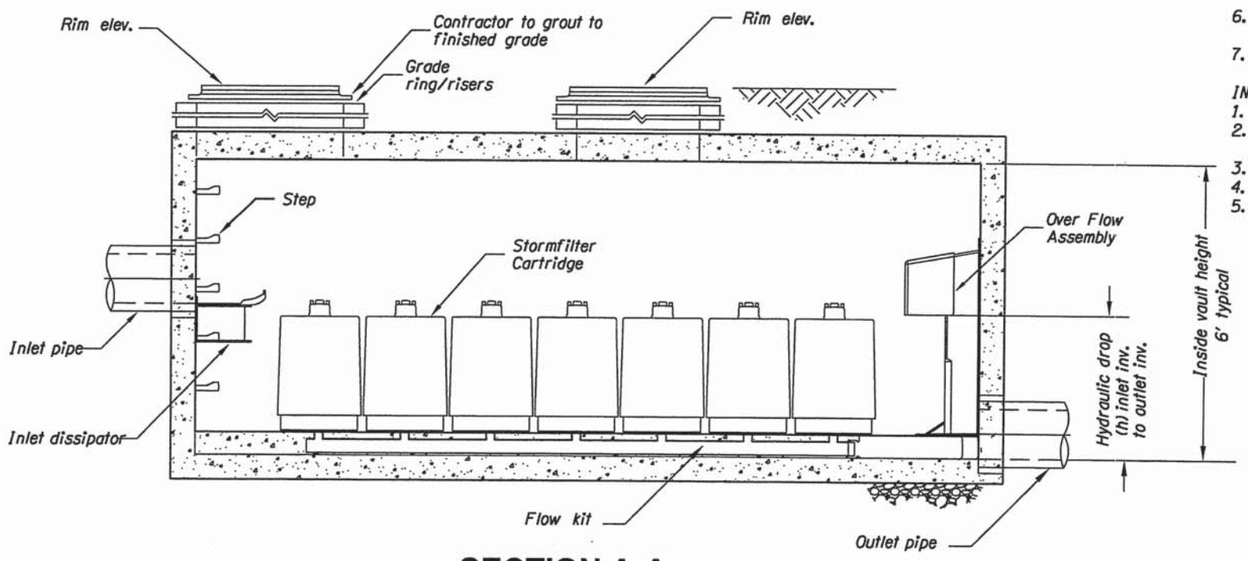
Reviewed By - T Kraft
Designed By - A Cantlon
Drafted By - A Cobb

WATER QUALITY PLAN

SHEET NO. GJ-2



PLAN VIEW
Vault Style: Outlet Sump (NIB)



SECTION A-A

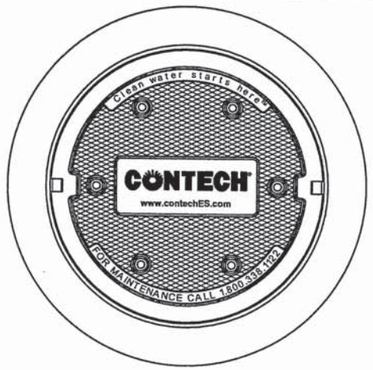
STORMFILTER DESIGN NOTES

49V-060

STORMFILTER TREATMENTCAPACITY IS A FUNCTION OF THE CARTRIDGE SELECTION AND THE NUMBER OF CARTRIDGES. THE STANDARD VAULT STYLE IS SHOWN WITH THE MAXIMUM NUMBER OF CARTRIDGES (39). VAULT STYLE OPTIONS INCLUDE INLET BAY (32), INLET BAY/OUTLET BAY (27), OUTLET BAY (34), FULL HEIGHT BAFFLE WALL (30). STORMFILTER 8X16 PEAK HYDRAULIC CAPACITY IS 1.8 CFS. IF THE SITE CONDITIONS EXCEED 1.8 CFS AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

CARTRIDGE SELECTION

CARTRIDGE HEIGHT	27"		18"		LOW DROP	
RECOMMENDED HYDRAULIC DROP (H)	3.05'		2.3'		1.8'	
SPECIFIC FLOW RATE (gpm/sf)	2 gpm/ft²	1 gpm/ft²	2 gpm/ft²	1 gpm/ft²	2 gpm/ft²	1 gpm/ft²
CARTRIDGE FLOW RATE (gpm)	22.5	11.25	15	7.5	10	5



FRAME AND COVER
(Diameter varies)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS			
STRUCTURE ID			D00929
WATER QUALITY FLOW RATE (cfs)			0.74
PEAK FLOW RATE (cfs)			1.41
RETURN PERIOD OF PEAK FLOW (yrs)			25
* OF CARTRIDGES REQUIRED			30
CARTRIDGE FLOW RATE (gpm)			11.25
MEDIA TYPE (CSF, PERLITE, ZPG, GAC, PHS)			MetalRx
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE *1	14.67		12"
INLET PIPE *2			
OUTLET PIPE	11.62		12"
UPSTREAM RIM ELEVATION			21.49
DOWNSTREAM RIM ELEVATION			21.49
ANTI-FLOTATION BALLAST	WIDTH		HEIGHT
NOTES/SPECIAL REQUIREMENTS:			
* PER ENGINEER OF RECORD			

GENERAL NOTES

1. Contech to provide all materials unless noted otherwise.
2. Dimensions marked with ( ) are reference dimensions. actual dimensions may vary.
3. For site specific drawings with detailed vault dimensions and weights, please contact your Contech Engineered Solutions LLC representative. www.ContechES.com
4. Stormfilter water quality structure shall be in accordance with all design data and information contained in this drawing.
5. Structure shall meet AASHTO hs20 load rating, assuming earth cover of 0' - 5' and groundwater elevation at, or below, the outlet pipe invert elevation. Engineer to confirm actual groundwater elevation. Castings shall meet AASHTO m306 and be cast with the Contech logo.
6. Filter cartridges shall be media-filled, passive, siphon actuated, radial flow, and self cleaning. radial media depth shall be 7-inches. Filter media contact time shall be at least 39 seconds.
7. Specific flow rate is equal to the filter treatment capacity (gpm) divided by the filter contact surface area (sq ft).

INSTALLATION NOTES

1. Any sub-base, backfill depth, and/or anti-flotation provisions are site-specific design considerations and shall be specified by engineer.
2. Contractor to provide equipment with sufficient lifting and reach capacity to lift and set the stormfilter vault (lifting clutches provided).
3. Contractor to install joint sealant between all vault sections and assemble vault.
4. Contractor to provide, install, and grout pipes. match outlet pipe invert with outlet bay floor.
5. Contractor to take appropriate measures to protect cartridges from construction-related erosion runoff.

CONTECH
ENGINEERED SOLUTIONS LLC
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TILLAMOOK COUNTY

Reviewed By - Ken Ackerman
Designed By - Ben Bross
Drafted by - S Reiter

WATER QUALITY STRUCTURE D00929

SHEET NO. GJ-6

C Appendix C – Proprietary Manufacturer's O&M Manual

Contents:

Manufacturer's Operation & Maintenance Manual

CONTECH
CONSTRUCTION PRODUCTS INC.

StormFilter Inspection and Maintenance Procedures

The Stormwater Management StormFilter®

Maintenance Guidelines

The primary purpose of the Stormwater Management StormFilter® is to filter out and prevent pollutants from entering our waterways. Like any effective filtration system, periodically these pollutants must be removed to restore the StormFilter to its full efficiency and effectiveness.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. It is a good practice to inspect the system after major storm events.

Maintenance Procedures

Although there are likely many effective maintenance options, we believe the following procedure is efficient and can be implemented using common equipment and existing maintenance protocols. A two step procedure is recommended as follows:

1. Inspection

Inspection of the vault interior to determine the need for maintenance.

2. Maintenance

Cartridge replacement

Sediment removal

Inspection and Maintenance Timing

At least one scheduled inspection should take place per year with maintenance following as warranted.

First, an inspection should be done before the winter season. During the inspection the need for maintenance should be determined and, if disposal during maintenance will be required, samples of the accumulated sediments and media should be obtained.

Second, if warranted, a maintenance (replacement of the filter cartridges and removal of accumulated sediments) should be performed during periods of dry weather.

In addition to these two activities, it is important to check the condition of the StormFilter unit after major storms for potential damage caused by high flows and for high sediment accumulation that may be caused by localized erosion in the drainage area. It may be necessary to adjust the inspection/ maintenance schedule depending on the actual operating conditions encountered by the system. In general, inspection activities can be conducted at any time, and maintenance should occur, if warranted, in late summer to early fall when flows into the system are not likely to be present.

Maintenance Frequency

The primary factor controlling timing of maintenance of the StormFilter is sediment loading.

A properly functioning system will remove solids from water by trapping particulates in the porous structure of the filter media inside the cartridges. The flow through the system will naturally decrease as more and more particulates are trapped. Eventually the flow through the cartridges will be low enough to require replacement. It may be possible to extend the usable span of the cartridges by removing sediment from upstream trapping devices on a routine as-needed basis in order to prevent material from being re-suspended and discharged to the StormFilter treatment system.

Site conditions greatly influence maintenance requirements. StormFilter units located in areas with erosion or active construction may need to be inspected and maintained more often than those with fully stabilized surface conditions.

The maintenance frequency may be adjusted as additional monitoring information becomes available during the inspection program. Areas that develop known problems should be inspected more frequently than areas that demonstrate no problems, particularly after major storms. Ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual StormFilter system or site. It is recommended that the site owner develop a database to properly manage StormFilter inspection and maintenance programs.

