Preliminary Stormwater Calculations

Oregon City Police and Courts

Prepared for: FFA Architecture and Interiors
Prepared by: Nathan Patterson
Project Engineer: Mark Reuland

March 2019 | KPFF Project #1800230

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Oregon City Police and Courts Preliminary Stormwater Calculations

Project Overview

The project consists of constructing the new Oregon City Police and Courts Facility and associated site improvements that will serve as the headquarters for the City's Police Department and Municipal Court. Major site components will include a public parking area, a large secured parking area and a public plaza.

The property is surrounded by residential neighborhoods to the west, north, east and southwest. The site is the current home of an existing single level school building that has received several expansions over the years. The City's planning and building divisions are based out an existing building to remain on the property to the south of the proposed development. North of the existing city building there is an existing parking lot and utility corridor that will largely remain intact. The corridor is a vacated street that contains underground sewer, storm and gas utilities, and overhead power.

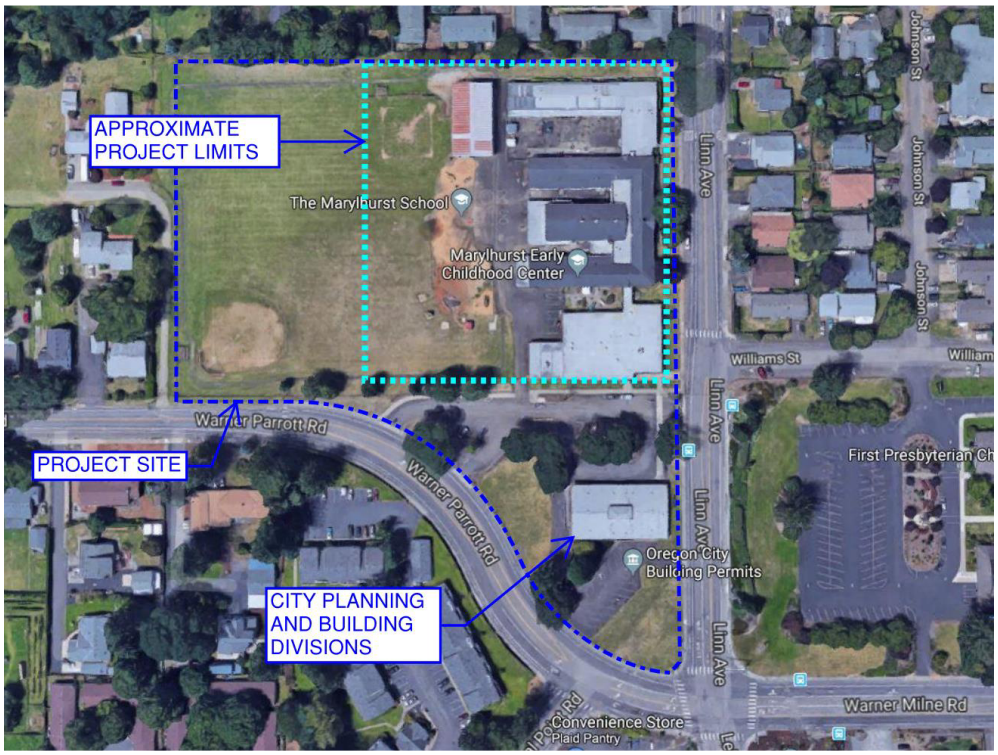


Figure 1: Project Location Map

Stormwater Management Methodology

Stormwater management within Oregon City is dictated by the 2015 Stormwater and Grading Design Standards (SGDS). All impervious site areas must be treated and detained to meet these standards. Applicable areas for this site are be roofs, asphalt and concrete pavements, sidewalks, and plazas. Low Impact Development (LID) infiltration facilities are used to the maximum extent possible. There is no storm main in Linn Avenue and the line in the southern parking area is approximately 3-ft deep and drains to the Mud Basin. Per the pre-application meeting, no additional flows shall connect to the Mud Basin. A 12-inch

public storm drain located in an easement through the site is the proposed point of connection for the majority of the site as it is located at the lower end of the site at an approximately depth of 7-ft.

Infiltration

The SGDS defines adequate infiltration to support an infiltration facility as 0.5 inches per hour. A draft geotechnical report performed by PBS Environmental and dated October 16, 2018 identifies a local field-tested infiltration rate of 0.375 inches per hour. The project will still utilize infiltration to the maximum extent possible.

Water Quality Treatment

The SGDS defines the water quality storm that must be treated as 1 inch in a 24 hour period. The City provides a Best Management Practices (BMP) sizing tool that is used to size all vegetated water quality treatment facilities. Where non-vegetated facilities cannot be sited within the northern secure parking area, Contech Stormfilters will be used. These are designed per City of Portland standards as directed by the SGDS. City standard rain gardens and building-side flow through planters are dispersed throughout the site as the primary treatment method. Vegetated facility surface area is determined by the BMP Sizing Tool but may be reduced by 20% if growing media depth is increased by 12-inches. Minimum and proposed sizes of the proposed vegetated facilities are shown in the Proposed Basin Map in Appendix A, and BMP Sizing Tool Report in Appendix B. Contech Stormfilter sizing are shown in the water quality calculation sheets in Appendix B.

Flow Control Requirement – Downstream Analysis

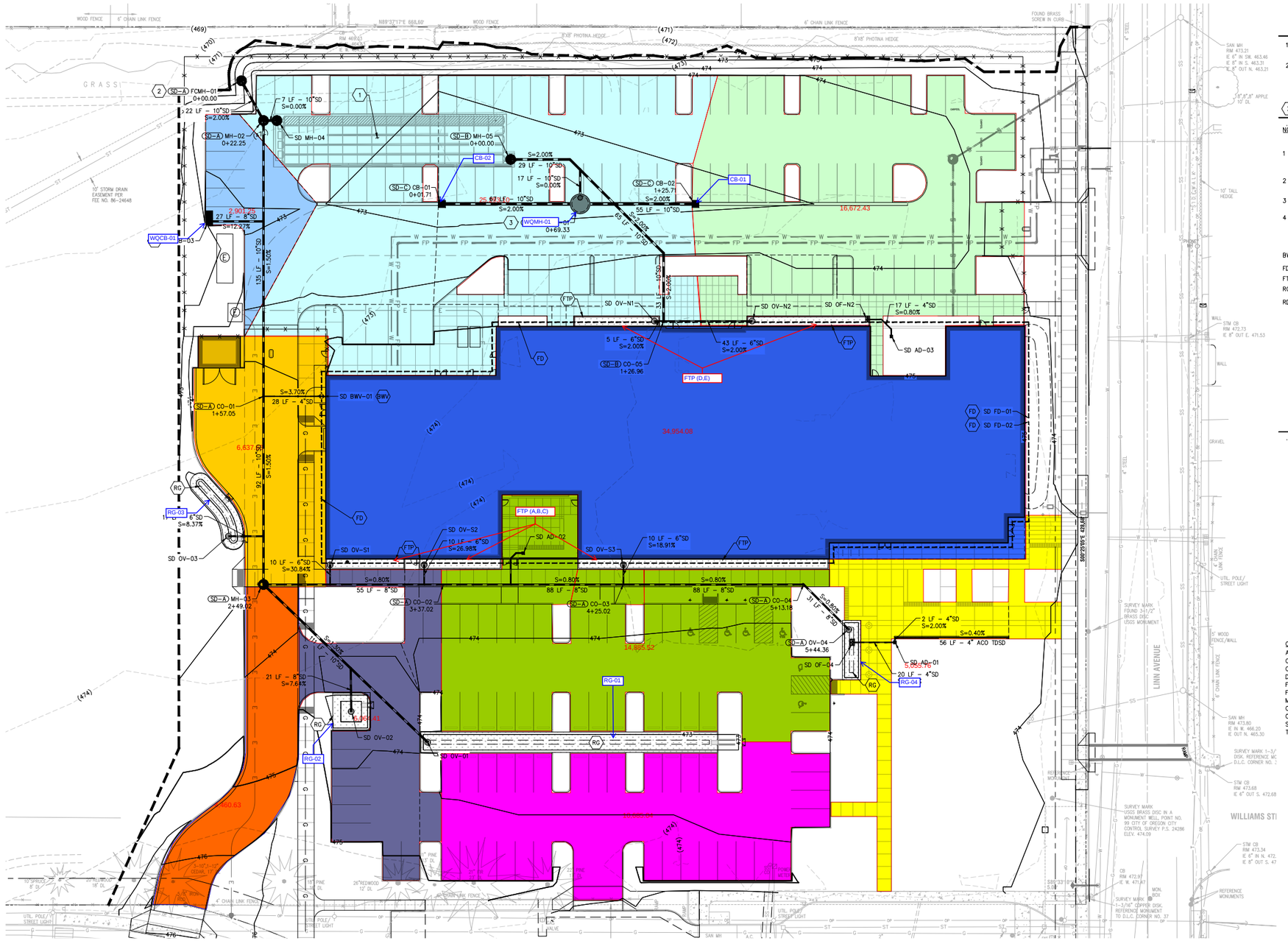
Study of upstream and downstream stormwater basin and infrastructure conditions revealed existing issues in the public conveyance system that crosses the site. In a preliminary discussion with the city, it was noted that one solution would be to demonstrate detention can be provided such that there are no adverse impacts to up or downstream conditions. To perform this analysis, the upstream contributing neighborhood basin 25-year peak runoff flows are used as the baseline in which the developed condition's runoff may not exceed. The developed condition includes the existing upstream basin, and the site pervious and impervious basins. Further design criteria used and the hydrographs of each basin can be found in Appendix E.

While typical site development would be subject to the 10-year storm analysis of pre versus post-development runoff, there are potential conveyance deficiencies in the existing public storm system that warrant use of the 25-year storm to demonstrate adequate conveyance per the SGDS.

Storage calculations indicate that the detention requirement can be met by providing 13,840 cubic feet of underground storage. Stormtech SC-740 chambers with rock storage are proposed. A flow control manhole with tee and 7.9-inch orifice will be installed over the public storm main which will divert flows in excess of the existing conditions to the storage facility located on site. A summary of the storage facility criteria and orificed flow control structure can be found in Appendix E and in stormwater details Appendix C.

Appendix A

Basin Map



SHEET NOTES

1. PIPE BEDDING AND BACKFILL FOR ALL UTILITIES SHALL BE DONE PER DETAIL X/XX.X.
2. STATIONS AND OFFSETS SHOWN ON STRUCTURES ARE SHOWN AT CENTER OF STRUCTURE.

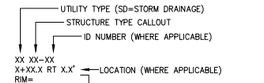
(X) UTILITY KEY NOTES

NOTE	DESCRIPTION	DETAIL REF.
1	APPROXIMATELY 6,200 CF UNDERGROUND STORMWATER DETENTION CHAMBERS, SC-740 OR SIMILAR WITH 6" ROCK STORAGE BASE AND COVER	
2	INSTALL 48" FLOW CONTROL MANHOLE WITH ORIFICE CONTROL OVER EXISTING 12" PUBLIC STORM MAIN IN EASEMENT	
3	96-INCH MANHOLE WITH 13 CONTECH STORMFILTER CARTRIDGES	
4	SINGLE CARTRIDGE WATER QUALITY CATCH BASIN. MANUFACTURED BY CONTECH (SFCB-1)	

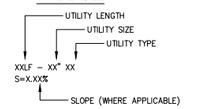
BWV	INSTALL BACKWATER VALVE AT FOUNDATION DRAIN CONNECTION TO STORM SYSTEM.
FD	4-INCH PERFORATED FOUNDATION DRAIN
FTP	FLOW-THROUGH PLANTER PER SITE PLAN
RG	RAIN GARDEN PER SITE PLAN
RD	BELOW GRADE ROOF DRAIN CONNECTION TO STORMWATER PLANTER. INSTALL SPLASHPAD.

