

White Pelican Consulting, LLC

Environmental Engineering & Data Analysis

WBE, DBE, ESB Oregon Certified # 12223

May 6th, 2021

1037-1041 SE 111TH AVE

PORTLAND, OR 97216

Stormwater Management Report (SWMR)

Submitting under the Performance Approach and Hierarchy 1.

PREPARED FOR:

Max Brunke
KLK Consulting, LLC
906 NW 23rd Ave
Portland, Oregon 97210

PREPARED BY:

White Pelican Consulting, LLC
Deborah Beck P.E.
PO BOX #33946
Portland, OR 97292
(503) 847-9455

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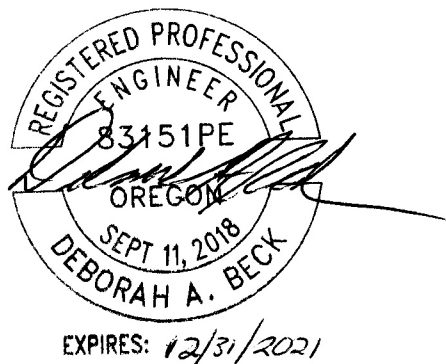
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ENGINEERS CERTIFICATION

I hereby certify that this Stormwater Management Report for 1037-1041 SE 111th Ave. Portland, OR 97216, Tax lot 3300, has been prepared by me or under my supervision and meets minimum standards of City of Portland and normal standards of engineering practice. I hereby acknowledge and agree that the jurisdiction does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities designed by me.



White Pelican Consulting, LLC

Deborah A. Beck, P.E.

Principle Engineer

White Pelican Consulting, LLC

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PROJECT SUMMARY

This project proposes to manage stormwater at 1037-1041 SE 111th Ave. Portland, OR 97216, Lot 48-51 TL 3300 through the use of a single PSORB StormFilter for water quality and then a two-chamber StormTech SC-740 system for complete infiltration of the runoff on-site. The StormFilter and StormTech combined system will treat and manage runoff from the proposed new impervious areas created by the construction of three separate 1,248 sq. ft. single-family residences, the shared private road (2,080 sq. ft.) and parking (1,134 sq. ft) servicing the residences.

Portions of the parking area and walkways are existing and will be retained. The new construction will create ~5,374 sq. ft of new impervious surface, however, the StormFilter and StormTech combined system have been sized to handle 7,258 sq. ft. of runoff to allow the combined system to accommodate runoff from both the new and retained impervious areas on site. Both the new and improved impervious areas will be directing runoff to the stormwater management system.

SITE LOCATION AND DESCRIPTION

1037-1041 SE 111th Ave. Portland, OR 97216 (site), is located within the Mill Park neighborhood. The site has been assigned a state tax lot identification number of 3300 and state ID 1S2E03BA-03300. The site is entirely located within Multnomah County and zoned R5. R5 is single-dwelling zone which allows 1 dwelling unit per 5,000 ft². The site is 0.59 acres (25,860 sq. ft.) with two existing homes and covered garage/shed like areas. All existing buildings on site are scheduled for demolition.

The site is located in the Outer East subwatershed of the Willamette River Watershed and is subject to Oregon DEQ Total Maximum Daily Load (TMDL) water quality requirements. The north part of the site is an Environmental C zone.

SOILS

The soils on the site are NRCS Wetted Drainage Class “Well drained” and are rated Hydrologic soil group B (Portland Maps). The geotech engineering company Rapid Soil Solutions (RSS) performed four (4) infiltration tests per the City of Portland Storm Water Manual 2016. Infiltration testing was performed at depths of 3 ft. or 6 ft. and occurred in open test pits due to the coarse-grained soils. All the test pits exhibited an infiltration rate of infinity. The maximum allowed infiltration rate for stormwater facility design is 20 in/hr. and requires the application of a safety factor of 2. Therefore, an infiltration rate of 10 in/hr. was used for sizing the unlined basin. The full RSS Infiltration report with maps of testing locations is in Appendix B.