Prior to the development of the maintenance database, the following maintenance frequencies should be followed:

Inspection

One time per year

After major storms

Maintenance

As needed, based on results of inspection (The average maintenance lifecycle is approximately 1-3 years)

Per Regulatory requirement

In the event of a chemical spill

Frequencies should be updated as required. The recommended initial frequency for inspection is one time per year. StormFilter units should be inspected after major storms.

Sediment removal and cartridge replacement on an as needed basis is recommended unless site conditions warrant.

Once an understanding of site characteristics has been established, maintenance may not be needed for one to three years, but inspection is warranted and recommended annually.

Inspection Procedures

The primary goal of an inspection is to assess the condition of the cartridges relative to the level of visual sediment loading as it relates to decreased treatment capacity. It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, then typically large amounts of sediments will be present and very little flow will be discharged from the drainage pipes. If this is the case, then maintenance is warranted and the cartridges need to be replaced.

Warning: In the case of a spill, the worker should abort inspection activities until the proper guidance is obtained. Notify the local hazard control agency and CONTECH Construction Products immediately.

To conduct an inspection:

Important: Inspection should be performed by a person who is familiar with the operation and configuration of the StormFilter treatment unit.

1. If applicable, set up safety equipment to protect and notify surrounding vehicle and pedestrian traffic.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.

3. Open the access portals to the vault and allow the system vent.
4. Without entering the vault, visually inspect the inside of the unit, and note accumulations of liquids and solids.
5. Be sure to record the level of sediment build-up on the floor of the vault, in the forebay, and on top of the cartridges. If flow is occurring, note the flow of water per drainage pipe. Record all observations. Digital pictures are valuable for historical documentation.
6. Close and fasten the access portals.
7. Remove safety equipment.
8. If appropriate, make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.
9. Discuss conditions that suggest maintenance and make decision as to weather or not maintenance is needed.

Maintenance Decision Tree

The need for maintenance is typically based on results of the inspection. The following Maintenance Decision Tree should be used as a general guide. (Other factors, such as Regulatory Requirements, may need to be considered)

1. Sediment loading on the vault floor.
   a. If >4" of accumulated sediment, maintenance is required.
2. Sediment loading on top of the cartridge.
   a. If >1/4" of accumulation, maintenance is required.
3. Submerged cartridges.
   a. If >4" of static water in the cartridge bay for more that 24 hours after end of rain event, maintenance is required.
4. Plugged media.
   a. If pore space between media granules is absent, maintenance is required.
5. Bypass condition.
   a. If inspection is conducted during an average rain fall event and StormFilter remains in bypass condition (water over the internal outlet baffle wall or submerged cartridges), maintenance is required.
6. Hazardous material release.
   a. If hazardous material release (automotive fluids or other) is reported, maintenance is required.
7. Pronounced scum line.
   a. If pronounced scum line (say ≥ 1/4" thick) is present above top cap, maintenance is required.
8. Calendar Lifecycle.
   a. If system has not been maintained for 3 years maintenance is required.

Assumptions

- No rainfall for 24 hours or more
- No upstream detention (at least not draining into StormFilter)
- Structure is online
- Outlet pipe is clear of obstruction
- Construction bypass is plugged

Maintenance

Depending on the configuration of the particular system, maintenance personnel will be required to enter the vault to perform the maintenance.

Important: If vault entry is required, OSHA rules for confined space entry must be followed.

Filter cartridge replacement should occur during dry weather. It may be necessary to plug the filter inlet pipe if base flows is occurring.

Replacement cartridges can be delivered to the site or customers facility. Information concerning how to obtain the replacement cartridges is available from CONTECH Construction Products.

Warning: In the case of a spill, the maintenance personnel should abort maintenance activities until the proper guidance is obtained. Notify the local hazard control agency and CONTECH Construction Products immediately.

To conduct cartridge replacement and sediment removal maintenance:

1. If applicable, set up safety equipment to protect maintenance personnel and pedestrians from site hazards.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the doors (access portals) to the vault and allow the system to vent.
4. Without entering the vault, give the inside of the unit, including components, a general condition inspection.
5. Make notes about the external and internal condition of the vault. Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.
6. Using appropriate equipment offload the replacement cartridges (up to 150 lbs. each) and set aside.
7. Remove used cartridges from the vault using one of the following methods:

Method 1:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Unscrew (counterclockwise rotations) each filter cartridge from the underdrain connector. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

Using appropriate hoisting equipment, attach a cable from the boom, crane, or tripod to the loose cartridge. Contact CONTECH Construction Products for suggested attachment devices.

Important: Note that cartridges containing leaf media (CSF) do not require unscrewing from their connectors. Take care not to damage the manifold connectors. This connector should remain installed in the manifold and could be capped during the maintenance activity to prevent sediments from entering the underdrain manifold.

B. Remove the used cartridges (up to 250 lbs. each) from the vault.

Important: Care must be used to avoid damaging the cartridges during removal and installation. The cost of repairing components damaged during maintenance will be the responsibility of the owner unless CONTECH Construction Products performs the maintenance activities and damage is not related to discharges to the system.

C. Set the used cartridge aside or load onto the hauling truck.

D. Continue steps a through c until all cartridges have been removed.

Method 2:

A. Enter the vault using appropriate confined space protocols.

B. Unscrew the cartridge cap.

C. Remove the cartridge hood screws (3) hood and float.

D. At location under structure access, tip the cartridge on its side.

Important: Note that cartridges containing media other than the leaf media require unscrewing from their threaded connectors. Take care not to damage the manifold connectors. This connector should remain installed in the manifold and capped if necessary.

D. Empty the cartridge onto the vault floor. Reassemble the empty cartridge.

E. Set the empty, used cartridge aside or load onto the hauling truck.

F. Continue steps a through e until all cartridges have been removed.

8. Remove accumulated sediment from the floor of the vault and from the forebay. This can most effectively be accomplished by use of a vacuum truck.
9. Once the sediments are removed, assess the condition of the vault and the condition of the connectors. The connectors are short sections of 2-inch schedule 40 PVC, or threaded schedule 80 PVC that should protrude about 1" above the floor of the vault. Lightly wash down the vault interior.
    a. Replace any damaged connectors.
10. Using the vacuum truck boom, crane, or tripod, lower and install the new cartridges. Once again, take care not to damage connections.
11. Close and fasten the door.
12. Remove safety equipment.
13. Finally, dispose of the accumulated materials in accordance with applicable regulations. Make arrangements to return the used empty cartridges to CONTECH Construction Products.

Related Maintenance Activities -

Performed on an as-needed basis

StormFilter units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

In order for maintenance of the StormFilter to be successful, it is imperative that all other components be properly maintained. The maintenance/repair of upstream facilities should be carried out prior to StormFilter maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.

Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads.

Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.

RECYCLED PAPER

CONTECH CONSTRUCTION PRODUCTS INC.
800.338.1122
www.contech-cpi.com

Support

- Drawings and specifications are available at contechstormwater.com.
- Site-specific design support is available from our engineers.

CONTECH Construction Products Inc. provides site solutions for the civil engineering industry. CONTECH's portfolio includes bridges, drainage, sanitary sewer, stormwater and earth stabilization products. For information on other CONTECH division offerings, visit contech-cpi.com or call 800.338.1122

Nothing in this catalog should be construed as an expressed warranty or an implied warranty of merchantability or fitness for any particular purpose. See the CONTECH standard quotation or acknowledgement for applicable warranties and other terms and conditions of sale.

Inspection Report

Date: _____ Personnel: _____

Location: _____ System Size: _____

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

Sediment Thickness in Forebay: _____ Date: _____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

Estimated Flow from Drainage Pipes (if available): _____

Cartridges Submerged: Yes ☐ No ☐ Depth of Standing Water: _____

StormFilter Maintenance Activities (check off if done and give description)

☐ Trash and Debris Removal: _____

☐ Minor Structural Repairs: _____

☐ Drainage Area Report _____

Excessive Oil Loading: Yes ☐ No ☐ Source: _____

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: _____

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: _____

Items Needing Further Work: _____

Owners should contact the local public works department and inquire about how the department disposes of their street waste residuals.

Other Comments:

_____

_____

_____

_____

_____

_____

_____

_____

Review the condition reports from the previous inspection visits.

StormFilter Maintenance Report

Date: _____ Personnel: _____

Location: _____ System Size: _____

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

List Safety Procedures and Equipment Used: _____

_____

_____

System Observations

Months in Service:

Oil in Forebay: Yes ☐ No ☐

Sediment Depth in Forebay: _____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

Drainage Area Report

Excessive Oil Loading: Yes ☐ No ☐ Source: _____

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: _____

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: _____

StormFilter Cartridge Replacement Maintenance Activities

Remove Trash and Debris: Yes ☐ No ☐ Details: _____

Replace Cartridges: Yes ☐ No ☐ Details: _____

Sediment Removed: Yes ☐ No ☐ Details: _____

Quantity of Sediment Removed (estimate?):

Minor Structural Repairs: Yes ☐ No ☐ Details: _____

Residuals (debris, sediment) Disposal Methods: _____

Notes:

_____

_____

_____

_____

_____

_____

_____

CONTECH CONSTRUCTION PRODUCTS INC.

The Stormwater Management StormFilter®

StormFilter Maintenance Guidelines

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site, and may be required in the event of a chemical spill or due to excessive sediment loading.

Maintenance Procedures

Although there are other effective maintenance options, CONTECH recommends the following two step procedure:

1. Inspection: Determine the need for maintenance.
2. Maintenance: Cartridge replacement and sediment removal.

Inspection and Maintenance Activity Timing

At least one scheduled inspection activity should take place per year with maintenance following as warranted.