UTILITY LABEL LEGEND

STRUCTURE LABEL



PIPE LABEL



STRUCTURE TYPE

CALLOUT	DESCRIPTION	DETAIL REF.
AD	AREA DRAIN	
CB	CATCH BASIN	
CO	CLEANOUT TO GRADE	
DI	DITCH INLET	
FCMH	FLOW CONTROL MANHOLE	
FD	FOUNDATION DRAINAGE	
MH	MANHOLE	
OF	OUTFALL	
OV	OVERFLOW INLET	
STUB	STUB	
TD	TRENCH DRAIN	

TREATMENT ID:	MINIMUM SIZE (SF)	PROPOSED SIZE (SF):
RG-01	384	1,567
RG-02	91	318
RG-03	167	267
RG-04	76	261
FTP (A-E)	525	1,193

BASIN LEGEND:	DRAINS TO:
BASIN A 2901 SF	WQCB-01
BASIN B 25293 SF	CB-02/ WQMH-01
BASIN C 16627 SF	CB-01/ WQMH-01
BASIN D 5056 SF	RG-04
BASIN E 4460 SF	RG-03
BASIN F 6637 SF	RG-03
BASIN G 35020 SF	FTP (A-E)
BASIN H 6064 SF	RG-02
BASIN I 14885 SF	RG-01
BASIN J 10695 SF	RG-01

TOTAL SITE IMPERVIOUS: 127,628 SF

SCALE 1 INCH = 20 FEET (20 0 20 40)

FFA Architecture + Interiors
FFA Architecture and Interiors, Inc.
520 SW Yamhill Suite 900 Portland OR 97204
Phone: 503.222.1661 Fax: 503.222.1781
www.ffadesign.com

kpff
111 SW Fifth Ave., Suite 2400
Portland, OR 97204
O: 503.227.3251
F: 503.274.4681
www.kpff.com

DESCRIPTION	DATE

ROBERT LIBKE PUBLIC SAFETY BUILDING

OREGON CITY POLICE DEPARTMENT

1232 LINN AVE
OREGON CITY, OR 97045

APPROVED:	MGR
DRAWN:	NLP
DATE:	March 29, 2019
PROJECT NUMBER:	1800230

NOT FOR CONSTRUCTION

STORM DRAINAGE PLAN

C-500

SITE PLAN & DESIGN REVIEW

Appendix B

Stormwater Treatment Calculations

WES BMP Sizing Software Version 1.6.0.2, May 2018

WES BMP Sizing Report

Project Information

Project Name	Oregon City Police Department
Project Type	PublicFacilities
Location	
Stormwater Management Area	3045
Project Applicant	Oregon City Police Department
Jurisdiction	CCSD1NCSA

Drainage Management Area

Name	Area (sq-ft)	Pre-Project Cover	Post-Project Cover	DMA Soil Type	BMP
BASIN D	5,056	Forested	ConventionalConcrete	C	RG-04
BASIN C	16,627	Forested	ConventionalConcrete	C	DETENTION-CHAMBERS
BASIN B	25,293	Forested	ConventionalConcrete	C	DETENTION-CHAMBERS
BASIN A	2,901	Forested	ConventionalConcrete	C	DETENTION-CHAMBERS
BASIN E	4,460	Forested	ConventionalConcrete	C	RG-03
BASIN F	6,637	Forested	ConventionalConcrete	C	RG-03
BASIN G	35,020	Forested	ConventionalConcrete	C	FTP-A-B-C-D-E
BASIN H	6,064	Forested	ConventionalConcrete	C	RG-02
BASIN I	14,885	Forested	ConventionalConcrete	C	RG-01
BASIN J	10,685	Forested	ConventionalConcrete	C	RG-01

LID Facility Sizing Details

LID ID	Design Criteria	BMP Type	Facility Soil Type	Minimum Area (sq-ft)	Planned Areas (sq-ft)	Orifice Diameter (in)
RG-03	WaterQuality	Rain Garden - Filtration	C1	166.5	367.0	0.5

RG-01	WaterQuality	Rain Garden - Filtration	C1	383.6	1,567.0	0.8
RG-02	WaterQuality	Rain Garden - Filtration	C1	91.0	318.0	0.4
RG-04	WaterQuality	Rain Garden - Filtration	C1	75.8	261.0	0.4
FTP-A-B-C-D-E	WaterQuality	Stormwater Planter - Filtration	Lined	525.3	1,193.0	1.0

SEE APPENDIX E FOR PROPOSED FLOW CONTROL MEASURES

Design criteria:

Contech Stormfilter with ZPG filter is proposed and sized per below to treat Basins A, B, and C. Sizing is based on the City of Portland criteria, as is directed by the Oregon City Stormwater and Grading Design Standards (SWGDS).

Per the SWGDS, the water quality design storm is 1.0 inch over 24 hours.

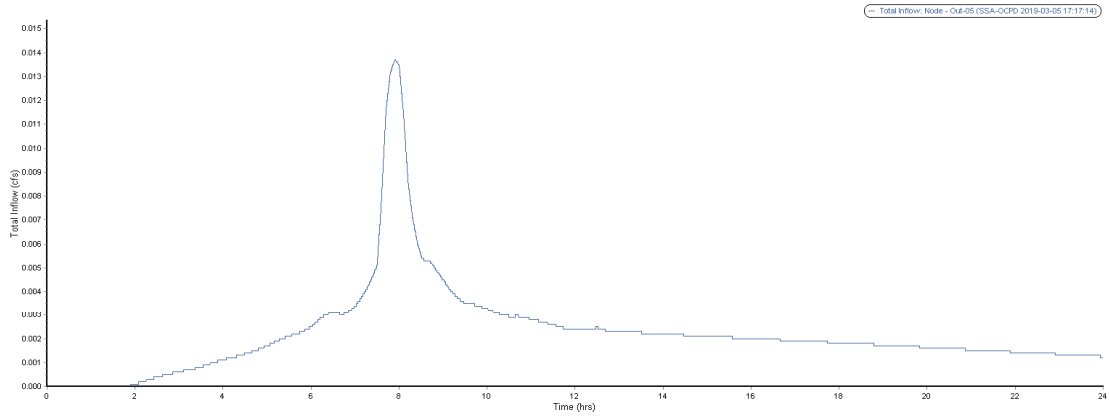
Contech Water Quality Design

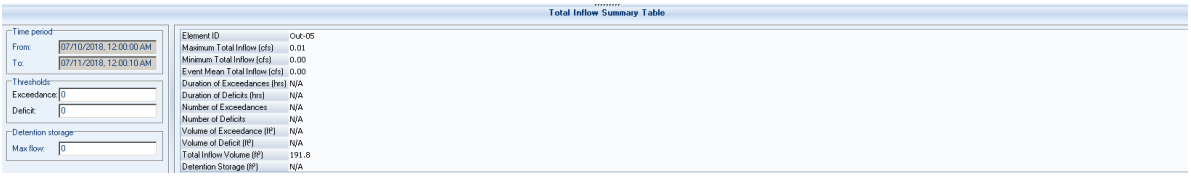
Basin A Impervious Area	0.07 ac
	2901.00 sf
Peak flow - Hydrograph below:	0.01 cfs
	4.49 gpm

SWGDS Section 4.2, water quality design storm:

Water Quality Requirement: Water quality facilities shall be designed to capture and treat 80 percent of the average annual runoff volume to the MEP with the goal of 70 percent total suspended solids removal. The treatment volume equates to a **water quality design storm of 1.0 inch over 24 hours**[1]. The BMP Sizing Tool addresses these water quality requirements to size stormwater management facilities.

Hydrograph Analysis of peak flow for sizing (Autodesk Storm and Sanitary Analysis 2018) SCS Type 1A 24-hr storm distribution





ZPG Contech Stormfilters per BES design criteria memo:

Table 1. Contech StormFilter with ZPG Sizing to Meet City of Portland Pollution Reduction Requirements

Cartridge Size/Stack Configuration	Cartridge Design Flow Rate (gpm/ cartridge stack)	Maximum Drainage Area (acres/ cartridge stack)	Maximum Drainage Area (square feet/ cartridge stack	Cartridge Stacks Per Impervious Acre
12	5	0.065	2838	16
18	7.5	0.098	4257	11
27	11.3	0.147	6413	7

To treat the 4.49 gpm runoff of Basin A, per Table 1 above a single cartridge catch basin configuration is proposed (7.5 gpm). Basins will be further refined in subsequent submittals to provide full treatment.

Design criteria:

Contech Stormfilter with ZPG filter is proposed and sized per below to treat Basins A, B, and C. Sizing is based on the City of Portland criteria, as is directed by the Oregon City Stormwater and Grading Design Standards (SWGDS).

Per the SWGDS, the water quality design storm is 1.0 inch over 24 hours.

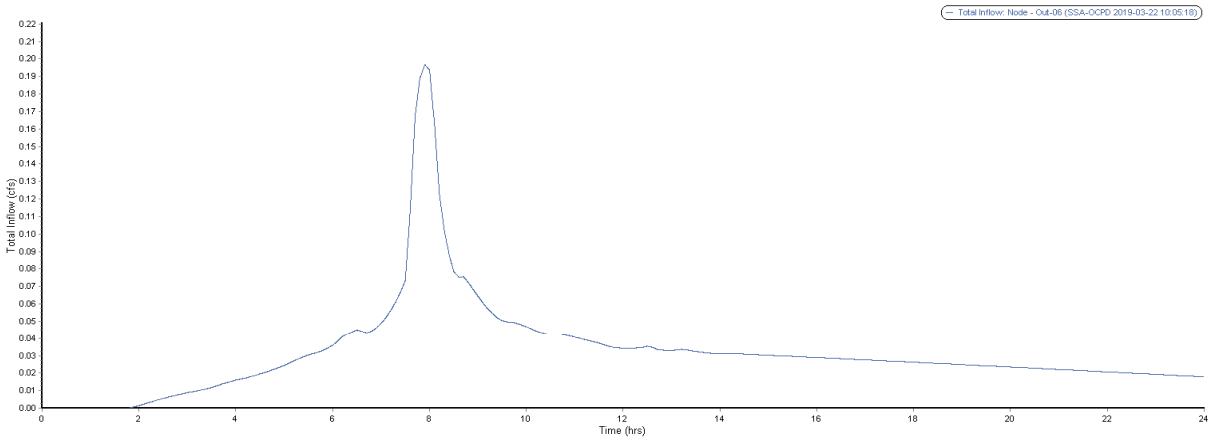
Contech Water Quality Design

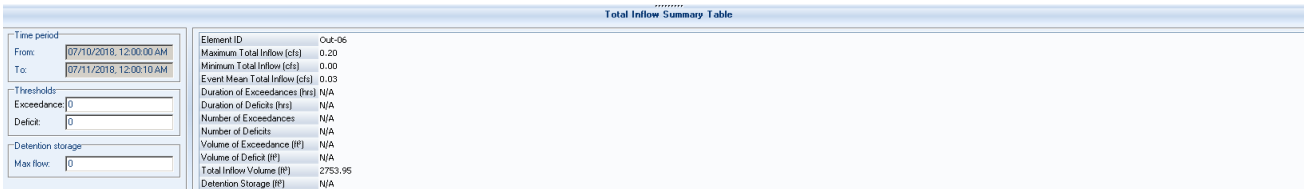
Basin B+C Impervious Area	0.96 ac
	41920.00 sf
Peak flow - Hydrograph below:	0.20 cfs
	89.76 gpm

SWGDS Section 4.2, water quality design storm:

Water Quality Requirement: Water quality facilities shall be designed to capture and treat 80 percent of the average annual runoff volume to the MEP with the goal of 70 percent total suspended solids removal. The treatment volume equates to a **water quality design storm of 1.0 inch over 24 hours**[1]. The BMP Sizing Tool addresses these water quality requirements to size stormwater management facilities.

Hydrograph Analysis of peak flow for sizing (Autodesk Storm and Sanitary Analysis 2018) SCS Type 1A 24-hr storm distribution





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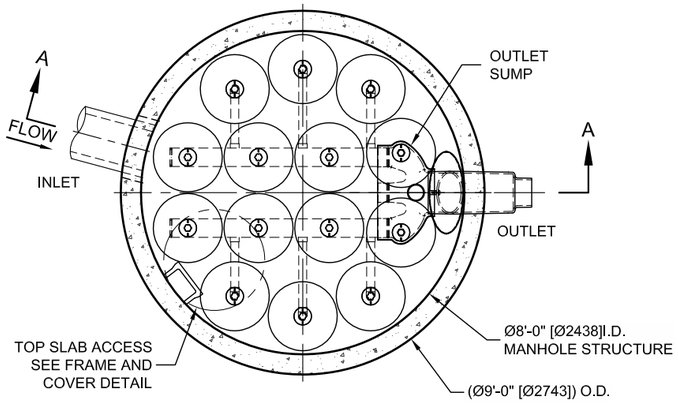
12	5	0.065	2838	16
18	7.5	0.098	4257	11
27	11.3	0.147	6413	7

To treat the 89.76 gpm runoff of Basin B, per Table 1 above a 12 cartridge manhole configuration is proposed (90 gpm). A Contech Stormfilter 96" Manhole capable of holding 14 cartridges is proposed to meet this requirement.

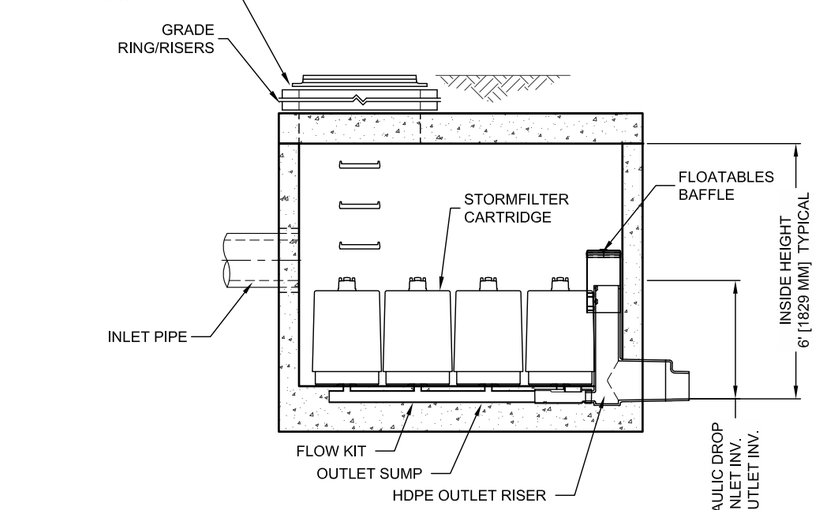
Appendix C

Stormwater Details



PLAN VIEW

STANDARD OUTLET RISER
FLOWKIT: 43A



SECTION A-A

The Stormwater Management StormFilter®

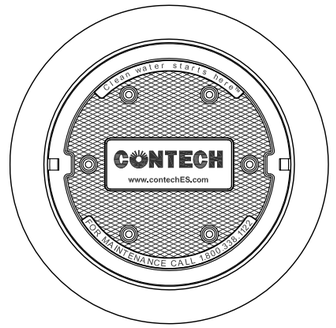
STORMFILTER DESIGN NOTES

STORMFILTER TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE SELECTION AND THE NUMBER OF CARTRIDGES. THE STANDARD MANHOLE STYLE IS SHOWN WITH THE MAXIMUM NUMBER OF CARTRIDGES (14). VOLUME SYSTEM IS ALSO AVAILABLE WITH MAXIMUM 14 CARTRIDGES. Ø8'-0" [2438 mm] MANHOLE STORMFILTER PEAK HYDRAULIC CAPACITY IS 1.8 CFS [51 L/s] . IF THE SITE CONDITIONS EXCEED 1.8 CFS [51 L/s] AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