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Groundwater

USGS Depth to seasonal high groundwater is estimated to be 100-120 feet (source Portland Maps).

SLOPES

Slope on the property varies as shown in Portland Maps. The site slopes down from the south to the north. The southern and upper portion of the site is relatively flat with 0-10% slopes then transitions steeply down to an old road creating a flat bench where slopes are again 0-10%. The slope transition running through the middle of the site has various retaining walls and sections of clumped trees adding stability. North of the road, the site slopes downhill >20%.

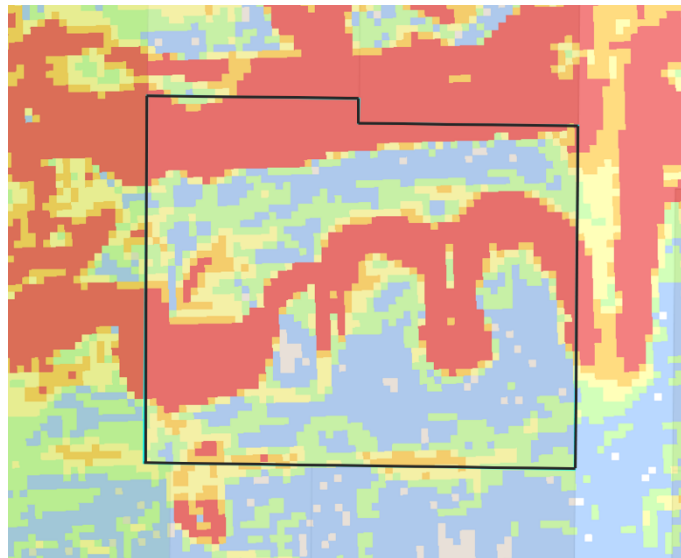


FIGURE 1: SLOPES OF THE SITE AS SHOWN IN PORTLAND MAPS, <5% = BLUE, 5-10% = GREEN, 10-15% = YELLOW, 15-20% = ORANGE, >20% = RED >20%.

Due to site constraints, a 100 ft. setback of the proposed unlined basin from slopes >20% is not possible. RSS performed an analysis of the soil type and elevated the risk of an infiltrating stormwater facility nearer than the required 100 ft setback of >20% slopes. RSS found that:

“the soils in the all the infiltration test pits to be densely packed coarse-grained gravels and cobbles. The placement of the facility will not cause any slope hazards as the water does not run horizontally though the coarse grained soils but down with gravity.”

See Appendix C for the RSS Field Memo.

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EXISTING STORMWATER CONDITIONS

Currently stormwater runoff from the residence on the west side of the site is conveyed to downspouts connected to ground. Stormwater from the residence on the east side of the site drains to grade. Both existing residences are scheduled for full demolition to make room for the proposed new construction. Runoff from the parking area and walkways is either absorbed by the soil and natural debris that has accumulated on top of those surfaces or drains to grade.

PROPOSED CONDITIONS

Three new single-family residences of 1,248 sq. ft. each are proposed to be constructed on the site on lots 1, 2, and 3. (Figure 2) A private street servicing the residences will be enlarged from the existing paved access and will be located in Tract "A". No impervious area will be constructed in the Environmental Resource Area (Tract "B").