First, inspection should be done before the winter season. During which, the need for maintenance should be determined and, if disposal during maintenance will be required, samples of the accumulated sediments and media should be obtained.

Second, if warranted, maintenance should be performed during periods of dry weather.

In addition, you should check the condition of the StormFilter unit after major storms for potential damage caused by high flows and for high sediment accumulation. It may be necessary to adjust the inspection/maintenance activity schedule depending on the actual operating conditions encountered by the system.

Generally, inspection activities can be conducted at any time, and maintenance should occur when flows into the system are unlikely.

Maintenance Activity Frequency

Maintenance is performed on an as needed basis, based on inspection. Average maintenance lifecycle is 1-3 years. The primary factor controlling timing of maintenance of the StormFilter is sediment loading. Until appropriate timeline is determined, use the following:

Inspection:

One time per year

After major storms

Maintenance:

As needed

Per regulatory requirement

In the event of a chemical spill

Inspection Procedures

It is desirable to inspect during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, then typically large amounts of sediments will be present and very little flow will be discharged from the drainage pipes. If this is the case, then maintenance is warranted and the cartridges need to be replaced.

Warning: In the case of a spill, the worker should abort inspection activities until the proper guidance is obtained. Notify the local hazard control agency and CONTECH immediately.

To conduct an inspection:

Important: Inspection should be performed by a person who is familiar with the StormFilter treatment unit.

1. If applicable, set up safety equipment to protect and notify surrounding vehicle and pedestrian traffic.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the access portals to the vault and allow the system vent.
4. Without entering the vault, visually inspect the inside of the unit, and note accumulations of liquids and solids.
5. Be sure to record the level of sediment build-up on the floor of the vault, in the forebay, and on top of the cartridges. If flow is occurring, note the flow of water per drainage pipe. Record all observations. Digital pictures are valuable for historical documentation.
6. Close and fasten the access portals.
7. Remove safety equipment.
8. If appropriate, make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.
9. Discuss conditions that suggest maintenance and make decision as to weather or not maintenance is needed.

Maintenance Decision Tree

The need for maintenance is typically based on results of the inspection. Use the following as a general guide. (Other factors, such as regulatory requirements, may need to be considered)

1. Sediment loading on the vault floor. If >4" of accumulated sediment, then go to maintenance.
2. Sediment loading on top of the cartridge. If >1/4" of accumulation, then go to maintenance.
3. Submerged cartridges. If >4" of static water in the cartridge bay for more that 24 hrs after end of rain event, then go to maintenance.
4. Plugged media. If pore space between media granules is absent, then go to maintenance.
5. Bypass condition. If inspection is conducted during an average rain fall event and StormFilter remains in bypass condition (water over the internal outlet baffle wall or submerged cartridges), then go to maintenance.
6. Hazardous material release. If hazardous material release (automotive fluids or other) is reported, then go to maintenance.
7. Pronounced scum line. If pronounced scum line (say ≥ 1/4" thick) is present above top cap, then go to maintenance.
8. Calendar Lifecycle. If system has not been maintained for 3 years, then go to maintenance.

Assumptions:

No rainfall for 24 hours or more.

No upstream detention (at least not draining into StormFilter).

Structure is online. Outlet pipe is clear of obstruction. Construction bypass is plugged.

Maintenance

Depending on the configuration of the particular system, workers will be required to enter the vault to perform the maintenance.

Important: If vault entry is required, OSHA rules for confined space entry must be followed.

Filter cartridge replacement should occur during dry weather. It may be necessary to plug the filter inlet pipe if base flow is occurring.

Replacement cartridges can be delivered to the site or customers facility. Contact CONTECH for more information.

Warning: In the case of a spill, the worker should abort maintenance activities until the proper guidance is obtained. Notify the local hazard control agency and CONTECH immediately.

To conduct cartridge replacement and sediment removal:

1. If applicable, set up safety equipment to protect workers and pedestrians from site hazards.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the doors (access portals) to the vault and allow the system to vent.
4. Without entering the vault, give the inside of the unit, including components, a general condition inspection.
5. Make notes about the external and internal condition of the vault. Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.
6. Using appropriate equipment offload the replacement cartridges (up to 150 lbs. each) and set aside.
7. Remove used cartridges from the vault using one of the following methods:

Method 1:

A. This activity will require that workers enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Unscrew (counterclockwise rotations) each filter cartridge from the underdrain connector. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

Using appropriate hoisting equipment, attach a cable from the boom, crane, or tripod to the loose cartridge. Contact CONTECH for suggested attachment devices.

Important: Cartridges containing leaf media (CSF) do not require unscrewing from their connectors. Do not damage the manifold connectors. They should remain installed in the manifold and can be capped during the maintenance activity to prevent sediments from entering the under drain manifold.

B. Remove the used cartridges (up to 250 lbs.) from the vault.

Important: Avoid damaging the cartridges during removal and installation.

C. Set the used cartridge aside or load onto the hauling truck.

D. Continue steps A through C until all cartridges have been removed.

Method 2:

A. Enter the vault using appropriate confined space protocols.

B. Unscrew the cartridge cap.

C. Remove the cartridge hood screws (3) hood and float.

D. At location under structure access, tip the cartridge on its side.

Important: Note that cartridges containing media other than the leaf media require unscrewing from their threaded connectors. Take care not to damage the manifold connectors. This connector should remain installed in the manifold and capped if necessary.

E. Empty the cartridge onto the vault floor. Reassemble the empty cartridge.

F. Set the empty, used cartridge aside or load onto the hauling truck.

G. Continue steps a through E until all cartridges have been removed.

8. Remove accumulated sediment from the floor of the vault and from the forebay. Use vacuum truck for highest effectiveness.
9. Once the sediments are removed, assess the condition of the vault and the connectors. The connectors are short sections of 2-inch schedule 40 PVC, or threaded schedule 80 PVC that should protrude about 1" above the floor of the vault. Lightly wash down the vault interior.
   a. Replace any damaged connectors.
10. Using the vacuum truck boom, crane, or tripod, lower and install the new cartridges. Take care not to damage connections.
11. Close and fasten the door.
12. Remove safety equipment.
13. Finally, dispose of the accumulated materials in accordance with applicable regulations. Make arrangements to return the used empty cartridges to CONTECH.

Material Disposal

The accumulated sediment must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals. Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads.

Sediments and water must be disposed of in accordance with applicable waste disposal regulations. Coordinate disposal of solids and liquids as part of your maintenance procedure. Contact the local public works department to inquire how they disposes of their street waste residuals.

800.338.1122
www.contech-cpi.com

CONTECH®

StormFilter

Configuration Guide

The Stormwater Management StormFilter®

The Stormwater Management StormFilter®

The Stormwater Management StormFilter® (StormFilter) is a passive, flow-through, stormwater filtration system. The system is comprised of one or more structures that house rechargeable, media-filled cartridges which trap particulates and adsorb materials such as dissolved metals, hydrocarbons, and nutrients in polluted runoff.

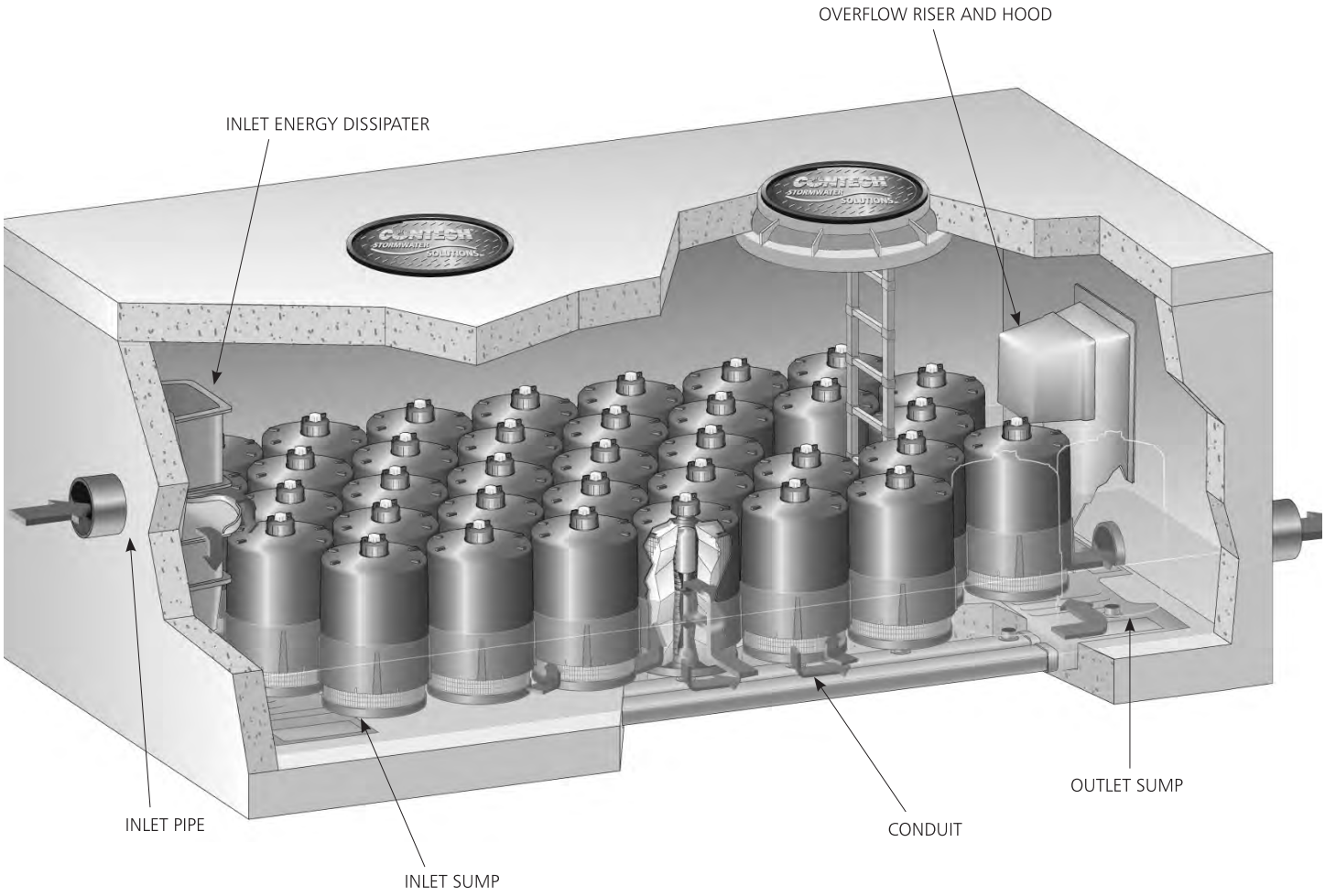
The StormFilter system comes in a variety of configurations and sizes to meet any site need. A variety of filter media is available and can be customized for each site to remove the desired pollutants.