CARTRIDGE SELECTION

CARTRIDGE HEIGHT	27" [686 mm]			18" [458 mm]			LOW DROP		
RECOMMENDED HYDRAULIC DROP (H)	3.05' [930 mm]			2.3' [700 mm]			1.8' [550 mm]		
SPECIFIC FLOW RATE (gpm/sf) [L/s/m^2]	2 [1.30]	1.67* [1.08]	1 [0.65]	2 [1.30]	1.67* [1.08]	1 [0.65]	2 [1.30]	1.67* [1.08]	1 [0.65]
CARTRIDGE FLOW RATE (gpm) [L/s]	22.5 [1.42]	18.79 [1.19]	11.25 [0.71]	15 [0.95]	12.53 [0.79]	7.5 [0.44]	10 [0.63]	8.35 [0.54]	5 [0.32]

* 1.67 gpm/sf [1.08 L/s/m^2] SPECIFIC FLOW RATE IS APPROVED WITH PHOSPHOSORB® (PSORB) MEDIA ONLY



FRAME AND COVER

(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
WATER QUALITY FLOW RATE (cfs) [L/s]	*
PEAK FLOW RATE (cfs) [L/s]	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
CARTRIDGE HEIGHT (SEE TABLE ABOVE)	*
NUMBER OF CARTRIDGES REQUIRED	*
CARTRIDGE FLOW RATE	*
MEDIA TYPE (PERLITE, ZPG, PSORB)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE #1	*	*	*
INLET PIPE #2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES

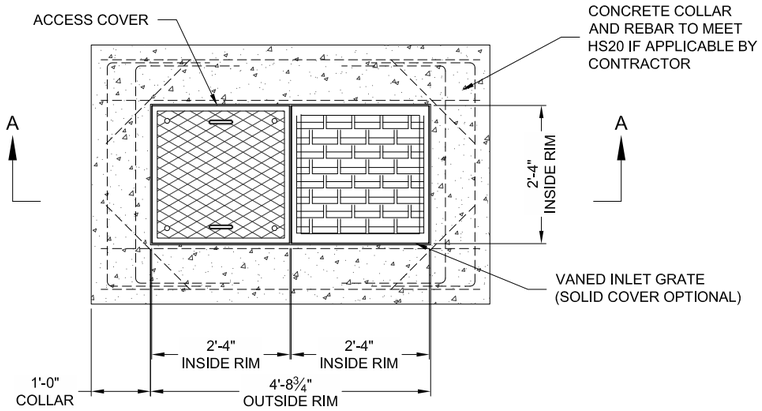
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR SITE SPECIFIC DRAWINGS WITH DETAILED VAULT DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
4. STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS-20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 5' [1524 mm] AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD 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 [178 mm]. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST 38 SECONDS.
7. SPECIFIC FLOW RATE IS EQUAL TO THE FILTER TREATMENT CAPACITY (gpm) [L/s] DIVIDED BY THE FILTER CONTACT SURFACE AREA (sq ft)[m^2].
8. STORMFILTER STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES

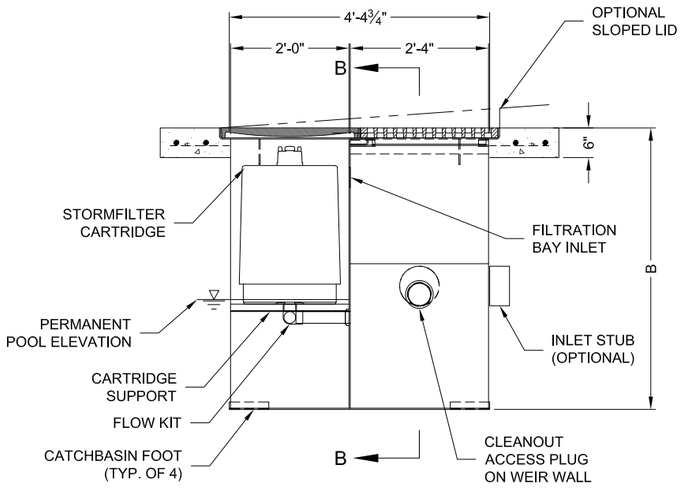
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET PIPE(S).
E. CONTRACTOR TO PROVIDE AND INSTALL CONNECTOR TO THE OUTLET RISER STUB. STORMFILTER EQUIPPED WITH A DUAL DIAMETER HDPE OUTLET STUB AND SAND COLLAR. IF OUTLET PIPE IS LARGER THAN 8 INCHES [200 mm], CONTRACTOR TO REMOVE THE 8 INCH [200 mm] OUTLET STUB AT MOLDED-IN CUT LINE. COUPLING BY FERNCO OR EQUAL AND PROVIDED BY CONTRACTOR.
F. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.

CONTECH® ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

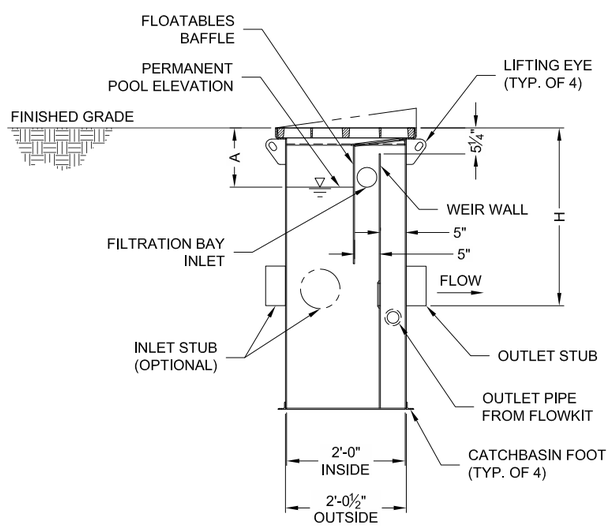
SFMH96
STORMFILTER
STANDARD DETAIL



PLAN VIEW



SECTION A-A



SECTION B-B

STORMFILTER STEEL CATCHBASIN DESIGN NOTES

STORMFILTER TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE SELECTION AND THE NUMBER OF CARTRIDGES. 1 CARTRIDGE CATCHBASIN HAS A MAXIMUM OF ONE CARTRIDGE. SYSTEM IS SHOWN WITH A 27" CARTRIDGE, AND IS ALSO AVAILABLE WITH AN 18" CARTRIDGE. STORMFILTER CATCHBASIN CONFIGURATIONS ARE AVAILABLE WITH A DRY INLET BAY FOR VECTOR CONTROL.
PEAK HYDRAULIC CAPACITY PER TABLE BELOW. IF THE SITE CONDITIONS EXCEED PEAK HYDRAULIC CAPACITY, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

CARTRIDGE SELECTION

CARTRIDGE HEIGHT	27"			18"			18" DEEP		
RECOMMENDED HYDRAULIC DROP (H)	3.05'			2.3'			3.3'		
SPECIFIC FLOW RATE (gpm/sf)	2 gpm/sf	1.67* gpm/sf	1 gpm/sf	2 gpm/sf	1.67* gpm/sf	1 gpm/sf	2 gpm/sf	1.67* gpm/sf	1 gpm/sf
CARTRIDGE FLOW RATE (gpm)	22.5	18.79	11.25	15	12.53	7.5	15	12.53	7.5
PEAK HYDRAULIC CAPACITY	1.0			1.0			1.8		
INLET PERMANENT POOL LEVEL (A)	1'-0"			1'-0"			2'-0"		
OVERALL STRUCTURE HEIGHT (B)	4'-9"			3'-9"			4'-9"		

* 1.67 gpm/sf SPECIFIC FLOW RATE IS APPROVED WITH PHOSPHOSORB® (PSORB) MEDIA ONLY

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STORMFILTER CATCHBASIN STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
3. STORMFILTER CATCHBASIN WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
4. INLET SHOULD NOT BE LOWER THAN OUTLET. INLET (IF APPLICABLE) AND OUTLET PIPING TO BE SPECIFIED BY ENGINEER AND PROVIDED BY CONTRACTOR.
5. MANUFACTURER TO APPLY A SURFACE BEAD WELD IN THE SHAPE OF THE LETTER "O" ABOVE THE OUTLET PIPE STUB ON THE EXTERIOR SURFACE OF THE STEEL SFCB.
6. STORMFILTER CATCHBASIN EQUIPPED WITH 4 INCH (APPROXIMATE) LONG STUBS FOR INLET (IF APPLICABLE) AND OUTLET PIPING. STANDARD OUTLET STUB IS 8 INCHES IN DIAMETER. MAXIMUM OUTLET STUB IS 15 INCHES IN DIAMETER. CONNECTION TO COLLECTION PIPING CAN BE MADE USING FLEXIBLE COUPLING BY CONTRACTOR.
7. STEEL STRUCTURE TO BE MANUFACTURED OF 1/4 INCH STEEL PLATE. CASTINGS SHALL MEET AASHTO M306 LOAD RATING. TO MEET HS20 LOAD RATING ON STRUCTURE, A CONCRETE COLLAR IS REQUIRED. WHEN REQUIRED, CONCRETE COLLAR WITH #4 REINFORCING BARS TO BE PROVIDED BY CONTRACTOR.
8. 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 38 SECONDS.
9. SPECIFIC FLOW RATE IS EQUAL TO THE FILTER TREATMENT CAPACITY (gpm) DIVIDED BY THE FILTER CONTACT SURFACE AREA (sq ft).

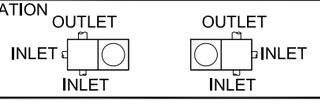
INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CATCHBASIN (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.

1-CARTRIDGE CATCHBASIN STORMFILTER DATA

STRUCTURE ID	XXX
WATER QUALITY FLOW RATE (cfs)	X.XX
PEAK FLOW RATE (<1 cfs)	X.XX
RETURN PERIOD OF PEAK FLOW (yrs)	XXX
CARTRIDGE HEIGHT (27", 18", 18" DEEP)	XX
CARTRIDGE FLOW RATE (gpm)	XX
MEDIA TYPE (PERLITE, ZPG, PSORB)	XXXXX
RIM ELEVATION	XXX.XX'

PIPE DATA:	I.E.	DIAMETER
INLET STUB	XXX.XX'	XX"
OUTLET STUB	XXX.XX'	XX"

CONFIGURATION



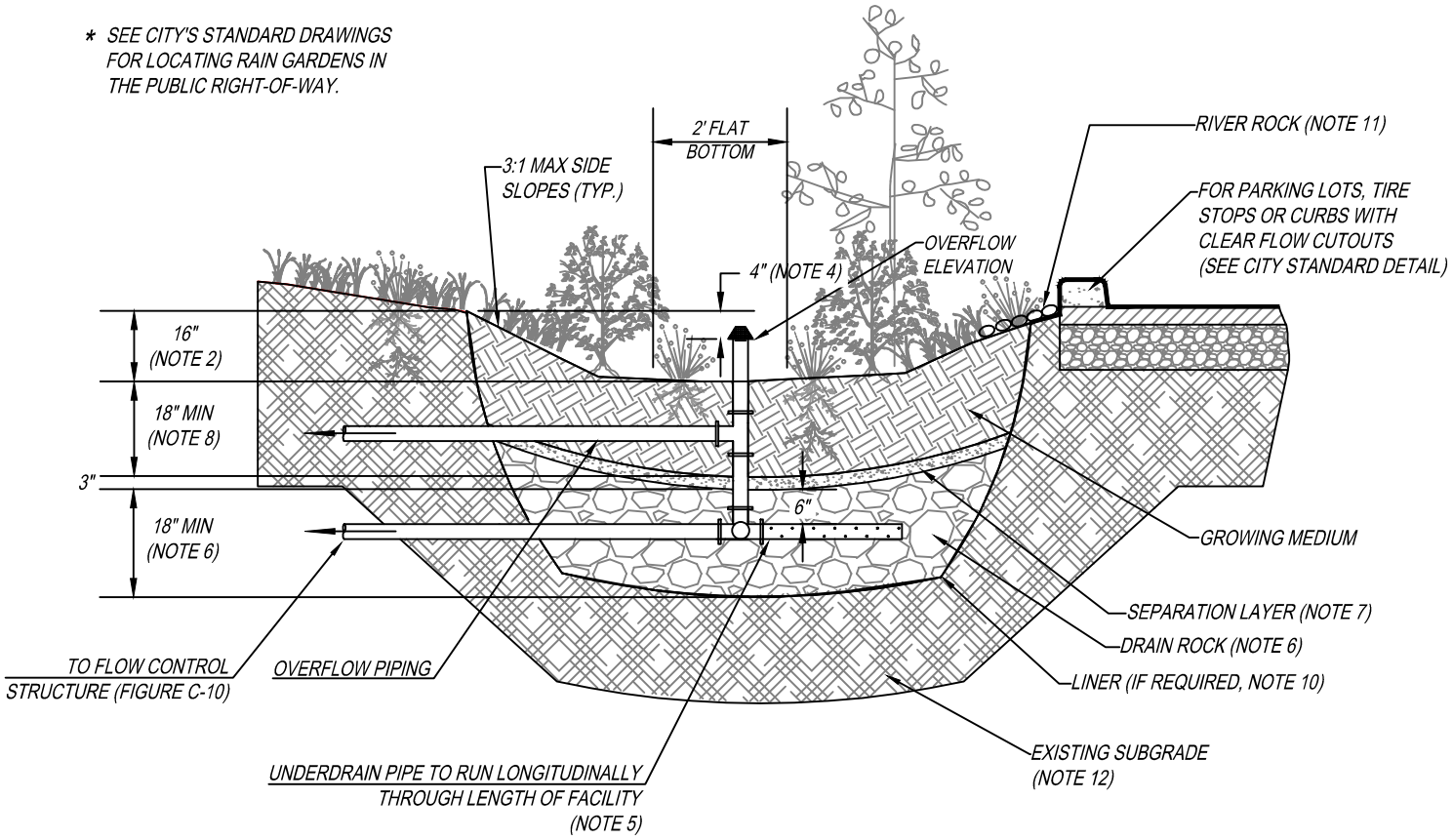
SLOPED LID	YES\NO
SOLID COVER	YES\NO

NOTES/SPECIAL REQUIREMENTS:

The Stormwater Management StormFilter®

CONTECH® ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-526-3999 513-645-7000 513-645-7993 FAX

1 CARTRIDGE CATCHBASIN STORMFILTER STANDARD DETAIL

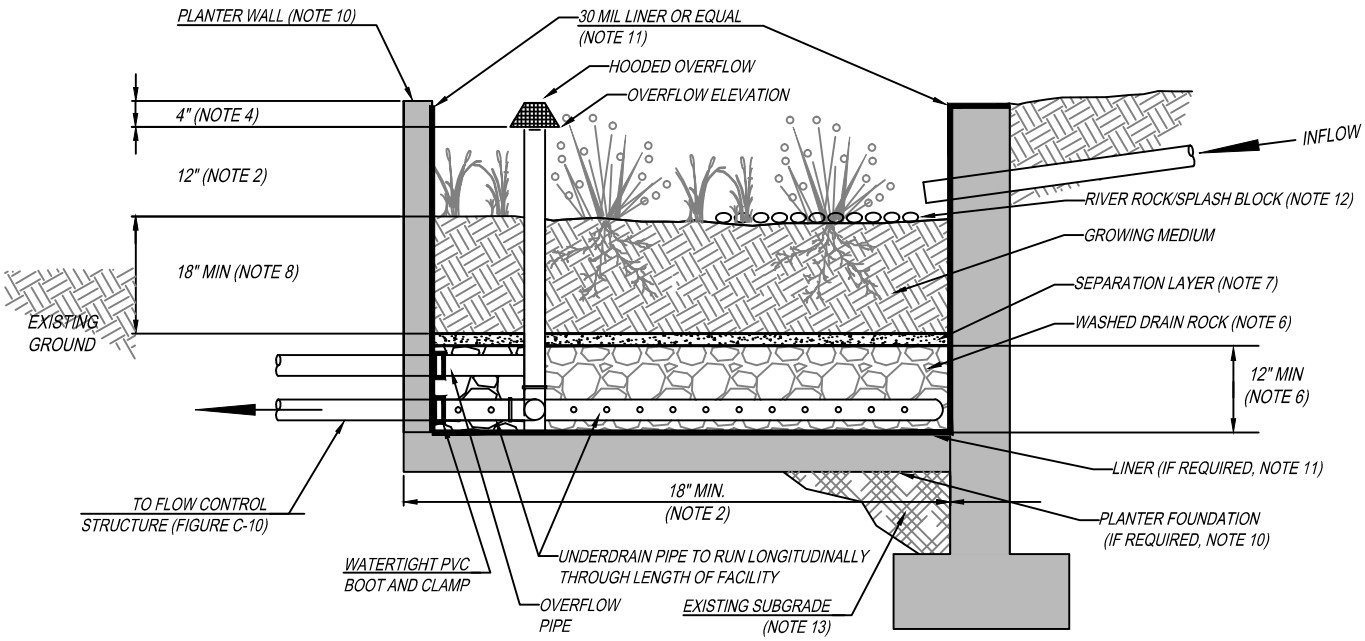


GENERAL NOTES:

1. **PROVIDE PROTECTION** FROM ALL VEHICLE TRAFFIC, EQUIPMENT STAGING, AND FOOT TRAFFIC IN PROPOSED INFILTRATION AREAS PRIOR TO, DURING AND AFTER CONSTRUCTION. UNLESS REQUIRED BY SITE CONDITIONS, UNLINED RAIN GARDENS ARE PREFERRED TO MAXIMIZE ONSITE INFILTRATION.
2. **DIMENSIONS:**
   -DEPTH OF BASIN (FROM TOP OF GROWING MEDIUM TO OVERFLOW ELEVATION): 12"
   -FLAT BOTTOM WIDTH: 2' MINIMUM
   -SIDE SLOPES OF BASIN: 3:1 MAXIMUM
   -SLOPE OF RAIN GARDEN: 0.5% OR LESS
3. **SETBACKS:**
   -FILTRATION RAIN GARDEN MUST BE 10' FROM FOUNDATIONS AND 5' FROM PROPERTY LINES UNLESS APPROVED BY BUILDING OFFICIAL.
4. **OVERFLOW:**
   -OVERFLOW REQUIRED. INLET ELEVATION MUST ALLOW FOR 4" OF FREEBOARD, MINIMUM.
   - PROTECT FROM DEBRIS AND SEDIMENT WITH STRAINER OR GRATE.
5. **PIPING:**
   -PERFORATED UNDERDRAIN PIPING: SHALL BE ABS SCH. 40, DUCTILE IRON, OR PVC SCH.40. MINIMUM DIAMETER IS 6". PIPING MUST HAVE 1% GRADE AND FOLLOW THE UNIFORM PLUMBING CODE. PVC NOT ALLOWED ABOVE GROUND.
   -OVERFLOW PIPING: SHALL BE ABS SCH. 40, DUCTILE IRON, OR PVC SCH. 40 AND SHALL NOT BE PERFORATED. MINIMUM DIAMETER IS 6". PIPING MUST HAVE 1% GRADE AND FOLLOW THE UNIFORM PLUMBING CODE. PVC NOT ALLOWED ABOVE GROUND.
6. **DRAIN ROCK:**
   -SIZE: 1 1/2" to 3/4"-0 WASHED
   -DEPTH: 18" MINIMUM
7. **SEPARATION** BETWEEN DRAIN ROCK AND GROWING MEDIUM: SHALL BE A 3" LAYER OF 3/4" - 1/4" OPEN GRADED AGGREGATE.
8. **GROWING MEDIUM:**
   -DEPTH: 18" MINIMUM
   -SEE APPENDIX A FOR SPECIFICATION OR USE SAND/LOAM/COMPOST 3-WAY MIX.
   -FACILITY SURFACE AREA MAY BE REDUCED BY 20% WHEN GROWING MEDIA DEPTH IS INCREASED TO 30" OR MORE.
9. **VEGETATION:** FOLLOW LANDSCAPE PLANS OR REFER TO PLANTING REQUIREMENTS IN APPENDIX A.
10. **WATERPROOF LINER (IF REQUIRED):** SHALL BE 30 MIL PVC OR EQUIVALENT.
11. **INSTALL RIVER ROCK** OR SPLASH PAD TO TRANSITION FROM INLETS TO GROWING MEDIUM. SIZE OF ROCK SHALL BE 1" - 3".
12. **SEASONAL HIGH GROUNDWATER SEPARATION:**
    -SEPARATION DISTANCE AS REQUIRED BY CITY.

Rain Garden - Filtration
Figure C-4

* SEE CITY'S STANDARD DRAWINGS FOR LOCATING PLANTERS IN THE PUBLIC RIGHT-OF-WAY.



GENERAL NOTES:

1. **PROVIDE PROTECTION** FROM ALL VEHICLE TRAFFIC, EQUIPMENT STAGING, AND FOOT TRAFFIC IN PROPOSED INFILTRATION AREAS PRIOR TO, DURING AND AFTER CONSTRUCTION.
2. **DIMENSIONS:**
   -WIDTH: 18" MINIMUM
   -DEPTH OF PLANTER (FROM TOP OF GROWING MEDIUM TO OVERFLOW ELEVATION): 12"
   -SLOPE OF PLANTER: 0.5% OR LESS
3. **SETBACKS**
   -PLANTERS MUST BE MINIMUM OF 5 FEET FROM PROPERTY LINE.
4. **OVERFLOW:**
   -INLET ELEVATION MUST ALLOW FOR 4" OF FREEBOARD, MINIMUM.
   -PROTECT FROM DEBRIS AND SEDIMENT WITH STRAINER OR GRATE.
5. **PIPING:**
   -PERFORATED UNDERDRAIN PIPING: SHALL BE ABS SCH. 40, DUCTILE IRON, OR PVC SCH.40, 6" MINIMUM DIAMETER. PIPING MUST HAVE 1% GRADE AND FOLLOW THE UNIFORM PLUMBING CODE. PVC NOT ALLOWED ABOVE GROUND.
   -OVERFLOW PIPING: SHALL BE ABS SCH.40, DUCTILE IRON, OR PVC SCH.40 AND SHALL NOT BE PERFORATED. MIMIMUM DIAMETER IS 6". PIPING MUST HAVE 1% GRADE AND FOLLOW THE UNIFORM PLUMBING CODE. PVC NOT ALLOWED ABOVE GROUND.
6. **DRAIN ROCK:**
   -SIZE FOR FLOW-THROUGH PLANTER: 1 1/2" - 3/4" WASHED
   -DEPTH: 12" MINIMUM
7. **SEPARATION** BETWEEN DRAIN ROCK AND GROWING MEDIUM: SHALL BE A 3" LAYER OF 3/4" - 1/4" OPEN GRADED AGGREGATE.
8. **GROWING MEDIUM:**
   -DEPTH: 18" MINIMUM
   -SEE APPENDIX A FOR SPECIFICATION OR USE SAND/LOAM/COMPOST 3-WAY MIX.
   -FACILITY SURFACE AREA MAY BE REDUCED BY 20% WHEN GROWING MEDIA DEPTH IS INCREASED TO 30" OR MORE.
9. **VEGETATION:** FOLLOW LANDSCAPE PLANS OR REFER TO PLANTING REQUIREMENTS IN APPENDIX A.
10. **PLANTER FOUNDATION AND WALLS:**
    -MATERIALS SHALL BE 4" REINFORCED CONCRETE, STONE, BRICK, OR OTHER DURABLE MATERIAL.
    -CONCRETE, BRICK, OR STONE WALLS SHALL BE INCLUDED ON FOUNDATION PLANS.
    -INSTALL INVERTED CURB AS NEEDED BETWEEN PLANTER AND ROAD SUBGRADE.
    -WALL HEIGHTS GREATER THAN 24" ABOVE GRADE REQUIRE HANDRAIL.
11. **WATERPROOF LINER (IF REQUIRED):**
    -LINER SHALL BE 30 MIL PVC OR EQUIVALENT, FOR FLOW THROUGH FACILITIES.
    -A WATERPROOF LINER IS NOT REQUIRED IF THE FOUNDATION OR WALL MATERIAL IS WATERPROOF REINFORCED CONCRETE OR APPROVED EQUAL.
12. **INSTALL RIVER ROCK** SPLASH PAD TO TRANSITION FROM INLET TO GROWING MEDIUM. SIZE OF ROCK SHALL BE 1" - 3".
13. **SEASONAL HIGH GROUNDWATER SEPARATION:**
    -SEPARATION DISTANCE AS REQUIRED BY THE CITY.
14. **SUBMIT RETAINING WALL DESIGN** IN ACCORDANCE WITH APPLICABLE STRUCTURAL CODES FOR REVIEW AND APPROVAL.

Stormwater Planter - Filtration
Figure C-1

ADVANCED DRAINAGE SYSTEMS, INC.

SiteASSIST by StormTech
FOR STORMTECH INSTRUCTIONS, DOWNLOAD THE INSTALLATION APP

OCPD

Oregon City, OR

STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH SC-740, SC-310, OR APPROVED EQUAL.
2. CHAMBERS SHALL BE MANUFACTURED FROM VIRGIN POLYPROPYLENE OR POLYETHYLENE RESINS.
3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
4. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
5. CHAMBERS SHALL MEET ASTM F2922 (POLYETHYLENE) OR ASTM F2418 (POLYPROPYLENE), "STANDARD SPECIFICATION FOR THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
6. CHAMBERS SHALL BE DESIGNED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
7. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
   a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY AASHTO FOR THERMOPLASTIC PIPE.
   b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 OR ASTM F2922 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
   c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
8. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF THE SC-310/SC-740 SYSTEM

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/SC-780 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS.

   STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm).
8. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
9. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
2. THE USE OF CONSTRUCTION EQUIPMENT OVER SC-310 & SC-740 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADERS, DUMP TRUCKS, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

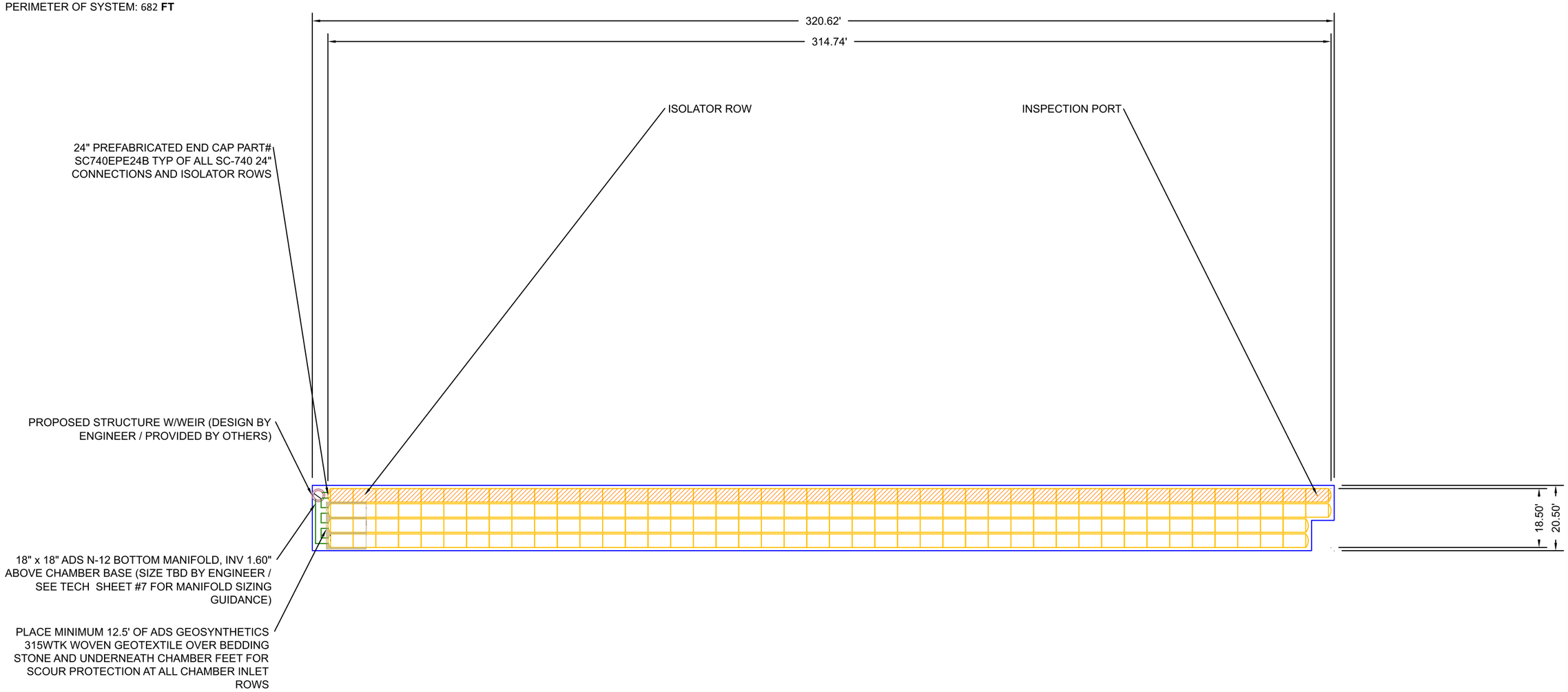
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO THE CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

CONCEPTUAL LAYOUT

(174) STORMTECH SC-740 CHAMBERS
(8) STORMTECH SC-740 END CAPS
INSTALLED WITH 6 " COVER STONE, 6 " BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 13905 CF
AREA OF SYSTEM: 6505 **FT²**
PERIMETER OF SYSTEM: 682 **FT**

COMPUTER GENERATED CONCEPTUAL LAYOUT - NOT FOR CONSTRUCTION



OCPD
Oregon City, OR

DATE: 01/25/2019 | DRAWN: NP | CHECKED: ---
PROJECT #: Tool

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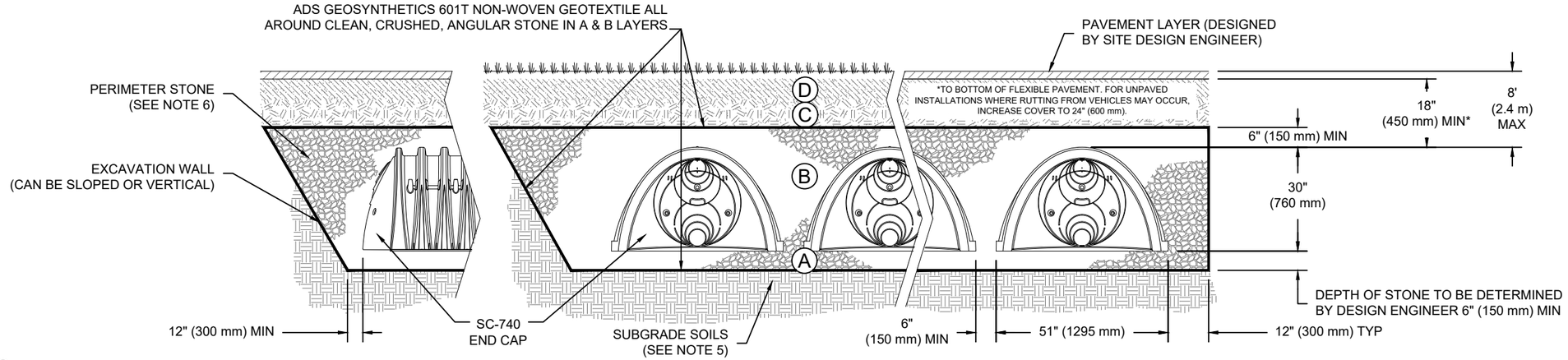
NOT TO SCALE

ACCEPTABLE FILL MATERIALS: STORMTECH SC-740 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. [2] [3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.



NOTES:

1. SC-740 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS", OR ASTM F2922 "STANDARD SPECIFICATION FOR POLYETHYLENE (PE) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-740 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
4. THE "SITE DESIGN ENGINEER" REFERS TO THE ENGINEER RESPONSIBLE FOR THE DESIGN AND LAYOUT OF THE STORMTECH CHAMBERS FOR THIS PROJECT.
5. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
6. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
7. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

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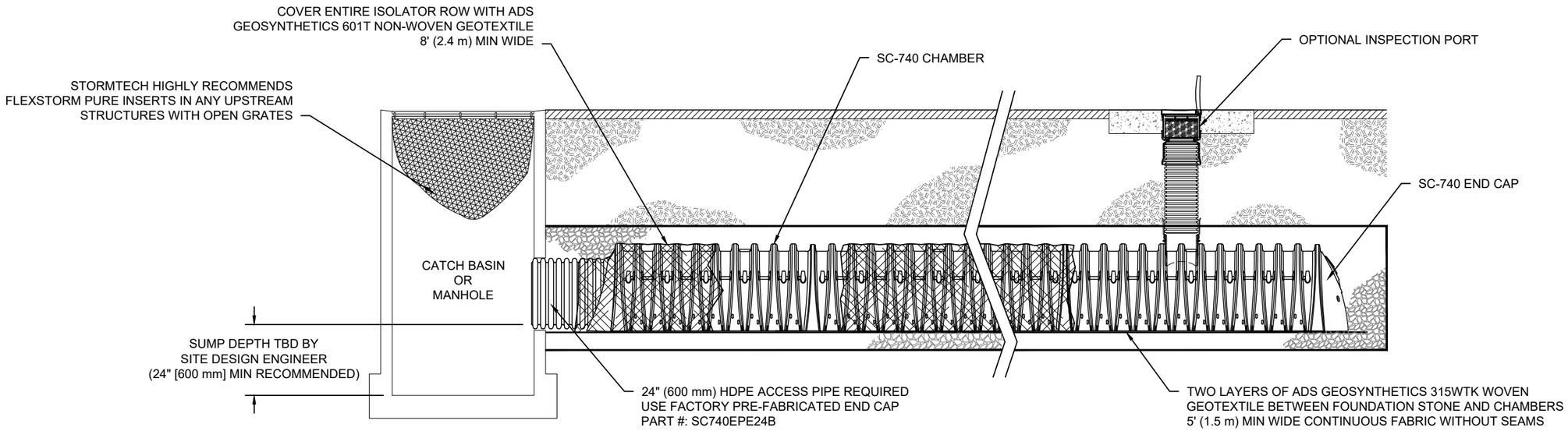


SC-740 ISOLATOR ROW DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

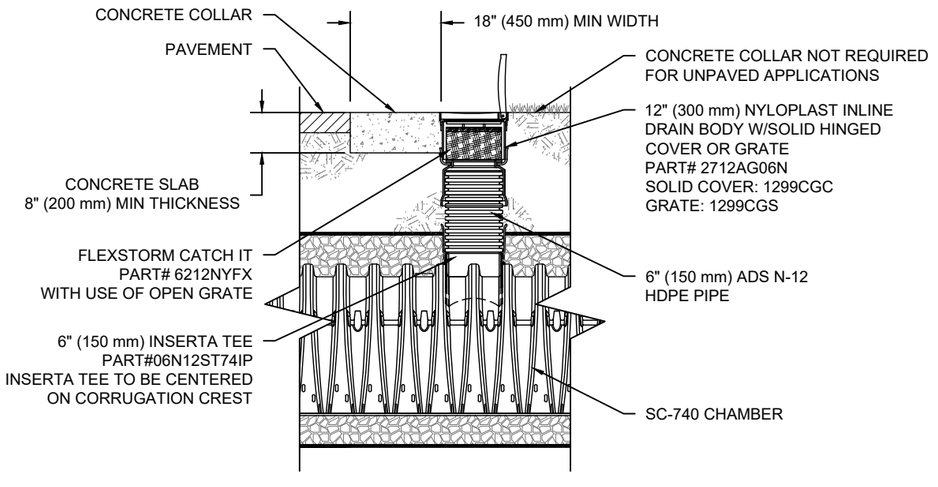
STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.

2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



SC-740 6" INSPECTION PORT DETAIL
NTS

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Oregon City, OR
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DRAWN: NP
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1-800-733-7473

INTENTIONALLY
LEFT BLANK

INSERTA TEE DETAIL

NTS

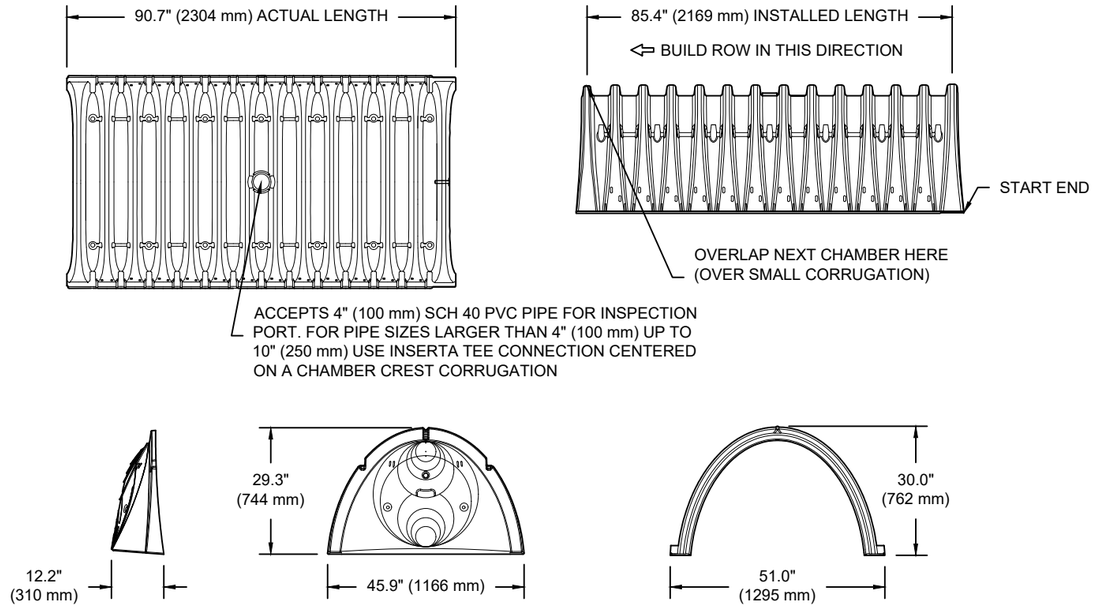
SECTION A-A **SIDE VIEW**

CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
MC-3500	12" (300 mm)	6" (150 mm)
MC-4500	12" (300 mm)	8" (200 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS.
CONTACT STORMTECH FOR MORE INFORMATION.