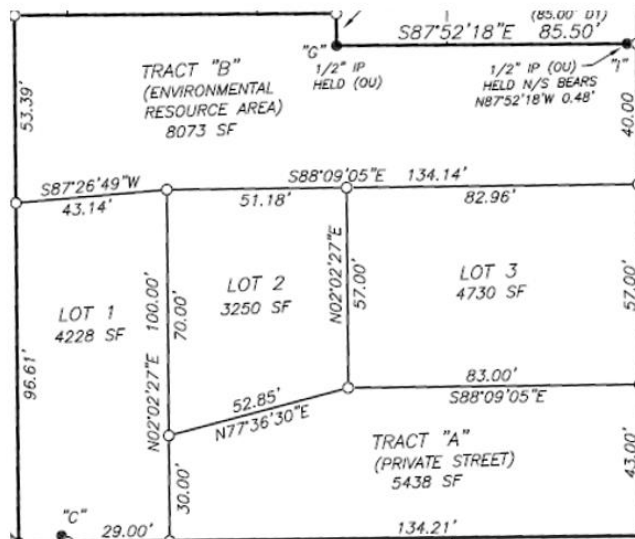


FIGURE 2: DIVISION OF THE THREE LOTS AND TWO TRACTS

The new residences will share a common private street (2,080 sq. ft.) and parking area (1,134 sq. ft.) and associated walkways leading to each residence. The residences will be constructed with gutters and downspouts connected to conveyance pipes exiting into steel catch basin with an 18" PSORB StormFilter. The StormFilter will provide water quality treatment of the runoff before sending treated water to a 2-chamber StormTech SC-740 system which will allow the runoff to infiltrate into the native soil. Stormwater runoff will be completely handled on-site.

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DESIGN HYDROLOGY

Design hydrology for on-site stormwater runoff from the impervious surfaces on the site and infiltration of the runoff into the pervious areas calculated using HydroCAD 10.10 modeling software and the Santa Barbara Urban Hydrograph (SBUH) Method.

Table 1 lists the standard modeling assumptions. Table 1 lists the pre and post-development impervious areas.

TABLE 1: MODELING ASSUMPTIONS

PAC modeling assumptions and inputs:
Tc = 5 minutes
Curve Number = 98 for all paved surfaces and rooftops

TABLE 2: PRE AND POST DEVELOPMENT IMPERVIOUS AREAS

Area	Number	Pre-Development impervious areas being retained	New Post-Development Square Footage (Not to Exceed)	Post-Development New Impervious Area (sq.ft)
Single residence house (each)	3	NA	1,248 (each)	3,744
Street	1	~1,579	2,080	2,080
Parking	1	~305	1,134	1,134
Walkways	1	NA	300	300
Total		~1,884		7,258

Type 1A, PR, 2, 5, 10, and 25 year storms were modeled in HydroCAD to show the post-development discharges. and

Table 2 lists the runoff peak rates and volumes for each of the design storms.

TABLE 3: POST DEVELOPMENT RUNOFF PEAK RATES AND VOLUMES FOR EACH DESIGN STORM AS DETERMINED BY HYDROCAD

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Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2 year	2.40	0.09	1,313	2.17
5 year	2.90	0.11	1,614	2.67
10 year	3.40	0.13	1,915	3.17
25 year	3.80	0.15	2,157	3.57
water quality	1.61	0.06	840	1.39

Runoff will be collected and directed to the catch basin containing the StormFilter. After treatment by the StormFilter, the discharge will be conveyed to the SC-740 StormTech chamber system. The StormFilter can handle up to 1.0 cfs and therefore any restriction of flow by the StormFilter was ignored and the StormTech system modeled as receiving the peak flow rates from the impervious areas (a conservative approach). Inflow and infiltrated (discarded) rates in the SC740 storm tech system are shown in Table 4. As sized, the SC-740 2 chamber system will completely infiltrate a 10-year storm. See Appendix A for the complete HydroCAD report.