Basic Design

The StormFilter is sized to treat the peak flow of a water quality design storm. The peak flow or WQv is determined from calculations based on the contributing watershed hydrology and from a design storm magnitude set by the local stormwater management agency. The StormFilter system is modular and each unit is designed with the number of cartridges required to meet the peak design flow rate, WQv or cap.

The flow rate through each filter cartridge is set to meet the jurisdictional performance requirements, allowing control over the amount of contact time between the influent and the filter media. The maximum flow rate through each cartridge can be adjusted, between 0.26 gpm/ft^2 and 2 gpm/ft^2 of surface area, using a calibrated restrictor disc at the base of each filter cartridge. Adjustments to the cartridge flow rate will affect the number of cartridges required to treat the peak flow or WQv.

Please contact your local CONTECH representative for site-specific design assistance.



Basic Operation

Priming System Function

The system is designed to siphon stormwater runoff through the StormFilter cartridge. Stormwater enters a StormFilter cartridge, percolates horizontally through the cartridge's filter media and collects in the center tube where the float valve is in a closed (downward) position.

As water passes through the filter media and into the cartridge's center tube, the air in the cartridge is displaced by the water and purged from beneath the filter hood through the one-way check valve located in the cap. Once the center tube is filled with water, there is enough buoyant force to open the float valve and allow the treated water in the center tube to flow into the under-drain manifold. This causes the check valve to close, initiating a siphon that draws polluted water throughout the full surface area and volume of the filter. Thus, the entire filter cartridge is used to filter water throughout the duration of the storm, regardless of the water surface elevation in the unit. This siphon continues until the water surface elevation drops to the elevation of the hood's scrubbing regulators, and the float returns to a closed position. Utilizing the hydraulic potential in the cartridge, the scrubbing regulators cause the filter surface to be clean of attached sediments thus extending the filter's operational life.

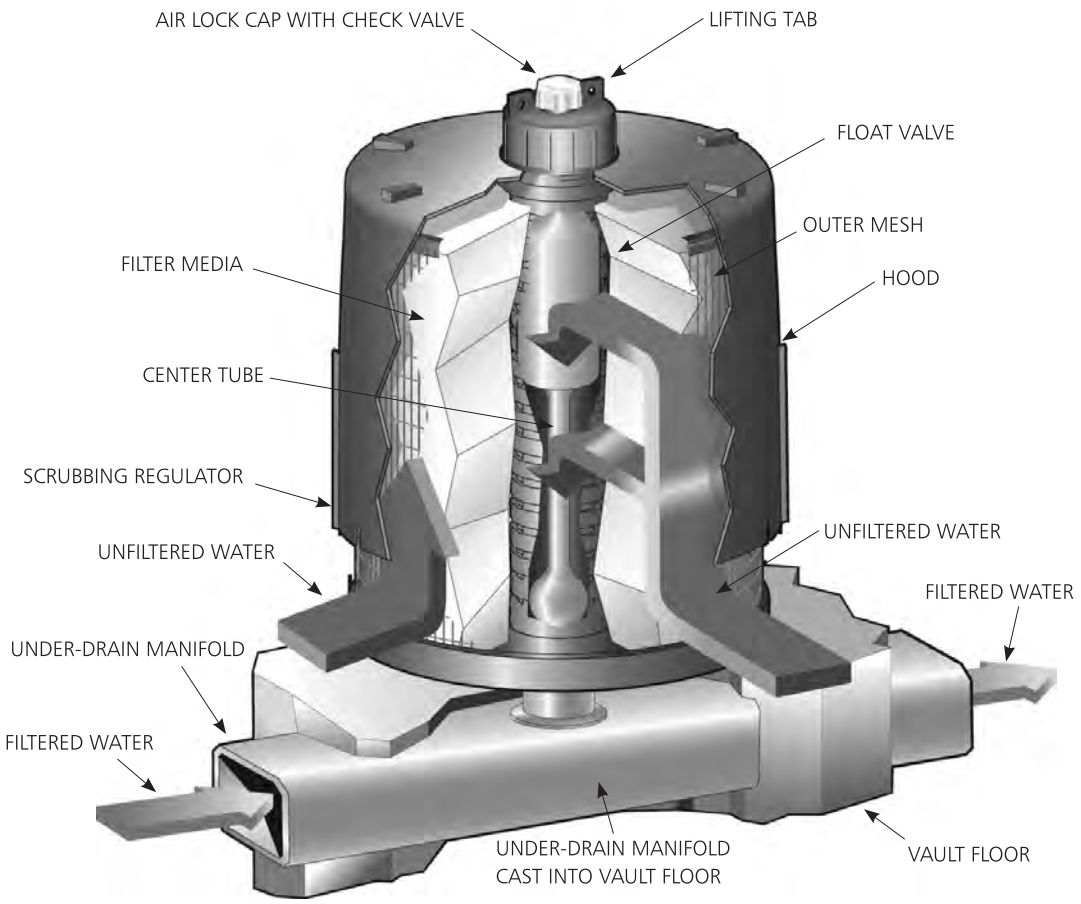
Flow and Valve Control

The filtration rate through a typical StormFilter cartridge can be adjusted so that it has a maximum flow rate of 2 gpm/ft^2 at the design driving head. The flow rate is individually controlled for each cartridge by a restrictor disc located at the connection point between the cartridge and the under-drain manifold. Consisting of a simple orifice disc of a specific diameter, the flow rate through the cartridges can be adjusted to a level that coincides with your treatment requirements by using a disc with the appropriate orifice diameter.

A reduction in flow rate affects the performance of the StormFilter system with regards to both sediment and soluble pollutants. For solids, Stokes' Law predicts the movement of sediment in a fluid and it has been proven that a reduction in the flow velocity through the system will facilitate increased settling and capture of sediments. In addition, some media types have the ability to remove soluble pollutants through chemical processes, like ion exchange. A reduction in the flow velocity through the StormFilter cartridge will increase the contact time between the stormwater and the media, thereby increasing the removal efficiency by increasing the time for a chemical process to take place.

Media type can be changed, but flow rate adjustment requires engineering consultation to ensure hydraulic demands are satisfied.

Through routine maintenance, a media filtration system can adjust the media type to target or update the system to treating specific pollutants, new TMDLs, or changing pollutants of concern. The media change out can provide a long-term solution to changing regulatory requirements.



StormFilter Configurations

The StormFilter technology can be configured to meet your unique site requirements.

Downstream Treatment Configurations

Conventional stormwater treatment involves collecting, conveying and treating stormwater runoff with an end of pipe treatment system before discharging off-site. StormFilter configurations suitable for these applications are listed below and can be engineered to treat a wide range of flows.

Vault/Manhole

The Vault/Manhole consists of one or more precast concrete structures ranging from 48" manholes to 8' x 24' vaults. The largest unit treats water quality design flows up to 3.75 cfs, and can be placed in series or in parallel to treat higher flows if needed.

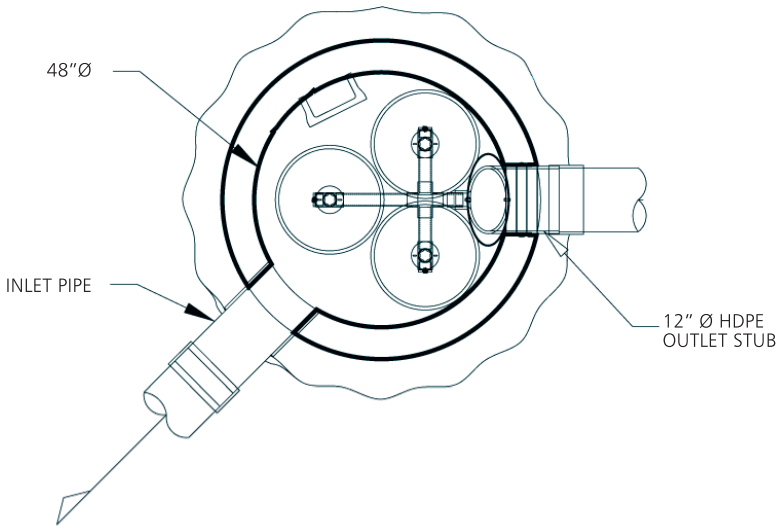
A Vault/Manhole configuration can be installed online or offline from storm system, where the unit has internal overflow bypass. These systems can also be installed offline, where high flows are bypassed around the treatment system and there is no internal overflow. However, if detention, pretreatment, or bypassing is required, it can be installed offline of the storm system.