SC-740 TECHNICAL SPECIFICATION

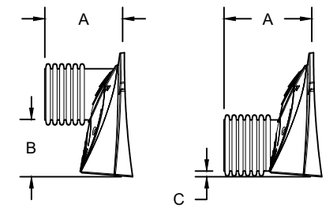
NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	51.0" X 30.0" X 85.4"	(1295 mm X 762 mm X 2169 mm)
CHAMBER STORAGE	45.9 CUBIC FEET	(1.30 m³)
MINIMUM INSTALLED STORAGE*	74.9 CUBIC FEET	(2.12 m³)
WEIGHT	75.0 lbs.	(33.6 kg)

*ASSUMES 6" (152 mm) STONE ABOVE, BELOW, AND BETWEEN CHAMBERS



STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"

PART #	STUB	A	B	C
SC740EPE06T / SC740EPE06TPC	6" (150 mm)	10.9" (277 mm)	18.5" (470 mm)	---
SC740EPE06B / SC740EPE06BPC			---	0.5" (13 mm)
SC740EPE08T /SC740EPE08TPC	8" (200 mm)	12.2" (310 mm)	16.5" (419 mm)	---
SC740EPE08B / SC740EPE08BPC			---	0.6" (15 mm)
SC740EPE10T / SC740EPE10TPC	10" (250 mm)	13.4" (340 mm)	14.5" (368 mm)	---
SC740EPE10B / SC740EPE10BPC			---	0.7" (18 mm)
SC740EPE12T / SC740EPE12TPC	12" (300 mm)	14.7" (373 mm)	12.5" (318 mm)	---
SC740EPE12B / SC740EPE12BPC			---	1.2" (30 mm)
SC740EPE15T / SC740EPE15TPC	15" (375 mm)	18.4" (467 mm)	9.0" (229 mm)	---
SC740EPE15B / SC740EPE15BPC			---	1.3" (33 mm)
SC740EPE18T / SC740EPE18TPC	18" (450 mm)	19.7" (500 mm)	5.0" (127 mm)	---
SC740EPE18B / SC740EPE18BPC			---	1.6" (41 mm)
SC740EPE24B*	24" (600 mm)	18.5" (470 mm)	---	0.1" (3 mm)

ALL STUBS, EXCEPT FOR THE SC740EPE24B ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC740EPE24B THE 24" (600 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 1.75" (44 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

NOTE: ALL DIMENSIONS ARE NOMINAL

OCPD
Oregon City, OR

DATE: 01/25/2019 | DRAWN: NP | CHECKED: ---
PROJECT #: Tool

REV	DRW	CHK	DESCRIPTION

StormTech
Detention•Retention•Water Quality
70 INWOOD ROAD, SUITE 3 | ROCKY HILL | CT | 06067
860-529-8188 | 888-892-2694 | WWW.STORMTECH.COM

ADS
ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

Appendix D

Site Assessment and Planning Checklist

SITE ASSESSMENT AND PLANNING CHECKLIST

✓	Information needed	Attach supporting materials as needed
2.2.1 Site Information		
	Applicant contact information	Applicant name: James Band Business name: Oregon City Police Department Contact address, phone number, and e-mail:
	Project location	Site address: 1234 Linn Avenue, Oregon City Site description: The site will be the new home of the Oregon City Police and Courts Facility, including associated parking and utility site improvements Major drainage basin: Coffee Basin Is the project site located with the WQRA as defined in OCMC 17.49? N (Y/N) *Include a vicinity map of the site (including location of property in relation to adjacent properties, roads, and pedestrian/bike facilities).* (Narrative page 1)
	Project type	Identify types of development planned for the site such as commercial, industrial, single-family residential, multi-family residential, or other (describe): Public Facilities
	Size of site	Size of site: 8.34 (acres) Number of existing/proposed tax lots: 3 Amount of new and replaced impervious area: 127,628 (SF)
2.2.2 Site Assessment *Note: Site assessment information may be available from the OCMaps online tool available through the City's website.*		
	Site Assessment Map	*Attach engineered scale Site Assessment Map, showing items below.*
	Topography Evaluate site and map slopes: *Flat: 0-10%* *Moderate: 10-25%* *Steep: 25% and greater*	*Surveyed or aerial-based mapping with 2-foot intervals for slopes 0-25% slope and 10-foot intervals for steeper. Indicate Geologic Hazard Areas as defined by OCMC 17.04.510 and Geologic Hazards Overlay Zone as defined by OCMC 17.04.515.* See Grading Plan C-400
	Soils and Groundwater Research and map site soil hydrologic group, depth to groundwater	NRCS Hydrologic Soil Type (show on map if more than one type present): *Attach seasonal groundwater depth evaluation if available or required (site has floodplain and/or wetland). Groundwater depth information is available from the City.* Appendix D2
	Infiltration Assessment Determine soil capacity for onsite infiltration	If an infiltration test is performed, attach the documentation. Report the test type (Basic/Professional) performed and results. See **Appendix D** for the approved infiltration testing methods. Test type: Cased-hole falling head 0.375 (inches/hour)

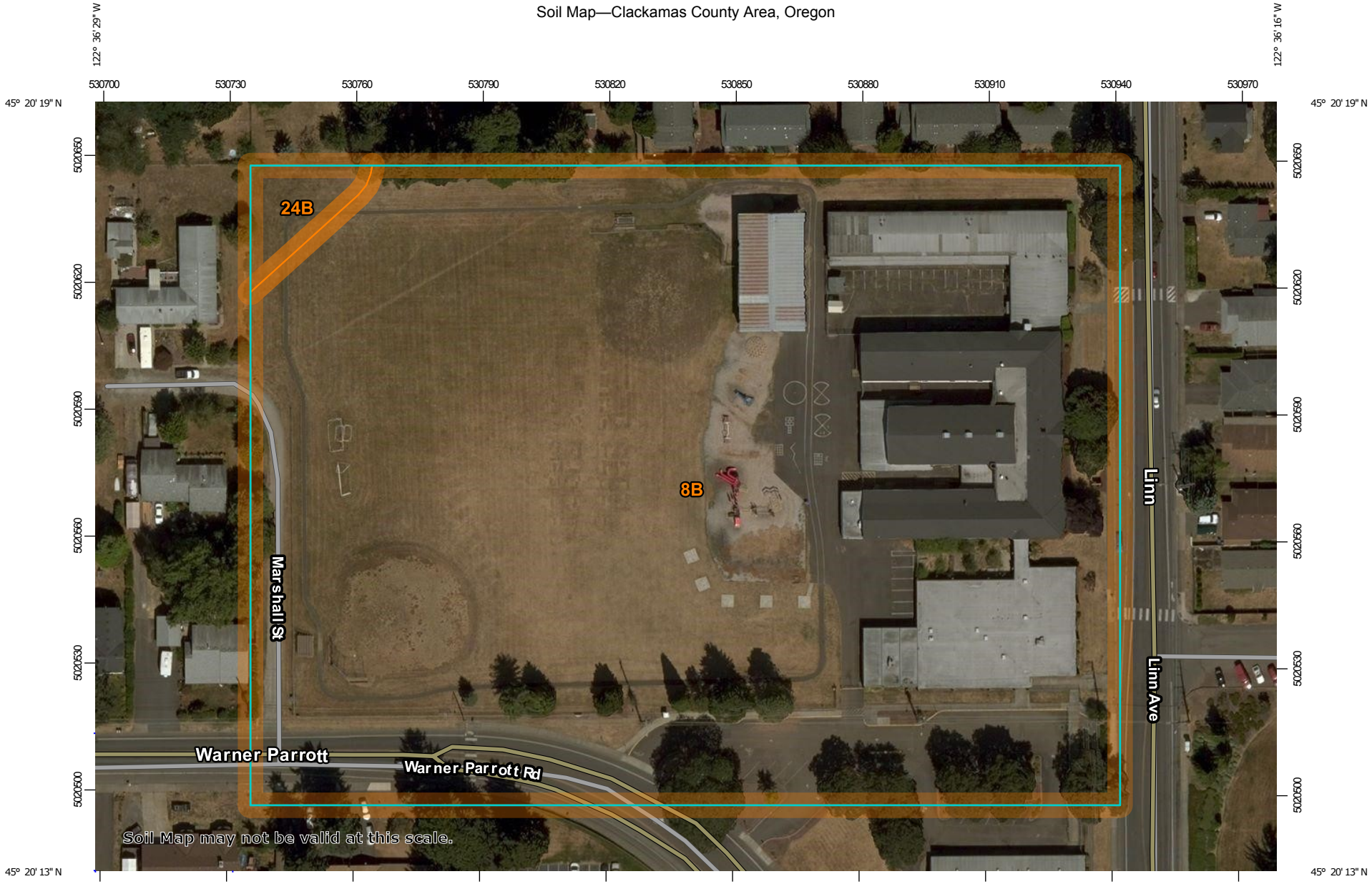
SITE ASSESSMENT AND PLANNING CHECKLIST		
	Hydrology – Conditions and Natural Features Map site floodplains, wetlands, streams, and location of outfalls	Clearly label on map all intermittent and perennial creeks/streams/rivers and wetlands, FEMA floodplains, and existing drainage systems (pipes, ditches, outfalls). Check here if present on site: N/A Sensitive area(s) N/A Floodplain N/A
	Downstream Conveyance	Indicate the proposed point of discharge on the site plan. *Prepare and attach a Downstream Analysis as required by **Chapter 5**.* Check here to verify that adequate downstream capacity is available: Appendix E
	Existing Vegetation Map trees and vegetation	Using aerial photos or survey, map all trees and vegetation. Note all existing trees 6-inch caliper and greater (DBH) on map. Delineate and identify other areas and types of existing vegetation. See tree plan The local planning authority may require a formal tree survey.
	Required Vegetated Buffers and Setbacks Assess and map buffers	Identify required vegetated buffer areas and other setback limits as defined by OCMC Title 17. See tree plan
	Land Use and Zoning	Existing Land Use Zoning designation(s): I - Institutional
	Access and Parking	Delineate proposed access points for all transportation modes on map. Indicate amount and area of required parking onsite if applicable, *attach documentation as needed.* C-300
	Utilities to Site and Surrounding Area	Map existing utilities including stormwater facilities, storm conveyance, sewer, water, electricity, phone/cable, gas, and any public storm system/facility downstream. C-500,-600 and Ex Conditions Plans C-101 through C-106
2.2.3 Site Planning Design Objectives *(attach engineered scale Preliminary Site Plan)*		
	1. Preserve existing resources	**Required:** Show sensitive areas and buffers on site plan. Denote buffer areas that require enhancement. Show any proposed areas of encroachment and associated buffer mitigation areas.
	2. Minimize site disturbance	**Required:** Delineate protection areas on site plan for areas to remain undisturbed during construction.
	3. Minimize soil compaction	**Required:** Delineate and note temporary fencing on site plan for proposed infiltration facilities, vegetated stormwater management facilities, and re-vegetation areas.
	4. Minimize imperviousness	**Required:** Delineate proposed impervious areas and proposed impervious area reduction methods on the site plan. A. Total proposed new/replaced impervious area: 127,628 (SF) B. Area of proposed Green Roofs: 0 (SF) C. Area of proposed pervious pavements: 0 (SF) D. Describe type of pavers or pavement proposed: Standard asphalt and concrete pavements E. Impervious area requiring management [A-(B+C)]: 127,628 (SF)

SITE ASSESSMENT AND PLANNING CHECKLIST

2.2.4 Proposed Stormwater Management Strategy

	Proposed Stormwater Management Strategy	_____ Infiltration facilities _____ Surface Infiltration facilities to the MEP _____ Full onsite retention/infiltration up to the 10-year storm event _____ Infiltration facilities are limited by the following conditions *(include documentation to demonstrate the limiting condition and choose an alternate strategy below):* _____ Stormwater management facility to be located on fill _____ Steep slopes _____ High groundwater _____ Contaminated soils _____ Conflict with required Source Controls (**Chapter 6**) X Onsite Stormwater management facilities (indicate below) _____ Offsite stormwater management facilities/regional facilities _____ Fee in Lieu, as determined by the City
	Preliminary Facility Selection/Sizing	Check all that apply, *attach output from BMP Sizing Tool*, and show proposed Stormwater Management Facilities on Preliminary Site Plan. LID facilities: _____ Infiltration Stormwater Planter X Filtration Stormwater Planter _____ Infiltration Rain Garden X Filtration Rain Garden _____ Vegetated Swale _____ Detention Pond _____ Infiltration Trench X Manufactured Treatment Technology X Other: Underground detention chambers
	Verify Minimum Facility Size	A. Required surface area of onsite surface infiltration facilities: As determined by BMP sizing tool or engineered method: 1,242 (SF) B. Calculate MEP surface area of surface infiltration facilities for sites with limiting conditions: Total new/replaced impervious area (SF) x 0.10 = 12,763 (SF) C. Calculate required surface area of onsite LID facilities: Smaller of [A] or [B]: 1,242 (SF) D. Proposed surface infiltration facility size(s): From site plan: 3,045 (SF) *must be larger than [C]*

SITE ASSESSMENT AND PLANNING CHECKLIST		
2.2.5 Other Project Requirements		
	Grading Permit	Review OCMC 15.48 to determine whether a grading permit will be required. Grading permit required? Y (Y/N) Type of Grading Plan proposed (see **Chapter 3**): Engineered Grading Plan
	Erosion Prevention and Sediment Control	Identify the required permits: X ESC Permit from the City *(sites that include 1,000+ SF new or replaced impervious area)* X 1200-C Permit from DEQ *(sites that disturb 1 acre or more land surface)*
	Source Control for High Use Sites	Identify whether the proposed development will include any of the following: _____ Fuel Dispensing Facilities and Surrounding Traffic Areas _____ Above-Ground Storage of Liquid Materials _____ Solid Waste Storage Areas, Containers, and Trash Compactors _____ Exterior Storage of Bulk Materials _____ Material Transfer Areas/Loading Docks _____ Equipment and/or Vehicle Washing Facilities _____ Development on Land With Suspected or Known Contamination _____ Covered Vehicle Parking Areas _____ Industrial and Commercial High Traffic Areas _____ Other land uses subject to the ODEQ 1200-Z Industrial Stormwater Permit
	Other Permits	Identify other natural resources related permits from local, state, or federal agencies that may be required as part of the proposed development activity. It is the responsibility of the applicant to identify and obtain required permits prior to project approval. List other anticipated permits: Oregon DEQ Underground Injection Control Closure Permit for removal of existing drywell



Map Scale: 1:1,280 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Clackamas County Area, Oregon
Survey Area Data: Version 14, Sep 18, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 26, 2014—Sep 5, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8B	Bornstedt silt loam, 0 to 8 percent slopes	7.6	98.4%
24B	Cottrell silty clay loam, 2 to 8 percent slopes	0.1	1.6%
Totals for Area of Interest		**7.7**	**100.0%**