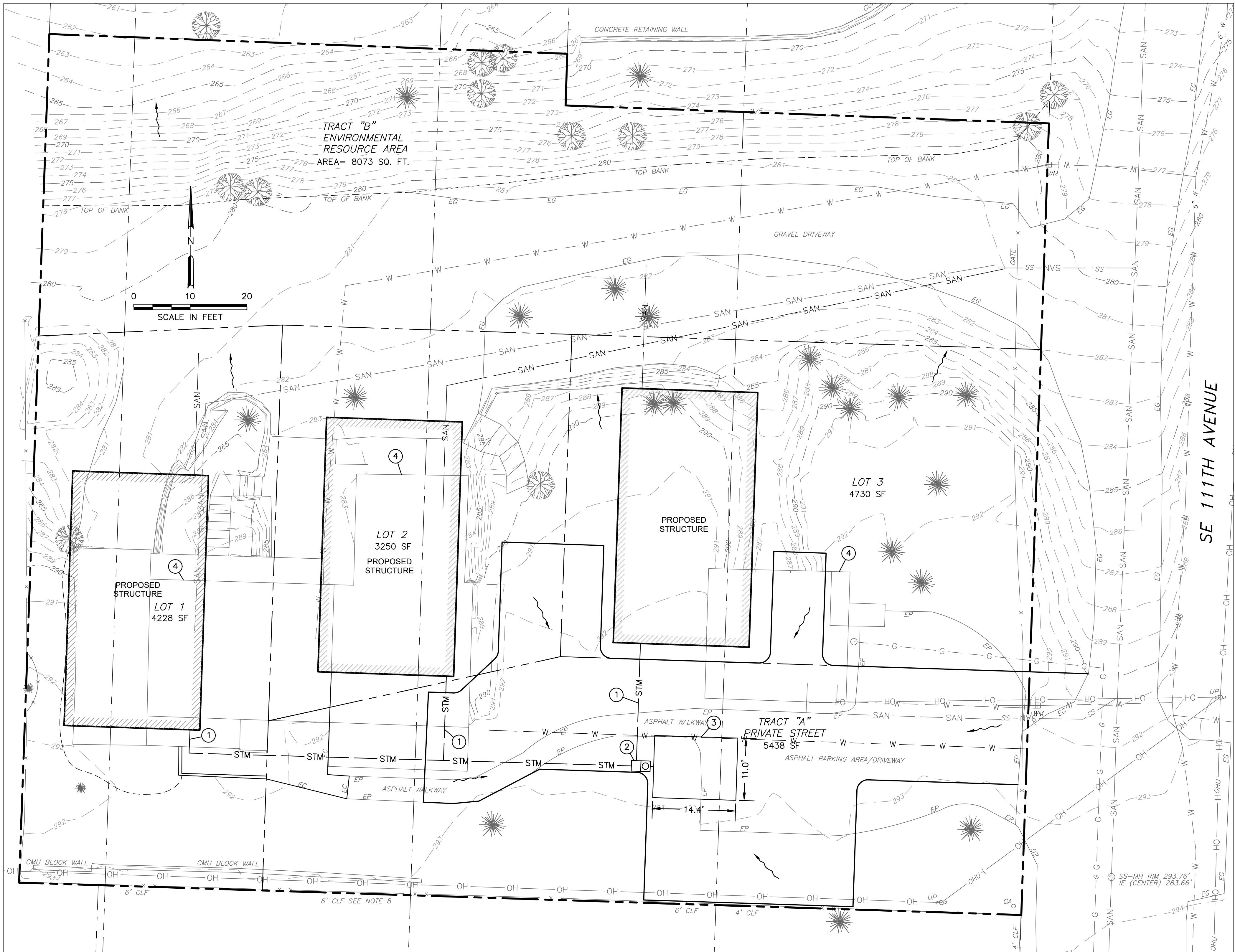
TABLE 4: INFLOW AND INFILTRATED (DISCARDED) RATES IN THE SC-740 STORMTECH CHAMBERS. CONSERVATIVELY MODELED ASSUMING STORMFILTER DOES NOT REDUCE INFLOW RATE TO THE STORMTECH CHAMBERS.

Event	Inflow (cfs)	Discarded (cfs)	Elevation (feet)	Storage (cubic-feet)
2 year	0.09	0.04	-3.21	107
5 year	0.11	0.04	-2.55	167
10 year	0.13	0.04	-1.61	241
water quality	0.06	0.04	-3.98	34

ENGINEERING CONCLUSIONS

Stormwater runoff from the post-development impervious areas will be directed to the vegetated unlined basin where it will fully infiltrate through the basin and then down through the native subsurface. This will meet the pollution reduction and 10-yr storm requirements as specified by the City of Portland and DEQ.