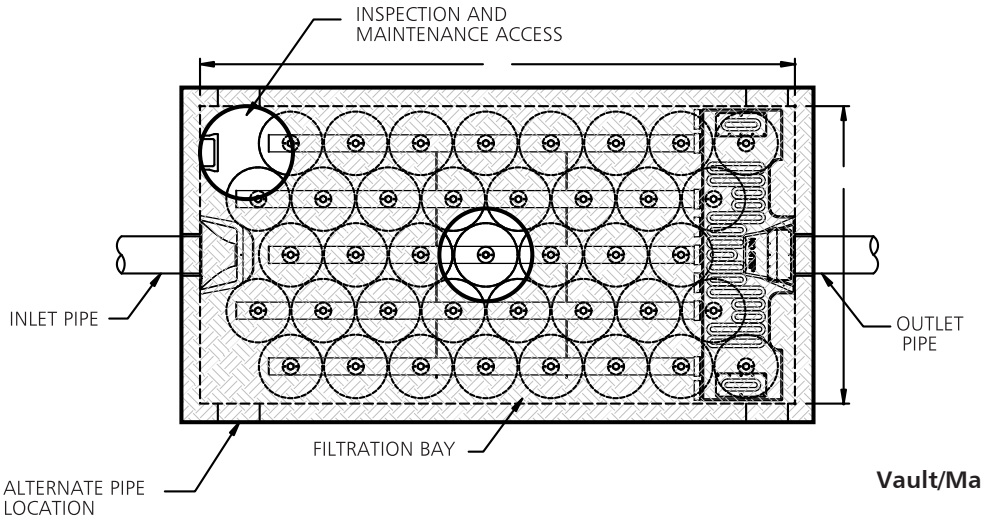
Basic Operation

Vault/Manhole systems are housed in either a vault or manhole. Stormwater first enters the structure through the inlet pipe where it is directed through the energy dissipator. This gently spreads the flow to minimize re-suspension of previously captured pollutants.

Once in the filtration area, the stormwater begins to pond and percolate horizontally through the media contained in the filter cartridges. After passing through the media, treated water that has collected in the cartridge center tube is directed into the outlet sump by an under-drain manifold. The treated water in the outlet sump is then discharged through the outlet pipe.

Precast StormFilter systems have an internal bypass capability from 1.0 cfs to 2.0 cfs, depending upon the size of the system. If peak flows to the system exceed 2.0 cfs, an offline high flow bypass is needed.





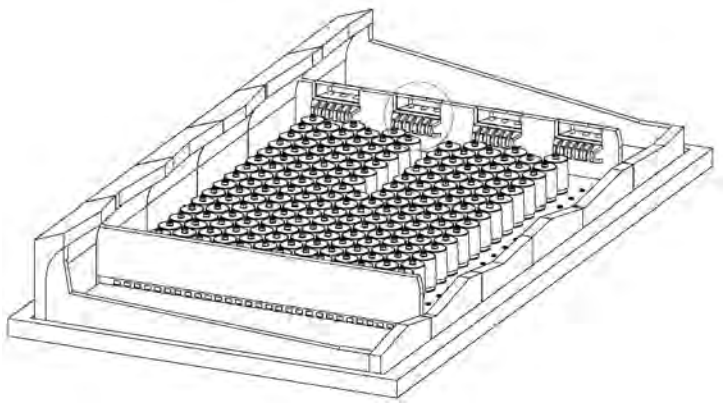
Vault/Manhole StormFilter

High Flow StormFilter

High Flow StormFilter systems can be designed within a variety of structures to meet local requirements and streamline installation. These systems are designed for large sites and large flows. Too big for standard precast structures, they are usually built from precast components that are assembled on site. The High Flow StormFilter is available in several configurations: CON/SPAN®, Panel Vaults, Box Culverts, or Cast-In-Place.

Basic Operation

The High Flow StormFilter design has the same basic configuration and components as the Precast StormFilter but operates on a larger scale.



High Flow StormFilter

Peak Diversion StormFilter

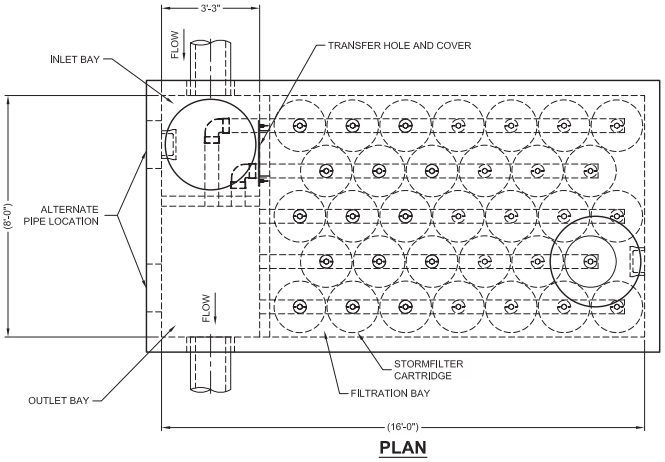
The Peak Diversion StormFilter includes a treatment chamber and offline by-pass capability in one precast vault. Sizes range from 8'x11" to 8'x24 in most areas. Larger units can treat up to 2.5cfs depending on cartridge height and the approved flow rate of regulatory jurisdiction. The integrated off-line bypass eliminates upstream flow splitters, downstream junction structures, and additional piping to save space and reduce the overall foot print. This lowers material and installation cost while reducing potential conflicts with right of way (ROW) boundaries and utilities.

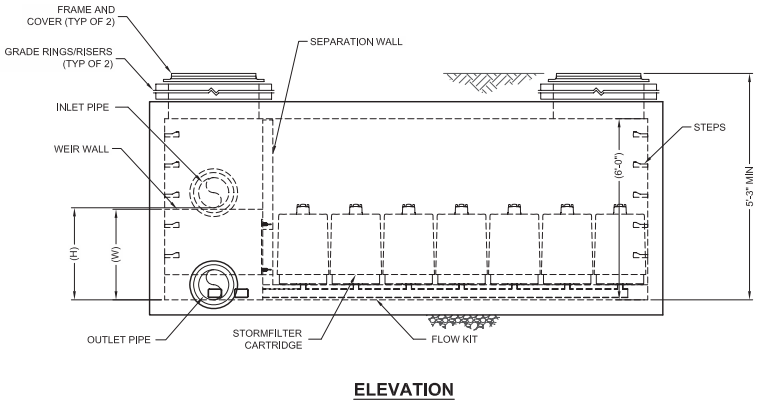
Basic Operation

Stormwater enters the structure through one or two inlets pipes into the inlet bay and low flows are directed to the filtration bay through a transfer opening. Once in the filtration area, the stormwater begins to pond and percolate horizontally through the media contained in the filter cartridges. After passing through the media, treated water that has collected in the cartridge center tube is directed into the outlet bay by an under-drain manifold. The treated water in the outlet sump is then discharged through the outlet pipe.

During large storm events greater than the treatment capacity, peak flows are diverted across the overflow weir directly to the outlet. Even during high flows the cartridges are still operating and water is entering the filtration bay from the inlet bay. This continuous flow into the filter bay helps ensure pollutants can not be washed out during high flow events.

As a general rule, the peak bypass capacity is 15 times the design flow rate, depending on the hydraulic grade line and available head loss.





Peak Diversion StormFilter

Volume StormFilter

The Volume StormFilter is designed to meet volume-based regulations where a specific water quality volume (WQv) must be captured and treated. In addition to treatment, the structure can be sized to capture all or a portion of the WQv.

Restrictor discs inside each cartridge can be used to control the discharge rate from the system. The size of the disc is calibrated to provide the design filtration rate at a live storage depth. Because of these discs (and the airlock cap with a one way vent) water can be impounded above the cartridges in the treatment bay.

Structures range in size from a 48" manhole to CON/SPAN sections with a 24' x 10' cross section built to length. In many cases smaller structures are combined with outboard storage, such as pipe, to provide the WQv storage.

The Volume StormFilter can be designed with or without an internal bypass. If peak flows to the system exceed the internal bypass, or external bypass is required, a high flow bypass is needed. The system can also be installed online or offline and uses a traffic-bearing lid.