Appendix E

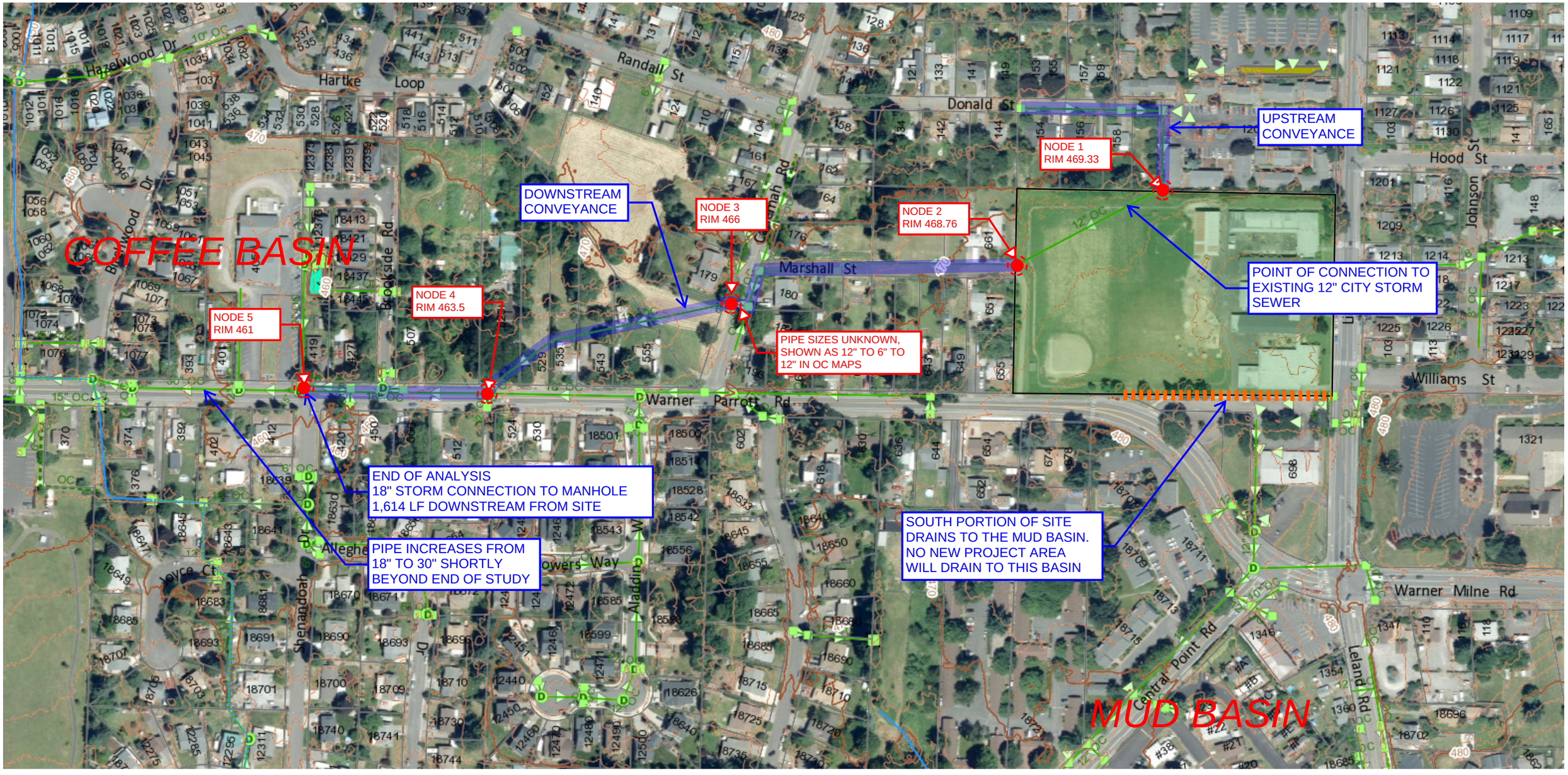
Downstream Analysis and Detention Calculations

OREGON CITY POLICE AND COURTS

STORM CONNECTION FEASIBILITY AND DOWNSTREAM ANALYSIS

3/27/2019

OVERALL



kpff

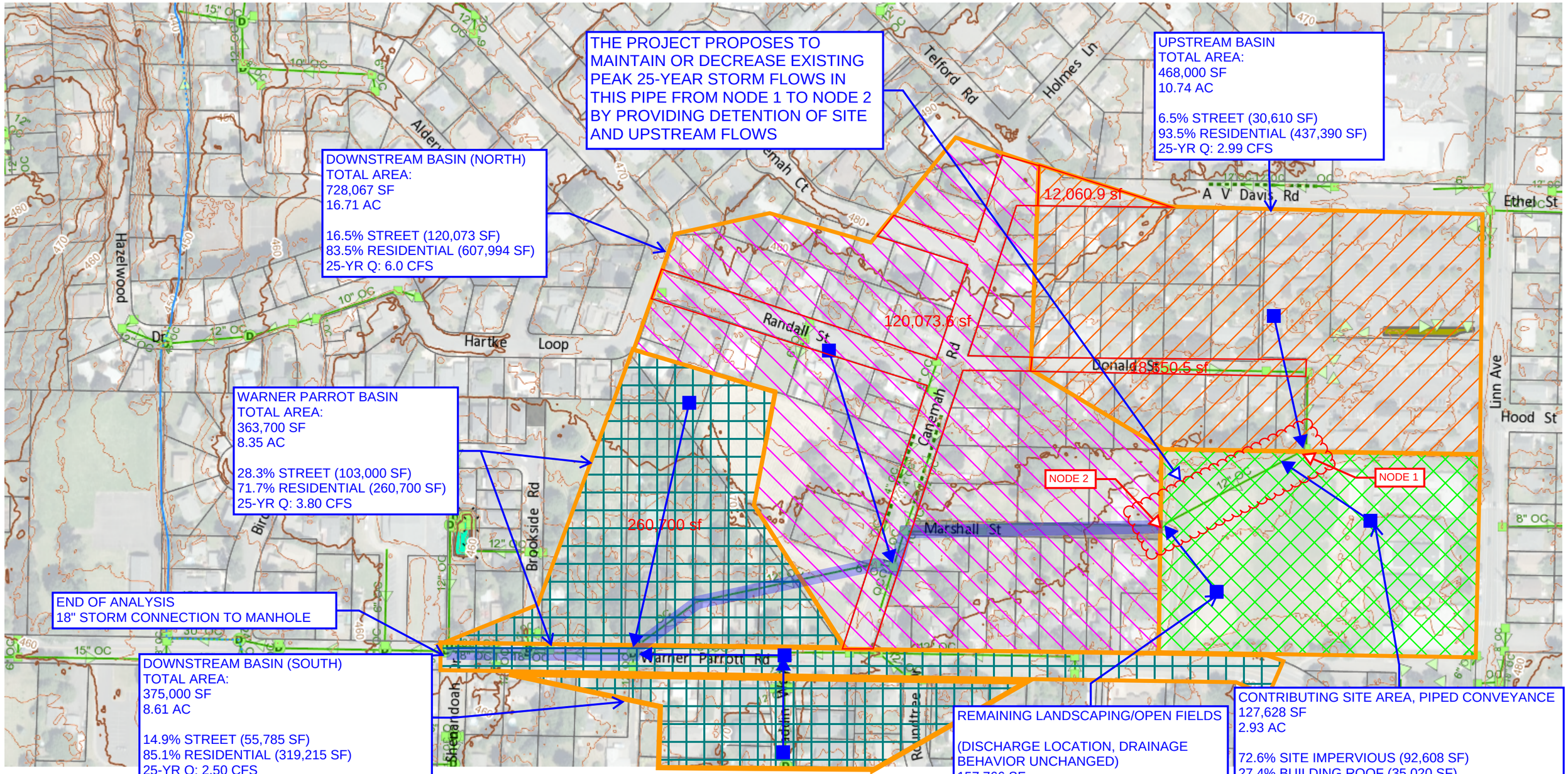
1:2400
1"=200'

OREGON CITY POLICE AND COURTS

STORM CONNECTION FEASIBILITY AND DOWNSTREAM ANALYSIS

3/27/2019

NORTH



kpff

Oregon City Police and Courts
KPFF Job No 1800230
Designer: NP
Check Engineer: MR

Detention Approach Summary

The upstream basin serves as the existing peak flow that the combined upstream, site pervious, and site impervious must match or be below. This will demonstrate that no adverse impacts to the downstream system will result from the proposed improvements. All flows are results of the 25-year storm model as shown in the attached hydrographs.

Stormtech SC-740 chambers with 6-inches of rock storage above and below are proposed. A Flow Control Manhole located on the existing public storm main will intercept flows from upstream and the site and provide detainment. An overflow weir will be located to bypass higher flows at the top of the proposed storage facility which will be located vertically as to not cause upstream flooding issues during overflow events.

Existing conditions in existing public storm main on site (undetained peak flows)

Upstream Basin	2.99 cfs

Site runoff, discharge to public storm main on site (undetained peak flows)

Site pervious	1.01 cfs
Site impervious	2.76 cfs

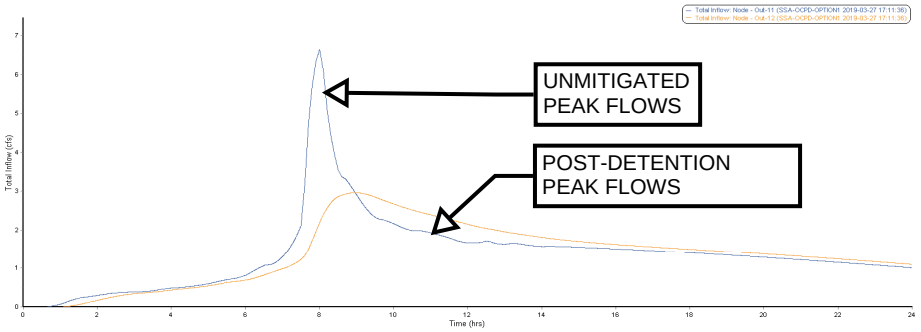
Combined discharge public storm main on site (detained peak flows)

MAXIMUM	2.99 cfs
Proposed	2.96 cfs

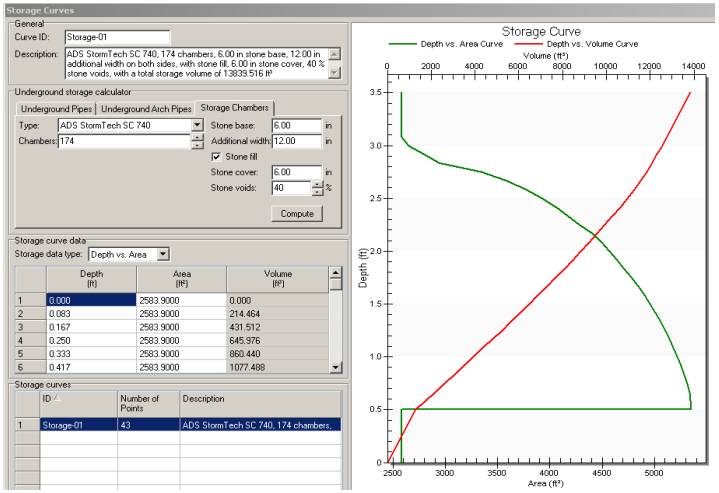
Storage Criteria

Storage Height:	3.50 ft
Orifice size:	7.900 in
Orifice height;	3.5 ft
Peak inflow:	6.65 cfs
Peak outflow:	2.96 cfs
Storage Volume:	13840 cf

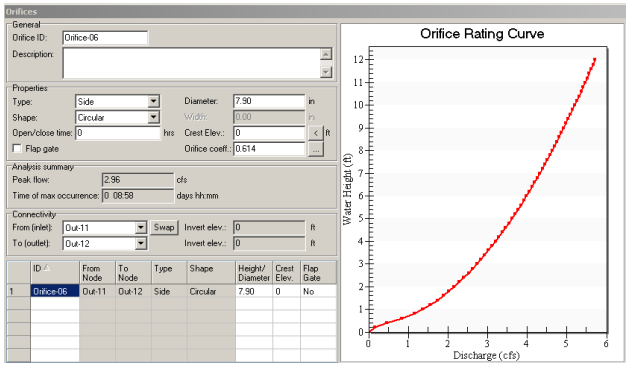
Peak Outflow Hydrograph (Detained vs Undetained)



Storage Curve



Orifice Criteria



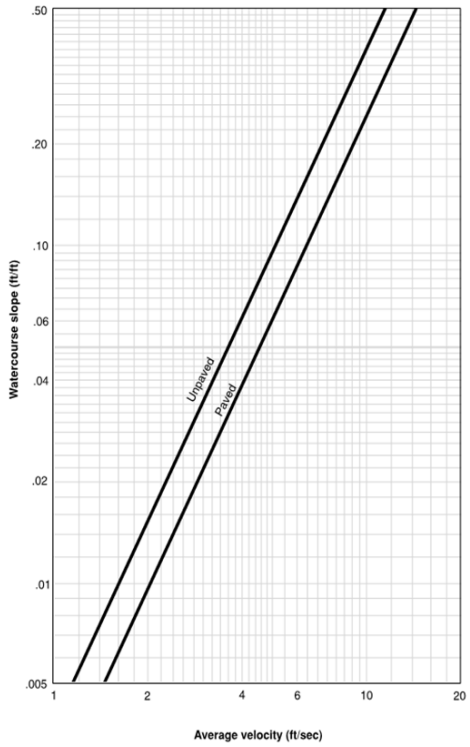
Design criteria:

Time of concentration (TOC) is calculated based on the Oregon City Stormwater Grading and Design Standards and the design criteria shown below. A time is first calculated for sheet flow up to a maximum of 300-ft before calculating concentrated flow time. This TOC represents flows crossing the non-impervious areas of each basin. Impervious areas (streets) are assumed to have the minimum 5 minute TOC. Finally, the composite TOC for each basin is calculated based on the weighted area of paved versus unpaved area for each basin. Each Basin TOC is used in the respective SBUH hydrograph modeling performed to determine peak flows for the 25-year storm.