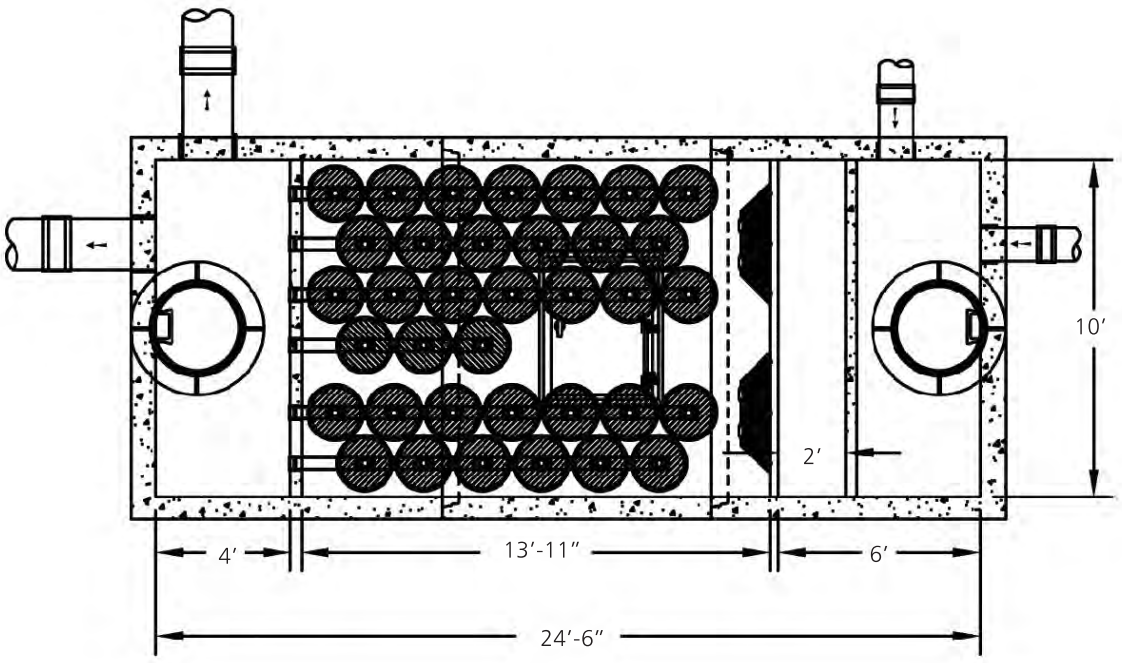
Basic Operation

The Volume StormFilter is typically configured in one of two ways.

A three bay system that incorporates internal storage for the WQv and includes: the storage bay, the filtration bay, and the outlet bay. Water first enters the storage bay (a portion of which includes dead storage) which facilitates pretreatment (gravity separation) and storage of the WQv. The stormwater is then directed into the filtration bay for full treatment and additional storage. The storage bay can be designed with a baffle to trap floatables, oils, and surface scum. Cartridges in the filtration bay treat the stormwater and control the discharge rate. Once in the filtration bay, the stormwater percolates horizontally through the media contained in the filter cartridges. After passing through the cartridge, treated water is directed to the outlet bay by an under-drain manifold where it is discharged through an outlet pipe.

A two bay, precast vault based system similar to the Vault StormFilter where pretreatment and live storage are provided upstream.

Providing WQv storage in an outboard storage facility such as storage pipe provides the versatility to meet most footprint and elevation requirements.



Volume StormFilter

Upstream Treatment Configurations

Low Impact Design (LID) design involves managing runoff close to the source using small, decentralized system. The following suite of StormFilter configurations are easily incorporated on sites where LID site design is recommended. These low-cost, lowdrop, point-of-entry systems also work well when you have a compact drainage area.

CatchBasin StormFilter

The CatchBasin StormFilter (CBSF) consists of a multi-chamber steel, concrete, or plastic catch basin unit that contains up to four StormFilter cartridges. The steel CBSF is offered both as a standard and as a deep unit.

The CBSF is installed flush with the finished grade and is applicable for small drainage areas from roadways and parking lots, and retrofit applications. It can also be fitted with an inlet pipe for roof leaders or similar applications.

The CBSF unit treats water quality design flows up to 0.20 cfs, coupled with an internal weir overflow capacity of 1.0 cfs for the standard steel and concrete units and 1.8 cfs for the deep steel units. Non-traffic rated plastic CBSF units have an internal weir overflow capacity of 0.5 cfs.

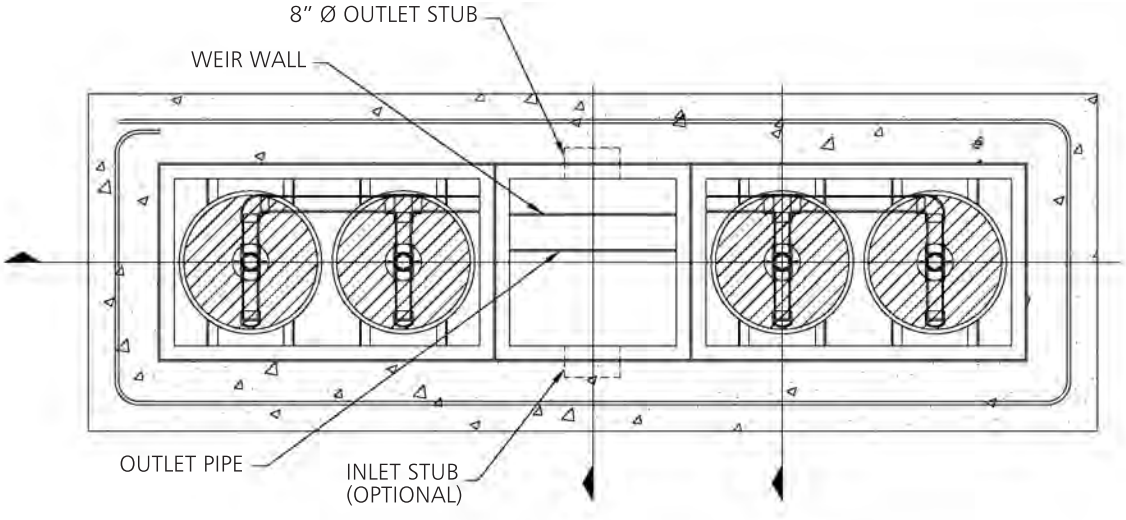
Basic Operation

The CBSF acts as the primary receiver of runoff, similar to a standard, grated catch basin. The steel and concrete CBSF units each have an H-20 rated, traffic-bearing lid that allows the filter to be installed in parking lots and take up no land area. Plastic CBSF units can be used in landscaped areas and for other non-traffic bearing applications.

The CBSF consists of a sumped inlet chamber and cartridge chamber(s). Runoff enters the sumped inlet chamber either by sheet flow from a paved surface or from an inlet pipe discharging directly to the unit. The inlet chamber's internal baffle traps debris and floating oil, and houses an overflow weir. Heavier solids settle into the deep sump, while lighter solids and soluble pollutants are directed under the baffle and into the cartridge chamber through a port between the baffle and the overflow weir. Once in the cartridge chamber, polluted water ponds and percolates horizontally through the media in the filter cartridges. Treated water collects in the cartridge's center tube from where it is directed by an under-drain manifold to the outlet pipe on the downstream side of the overflow weir and discharged.

When flows into the CBSF exceed the water quality design value, excess water spills over the overflow weir, bypassing the cartridge bay, and discharges to the outlet pipe.

The CBSF is particularly useful where small flows are being treated or for sites that are flat and have little available hydraulic head to spare. The unit is ideal for applications in which standard catch basins are to be used. Both water quality and catchment issues can be resolved with the use of the CBSF.



CathBasin StormFilter

Curb Inlet StormFilter

The Curb Inlet StormFilter consists of a precast concrete vault ranging from 6'x8' to 8'x16' in size. These units treat peak water quality design flows up to 1.05 cfs. The system is installed online and includes an internal offline overflow bypass around the filtration chamber. The internal bypass capability is based on depth of the structure. The standard bypass capacity is 15 cfs but is larger for deeper units. A traffic-bearing lid is placed underneath the median or sidewalk adjacent to the roadway.

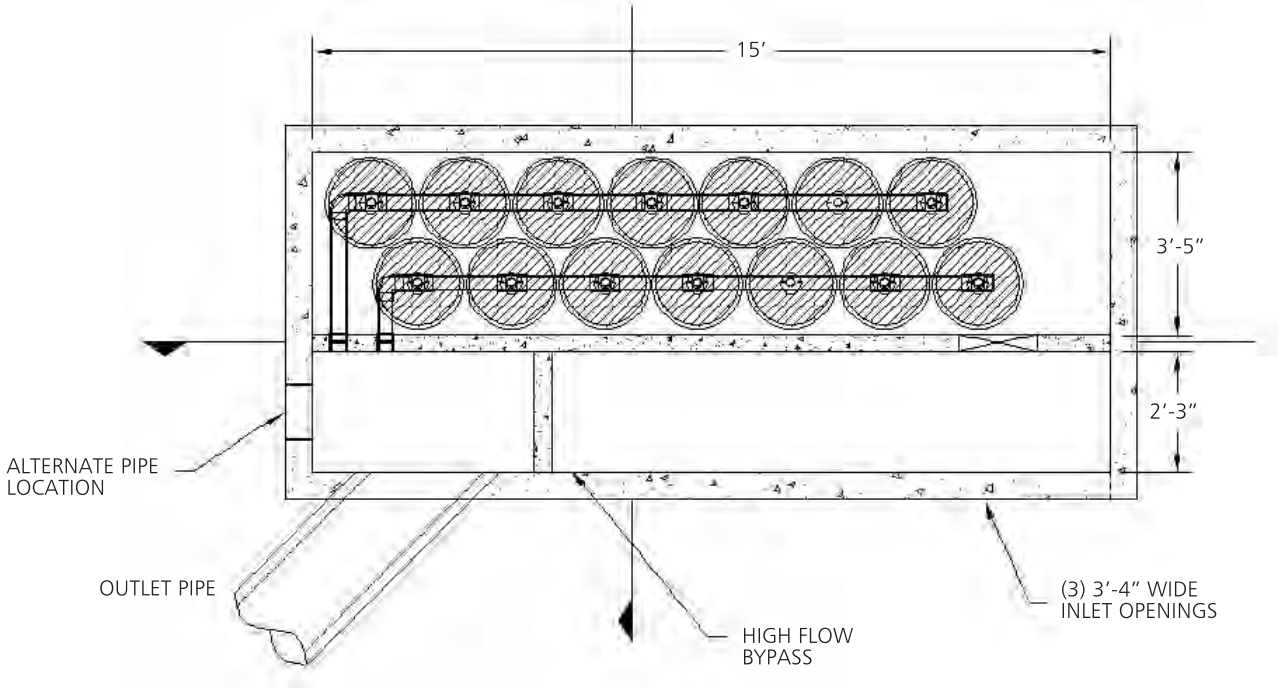
Basic Operation

The Curb Inlet StormFilter is composed of three bays: the inlet bay, the filtration bay, and the outlet bay. Stormwater enters the inlet bay through the curb inlet opening. The design flow is directed through a transfer opening to the filtration bay for full treatment.

Once in the filtration bay, the stormwater percolates horizontally through the media in the filter cartridges to the center tube. Treated water in the cartridge center tube is directed into the outlet bay by an under-drain manifold and discharged through the outlet pipe. Outlet pipes can be placed parallel, perpendicular, or up to 45° to the roadway. Overflow is directed over a weir wall between the inlet bay and the outlet bay, bypassing the filtration bay leaving accumulated pollutants undisturbed.

Curb Inlet Openings

Every Curb Inlet StormFilter is designed to meet local regulations governing the geometry of the curb inlet. This can be accomplished in two ways. One way is with an integrated face plate – the vault lid includes the face plate which is tied into the curb. Another way is with a cast-in-place face plate – the entire face plate is constructed by the contractor pouring the curb. Curb inlet openings can be 4', 7', or 10' in length.



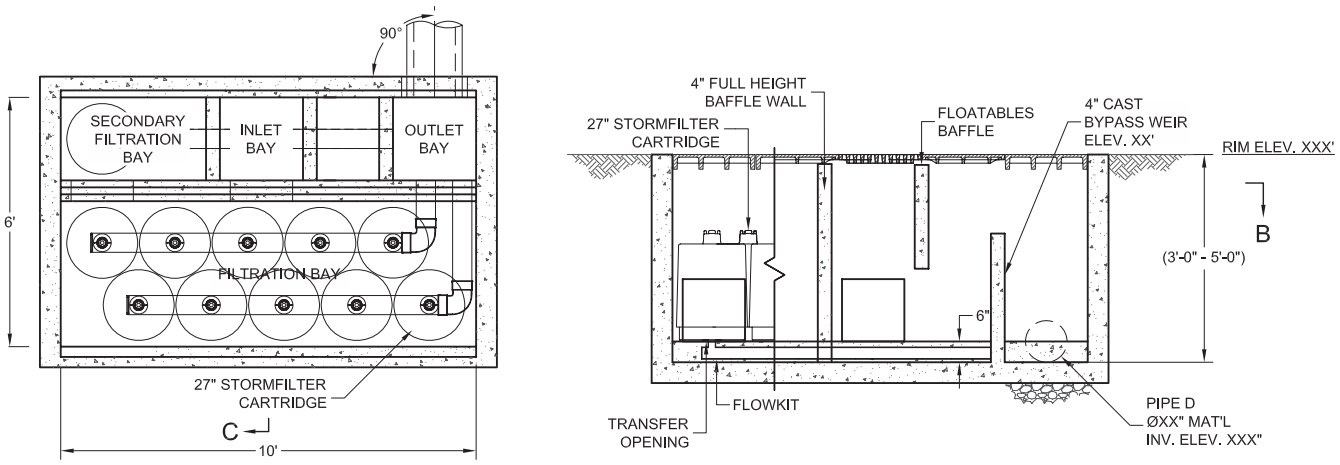
Curb Inlet StormFilter

Linear Grate StormFilter

The Linear Grate StormFilter is a precast vault that acts as the primary receiver of runoff, similar to a standard grated catch basin. The unit has H-20 rated traffic-bearing lids that allow the filter to be installed under parking lots. The system consists of an inlet bay, filtration bay, and an outlet bay. Providing treatment as it enters the conveyance system reduces the overall head loss because the vertical drop from the finished grade into the conveyance system is also used to provide hydraulic pressure on the filter cartridges.

Basic Operation

Runoff enters the inlet bay by sheet flow from a paved surface or from an inlet pipe discharging directly to the unit. The inlet bay's internal baffle traps debris and floating oil and denser pollutants are directed into the filtration bay. Once in the cartridge chamber, polluted water ponds and percolates through a radial media filter cartridge. Treated water collects in the cartridge's center tube where it is directed by an under-drain manifold to the outlet pipe on the downstream side of the overflow weir. When flow rates exceed the water quality design value, excess water spills across the overflow weir, bypassing the cartridge bay and proceed directly to the outlet pipe. This integrated offline bypass ensures pollutants captured in the filtration bay are not washed downstream during peak flow events.



Liner Grate StormFilter

Grated Inlet Openings

The number of inlet grates and the size of the inlet bay are designed to capture the peak flow rates from the drainage area. The remaining area is devoted to the filtration bay and the outlet bay which are covered with removable plates for access during maintenance. The entire inlet bay, filtration bay, and outlet bay can be opened at one time allowing full access. In many cases, due to the shallow nature of the design, confined space entry is not required for maintenance.

Linear StormFilter

The Linear StormFilter consists of one or two precast concrete channels that are 10′ or 20′ in length and 2′ 9″ in width.

The Linear StormFilter is installed flush with the finished grade, functioning similar to a catch basin or trench drain. The top of the unit has either covers or doors for easy access. The Linear StormFilter is typically installed online like the precast StormFilter.

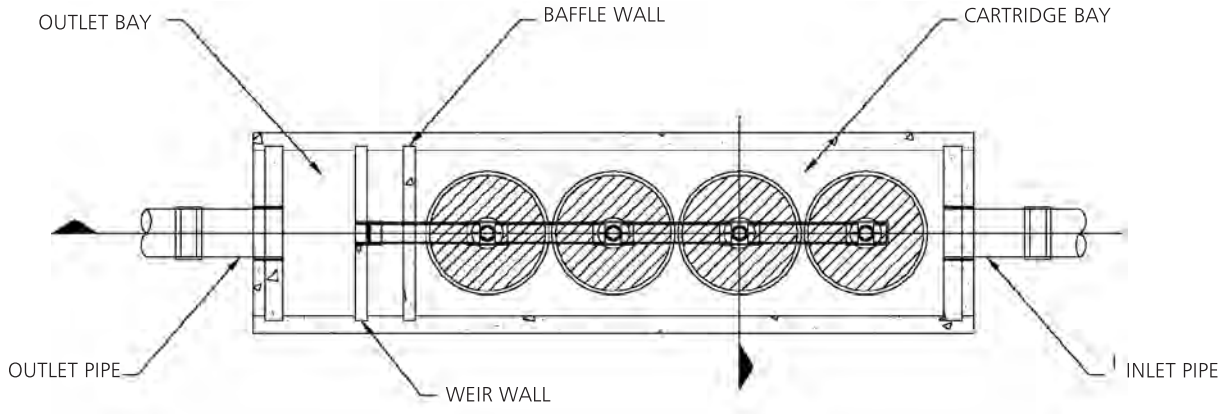
The Linear StormFilter unit treats water quality design flows up to 0.27 cfs.

Basic Operation

The Linear StormFilter can be installed either as the primary receiver of runoff, similar to a grated catch basin, or with an inlet stub and doors to receive runoff collected upstream.

The system is equipped with an internal overflow weir to ensure that there is no local flooding for storm events in excess of the design treatment flow. Maintenance costs for the unit are typically less because there are no confined space entry requirements, and access is quick and easy.

The Linear StormFilter is particularly useful where small flows are being treated or where the site is very flat and there is little available hydraulic head to spare.



Linear StormFilter

Infiltration Configuration

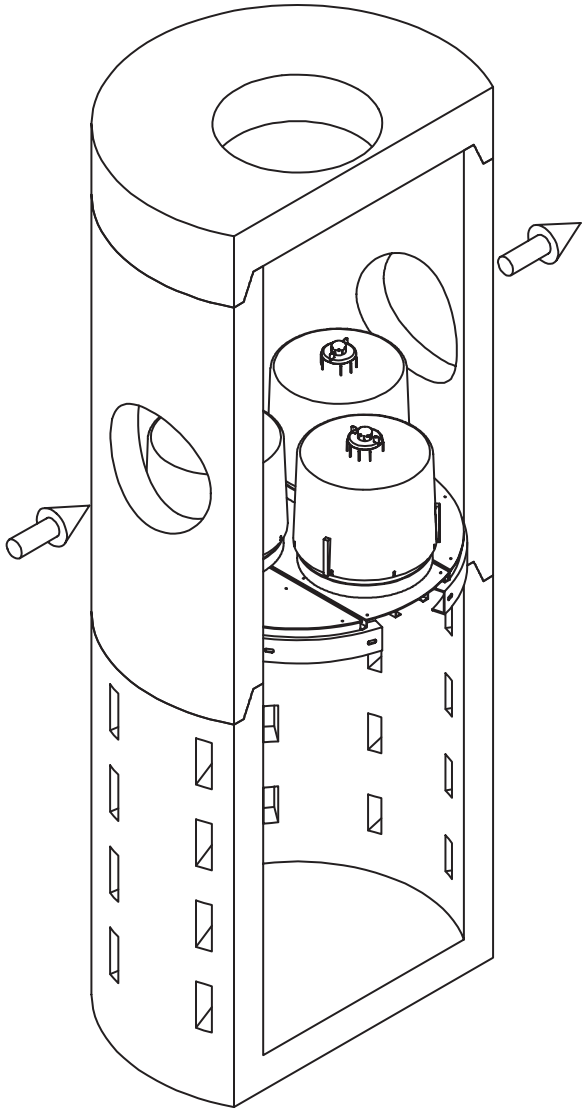
Dry Well StormFilter

The Dry Well StormFilter provides treatment, infiltration and groundwater protection in a single structure. The system is designed to treat conveyed flow or sheet flow from small drainages. Multiple units can be installed to treat any size site. Because it provides treatment and infiltration in a single unit, the total number of structures and the amount of pipe required for the stormwater system are reduced.