Time of Concentration

Basin	Average Slope (s, ft/ft)	Sheet Flow Roughness (n)	Sheet Flow (L, ft) (300-ft max)	T-sheet flow (min)	Remaining L (ft)	Velocity (per table)	T-concentrated flow (min)	**Tc (unpaved)**	**Tc (paved)**	UNPAVED (%/100)	PAVED (%/100)	**COMPOSITE T**
Upstream Basin	0.0229	0.03	300	6.60	400	2.4	2.78	9.38	5	0.935	0.065	**9.09**
Site	0.0078	0.15	300	36.72	370	1.4	4.40	41.13	5	0.527	0.473	**24.04**
Downstream North	0.0175	0.03	300	7.34	500	2.1	3.97	11.31	5	0.835	0.165	**10.27**
Warner Parrot Basin	0.0163	0.03	300	7.55	220	2.1	1.75	9.29	5	0.717	0.283	**8.08**
Downstream South	0.0029	0.03	300	15.01	550	1.2	7.64	22.64	5	0.851	0.149	**20.02**

FIGURE 3-1 TR-55 URBAN HYDROLOGY FOR SMALL WATERSHEDS



EXCERPT FROM OREGON CITY STORMWATER AND GRADING DESIGN GUIDELINES

D. In computing the Time of Concentration (Tc), for smaller basins, the largest and most significant component in the total Tc is the portion of the time devoted to sheet flow. For this reason, extreme care should be given to determining the true travel time for the sheet flow component of the Tc. In calculating the total Tc, the following limitations will apply:

1. The flow segment used for the sheet flow component shall not extend for more than 300 feet. The use of a distance of less than 200 feet on a pre-developed land use will require supporting documentation, such as photographs that show evidence of shallow concentrated flow at the point of transition.
2. For segments of the Tc route that flow through closed conveyance facilities, such as pipes and culverts, use standard hydraulics formulas for establishing velocity and travel time.
3. For segments of the Tc route that flow through lakes or submerged wetlands, travel time is normally very short. The travel time can be determined using an appropriate storage routing technique, or it can be assumed to be zero.
4. The minimum total Tc used in the runoff calculations shall be 5 minutes.

EXCERPTS FROM TR-55 URBAN HYDROLOGY FOR SMALL WATERSHEDS

Overland Surface	Manning value (*n*)
Smooth asphalt pavement	0.010
Smooth impervious surface	0.011
Tar and sand pavement	0.012
Concrete pavement	0.014
Rough impervious surface	0.015
Smooth bare packed soil	0.017
Moderate bare packed soil	0.025
Rough bare packed soil	0.032
Gravel soil	0.025
Mowed poor grass	0.030
Average grass, closely clipped sod	0.040
Pasture	0.040
Timberland	0.060
Dense grass	0.060
Shrubs and bushes	0.080
Land Use	
Business	0.014
Semibusiness	0.022
Industrial	0.020
Dense residential	0.025
Suburban residential	0.030
Parks and lawns	0.040

Table 3-1 Roughness coefficients (Manning's n) for sheet flow

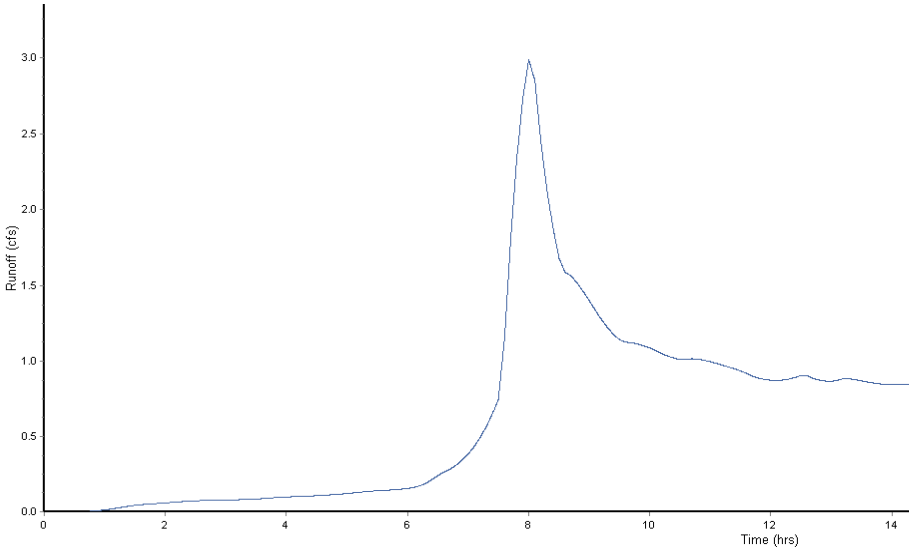
Surface description	n [1]
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤20%	0.06
Residue cover >20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses [2]	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods: [3]	
Light underbrush	0.40
Dense underbrush	0.80

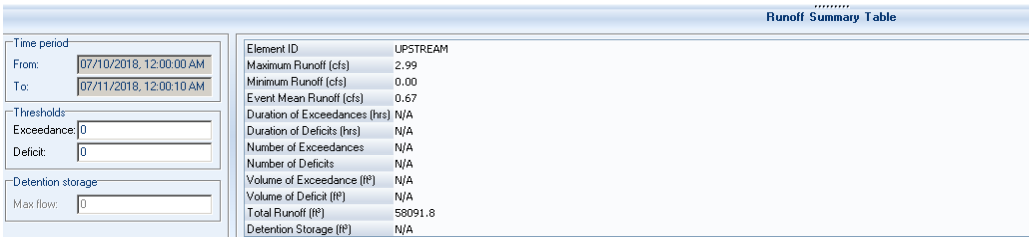
Design criteria:

The upstream contributing basin connects to the public storm sewer line that traverses the site year peak flow is analyzed below to determine the maximum peak flow that the sum of upstre onsite flows must match or be less than. This demonstrates that the development of the site w adversely impact downstream conditions for the 25-year storm event.

Hydrograph Analysis

Autodesk Storm and Sanitary Analysis 2018 - SCS Type 1A 24-hr storm distribution





UPSTREAM BASIN PEAK FLOW

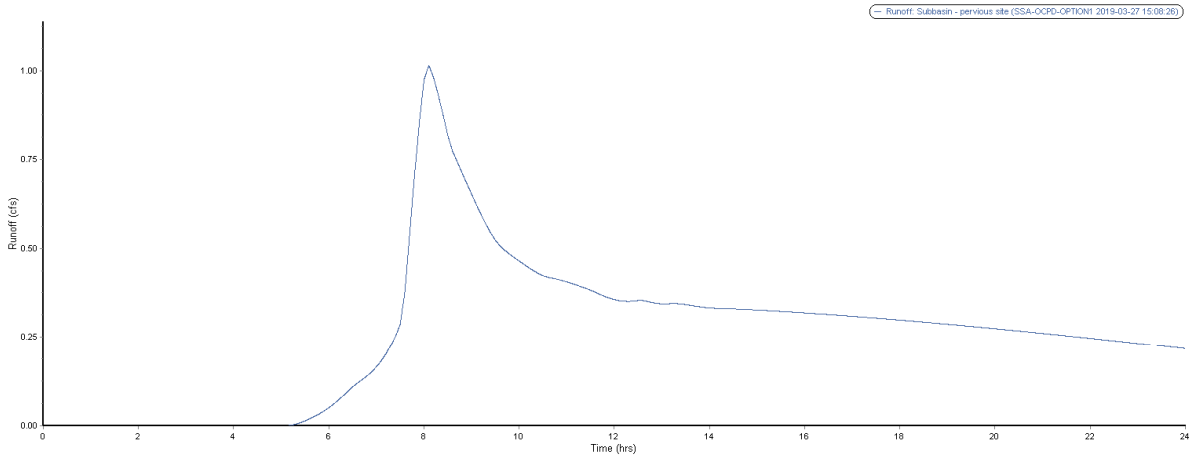
2.99 CFS

Design criteria:

The site not part of the piped conveyance improvements is assumed to shed off the site across the open field to remain on the west side of the site. The model below represents the peak flow for this portion of the site

Hydrograph Analysis

Autodesk Storm and Sanitary Analysis 2018 - SCS Type 1A 24-hr storm distribution



Runoff Summary Table

Time period	
From:	07/10/2018, 12:00:00 AM
To:	07/11/2018, 12:00:10 AM
Thresholds	
Exceedance:	0
Deficit:	0
Detention storage	
Max flow:	0

Element ID	pervious site
Maximum Runoff (cfs)	1.01
Minimum Runoff (cfs)	0.00
Event Mean Runoff (cfs)	0.26
Duration of Exceedances (hrs)	N/A
Duration of Deficits (hrs)	N/A
Number of Exceedances	N/A
Number of Deficits	N/A
Volume of Exceedance (ft³)	N/A
Volume of Deficit (ft³)	N/A
Total Runoff (ft³)	22502.17
Detention Storage (ft³)	N/A

PERVIOUS SITE BASIN PEAK FLOW

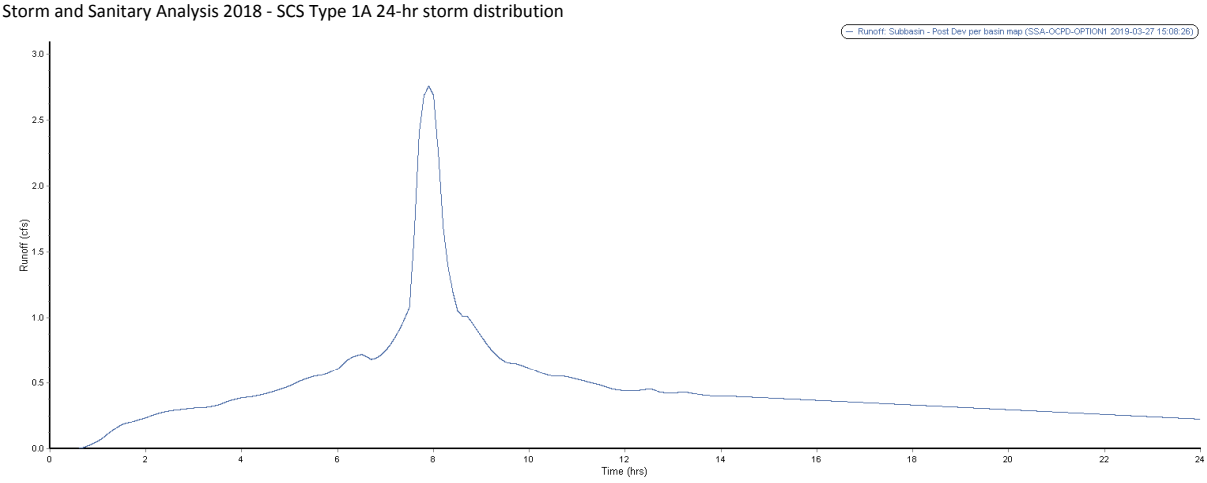
1.01 CFS

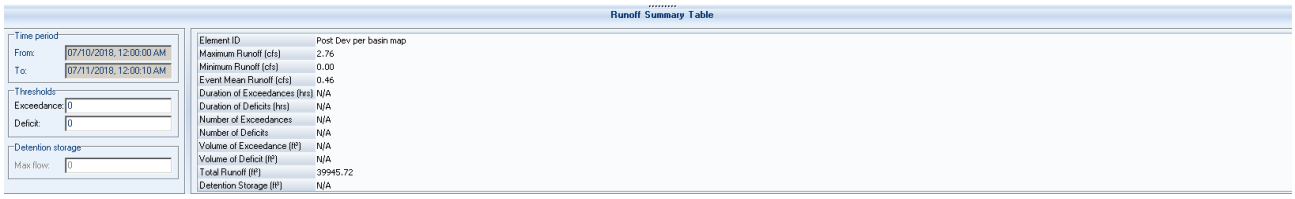
Design criteria:

The piped conveyance of impervious areas is modelled below. TOC is assumed to be 5-minutes, despite the presence of vegetated water quality facilities that could potentially increase this time. This presents a conservative (higher) peak flow runoff that must be managed by the detention facility prior to leaving the site.

Hydrograph Analysis

Autodesk Storm and Sanitary Analysis 2018 - SCS Type 1A 24-hr storm distribution





Runoff Summary Table

Time period
From: 07/10/2018, 12:00:00 AM
To: 07/11/2018, 12:00:10 AM

Thresholds
Exceedance: 0
Deficit: 0

Detention storage
Max flow: 0

Element ID	Post Dev per basin map
Maximum Runoff (cfs)	2.76
Minimum Runoff (cfs)	0.00
Event Mean Runoff (cfs)	0.46
Duration of Exceedances (hrs)	N/A
Duration of Deficits (hrs)	N/A
Number of Exceedances	N/A
Number of Deficits	N/A
Volume of Exceedance (ft³)	N/A
Volume of Deficit (ft³)	N/A
Total Runoff (ft³)	39945.72
Detention Storage (ft³)	N/A

IMPERVIOUS SITE BASIN PEAK FLOW

2.76 CFS