The Dry Well StormFilter system is available in 48", 60" and 72-" pre-cast manhole top sections that are designed to be stacked on top of dry well infiltration risers. The StormFilter portion of the unit arrives fully assembled and ready to install, including an integrated concrete deck for the StormFilter cartridges. The system can also be retrofitted into existing 48" manhole dry wells.

Basic Operation

Stormwater enters the dry well unit through one or more entry pipes or channels at its top. It then percolates through the media in the StormFilter cartridge to the center tube. Treated water in the cartridge center tube is discharged to the infiltration section below, and then infiltrates into the surrounding soils through a number of small exit openings at the sides and bottom.



DryWell StormFilter

Roof Runoff Treatment Configuration

Downspout StormFilter

The Downspout StormFilter is an aboveground configuration that can be easily integrated into existing gutter systems to eliminate pollution from rooftop runoff. It typically occupies 2.5'x 5' footprint, and can fit most downspout configurations and sizes. Each unit holds two StormFilter cartridges, and single- and dual-stage options are available. It treats up to 14,000 square feet of rooftop area per dual-cartridge system.

StormFilter Cartridges

There are three cartridge heights available for StormFilter systems: 27", 18", and Low Drop. The most economical is the 27" tall cartridge. It can treat the highest flow rate per cartridge, which creates the smallest system with the lowest installed cost. The 27" cartridge requires 3.05' of driving head to operate. For sites with less driving head available, the 18" cartridge is the next best option. Lower flow rates per cartridge increase the footprint of the overall system but only 2.3' of driving head is required. For sites with very limited drop, the Low Drop cartridge only requires 1.8" of driving head.

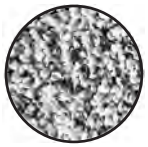
Cartridge Flow Rates

Cartridge Type	Hydraulic Drop	Treatment Capacity (gpm)	
		1 gpm/ft2	2 gpm/ft2
StormFilter 27"	3.05'	11.25	22.5
StormFilter 18"	2.30'	7.5	15
StormFilter Low Drop	1.80'	5	10

StormFilter Media

The removal of site-specific pollutants can be maximized with the variety of filtration media available. In many cases, different media types can be combined so as to target a wide spectrum of pollutants. This ability to combine and use various media types allows the system to be easily adjusted to meet ever-changing site conditions and increasingly stringent regulatory requirements.

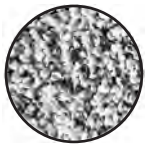
PhosphoSorb™



PhosphoSorb, a lightweight media comprised of Perlite (a heat-expanded volcanic rock) and activated alumina, removes total phosphorus (TP) by adsorbing dissolved-P and filtering particulate-P simultaneously. The Perlite provides the capability to remove suspended solids while the activated alumina adsorbs soluble phosphorus adsorption.

PhosphoSorb is composed of a slightly finer media gradation than the field proven ZPG™ (Zeolite, Perlite, Granular Activated Carbon) media and will provide equivalent - or even better - removal of suspended solids. Initial field tests have indicated an increase in the TSS removal efficiency up to 10% over the field-proven ZPG media. The StormFilter with ZPG media has already received a General Use Level Designation for basic treatment in the State of Washington.

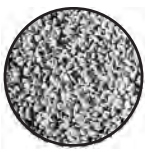
Perlite



Perlite is a natural, volcanic ash, similar in composition to glass and similar in appearance to pumice. To use perlite as a filter medium, it must first go through a heating process to yield a lightweight, multicellular, expanded form. This expanded form has a coarse texture, very low-density, high surface area, and stable, inert chemistry, all of which make perlite an excellent physical filtration medium.

Perlite has proven to be our media of choice for sediment and oil removal. The multicellular nature of expanded perlite is the key to its excellent ability to trap sediments and adsorb oil. The coarse texture of the expanded perlite creates a bed of material with a very high porosity, which allows perlite to have the highest sediment and oil storage capacity of all of the available media options.

Zeolite



The term zeolite defines a family of both natural and synthetic, hydrous aluminosilicate materials with a highly porous mineral matrix that holds light, alkali metal cations (ideally sodium ions).

Zeolite has the ability to use a cation exchange reaction that removes other cations such as zinc, copper, lead, and ammonia from water. In the cation exchange reaction, the light metal cations in the zeolite matrix are displaced by the heavier metal cations, such as copper, in the water.

The zeolite used in our system is clinoptilolite, which has a cation exchange capacity (CEC) of approximately 100 to 220 meq/100 g. Clinoptilolite has inert characteristics that make it an excellent metals removal media option when CSF media cannot be used. It can be combined with other media such as GAC and perlite when metals are not of exclusive concern.

CSF® Leaf Media

CSF Leaf Media is a patented filtration media composed of composted deciduous leaves originating from the City of Portland, Oregon. CONTECH Stormwater Solutions purchases the mature, stable, deciduous leaf compost and then processes it into an odorless, pelletized compost product with physical and chemical characteristics desirable for stormwater filtration.

The patented compost process creates a material with excellent flow-through characteristics and stability in water. Not only do CSF Leaf Media consist of 100% recycled, all natural materials, but it also provides good removal of sediments and excellent removal of a wide range of toxic contaminants.

CSF Leaf Media provides the multitude of beneficial water treatment properties typical of soil in a form that is compatible with the compact, modular, media-based design of the StormFilter system. In addition to the physical filtration provided by the granular nature of the CSF Leaf Media, the complex chemistry of the compost also provides chemical filtration as well.

Sediment and total nutrients are removed through physical filtration. Oil, complexed metals, and anthropogenic organic contaminants such as herbicides and pesticides are removed through adsorption, the physical partitioning of organic compounds, such as pesticides, to carbon-rich materials, such as the compost.

Soluble metals are removed by cation exchange, as well as by complexation of metal ions to the organic chelating agents present in compost. CSF Leaf Media is an excellent, cost-effective, all-purpose media that epitomizes the potential value of recycled materials.

GAC

GAC (Granular Activated Carbon) is a widely accepted water filtration media used for the removal of organic compounds. It consists of pure carbon (originating from coal or charcoal) whose micro-porous structure has been enhanced through steam or acid "activation."

The high carbon content and porous nature of GAC accounts for its excellent ability to remove organic compounds through adsorption. Since adsorption is the physical partitioning of organic compounds to high carbon surfaces, the "activation" of the carbon (which creates GAC) endows it with an enormous surface area upon which adsorption can take place.

In situations where anthropogenic organic contaminants are of exclusive concern, GAC media provide the highest level of stormwater treatment compared to other available media options. However, because it is not very often the case that anthropogenic organic contaminants are of exclusive concern, GAC is usually combined with another media such as perlite or zeolite for the treatment of additional contaminants.

Combination of GAC with perlite constitutes the most cost-effective configuration, as the effectiveness of GAC is drastically reduced if it is coated with high concentrations of heavy oil or sediment, which can restrict access via surface pores to the interior of the GAC granules.

ZPG™ (Zeolite, Perlite, GAC blend)

This proprietary blend of zeolite, perlite, and granular activated carbon media is used to provide an alternative for CSF media for installations where leaf media cannot be used.

Laboratory and Field Testing

The StormFilter system is designed to meet the most stringent regulatory requirements. The field-proven performance of the StormFilter has led to hundreds of regulatory agency approvals nationwide as a standalone BMP.

The Stormwater Management StormFilter® is the first manufactured BMP to receive stand-alone approval through field testing and satisfying the total suspended solids treatment requirements in Washington and New Jersey.

Log on to www.contechstormwater.com/stormfilter to view the following reports in full.

Field Monitoring Reports

Field Proven Performance of the StormFilter using the Technology Assessment Protocol - Ecology (TAPE) and Technology Acceptance Reciprocity Partnership (TARP) Tier II Protocol

1. Washington
   a. Washington State Department of Ecology General Use Level Designation for Basic Treatment
   b. Technical Evaluator Engineering Report (TEER). Gary Minton, Ph.D., P.E.
2. New Jersey
   a. New Jersey State Department of Environmental Protection Final Certification
   b. New Jersey Corporation for Advanced Technology (NJCAT) Field Verification Report

Laboratory Reports

Total Suspended Solids (TSS) Removal Using Different Particle Size Distributions with the Stormwater Management StormFilter.

Influences on TSS removal efficiency

Influence of analytical method, data summarization method, and particle size on total suspended solids (TSS) removal efficiency of the StormFilter

StormFilter removal efficiency with coarse/fine perlite media

Evaluation of the removal of silt loam TSS using coarse/fine perlite at 28 L/min (7.5 gpm).

StormFilter removal efficiency with ZPG media

Evaluation of the removal of SIL-CO-SIL 106 using ZPG media at 28 L/min (7.5 gpm)

StormFilter removal efficiency with coarse perlite

Evaluation of the removal of sandy loam TSS using coarse perlite at 57 L/min (15 gpm)

Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

CONTECH Construction Products Inc. provides site solutions for the civil engineering industry. CONTECH's portfolio includes bridges, drainage, sanitary sewer, stormwater and earth stabilization products. For information on other CONTECH division offerings, visit contech-cpi.com or call 800.338.1122

The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; related foreign patents or other patents pending.

CONTECH® CONSTRUCTION PRODUCTS INC.

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