The proposed installation of the unlined basin as described in this report is expected to meet the site's needs for stormwater management of impervious areas on the site.



PROJECT AREA

CONSTRUCTION NOTES

- ① ROOF DRAIN, TYPICAL 3 PLACES
- ② INSTALL 18" PSORB STORMFILTER IN STEEL CATCH BASIN, SEE DETAILS 1 AND 2
- ③ INSTALL 2 SC-740 CHAMBERS IN 11'x14.4' BED
INSTALL PER MANUFACTURERS' INSTALLATION INSTRUCTIONS, SEE DETAILS 2, 3, 4, 5, AND 6
- ④ STRUCTURES TO BE REMOVED



VICINITY MAP



WHITE PELICAN CONSULTING IS NOT LIABLE FOR THE ACCURACY OF THE TOPOGRAPHY INFORMATION. IT IS THE SOLE RESPONSIBILITY OF THE BUILDER TO VERIFY ALL SITE CONDITIONS, INCLUDING ANY FILL PLACED ON THE SITE, AND INFORM OWNERS OF ANY POTENTIAL FIELD MODIFICATIONS.

WHITE PELICAN CONSULTING
 PORTLAND, OREGON
 503-847-9455
 www.whitepelicanconsulting.com
 email: dbeck@whitepelicanconsulting.com

RETAIL NEST LLC
 1037-1041 SE 111TH AVENUE
 PORTLAND, OREGON
 STORMWATER MANAGEMENT
 SITE PLAN

DATE 5/6/21	
SCALE 1"=10'	PROJ. NO.
DRAWN BY TT	CHECKED BY DB

SW1



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WHITE PELICAN CONSULTING
PORTLAND, OREGON
503-847-9455
www.whitepelicanconsulting.com
email: dbeck@whitepelicanconsulting.com

RETAIL NEST LLC
1037-1041 SE 11TH AVENUE
PORTLAND, OREGON
STORMWATER MANAGEMENT
DETAILS

DATE
5/5/21
SCALE
NTS
PROJ. NO.
DRAWN BY
TT
CHECKED BY
DB

SW2

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	27"	18"	18" DEEP
CARTRIDGE HEIGHT	3.06'	2.3'	3.3'
RECOMMENDED HYDRAULIC DROP (H)	2 gpm/sf	1.67 gpm/sf	1 gpm/sf
SPECIFIC FLOW RATE (gpm/sf)	22.5	16.79	11.25
CARTRIDGE FLOW RATE (gpm)	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 PHOSPHORUS (PSORB) MEDIA ONLY

GENERAL NOTES

- CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
- FOR SITE SPECIFIC DRAWINGS WITH DETAILED STORMFILTER STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
- STORMFILTER CATCHBASIN WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
- INLET SHOULD NOT BE LOWER THAN OUTLET. INLET (IF APPLICABLE) AND OUTLET PIPING TO BE SPECIFIED BY ENGINEER AND PROVIDED BY CONTRACTOR.
- 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 SPON.
- 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.
- 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.
- 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.
- SPECIFIC FLOW RATE IS EQUAL TO THE FILTER TREATMENT CAPACITY (gpm) DIVIDED BY THE FILTER CONTACT SURFACE AREA (sq ft).

INSTALLATION NOTES

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

1-CARTRIDGE CATCHBASIN STORMFILTER DATA

STRUCTURE ID	Redtail
WATER QUALITY FLOW RATE (cfs)	0.06
PEAK FLOW RATE (<1 cfs)	0.13
RETURN PERIOD OF PEAK FLOW (yrs)	10
CARTRIDGE HEIGHT (27", 18", 18" DEEP)	18
CARTRIDGE FLOW RATE (gpm)	1.67
MEDIA TYPE (PERLITE, ZPG, PSORB)	PSORB
RIM ELEVATION	see plan sheet

PIPE DATA:	I.E. DIAMETER
INLET STUB	see plan sheet
OUTLET STUB	2.3" below rim

CONFIGURATION	OUTLET
INLET	INLET

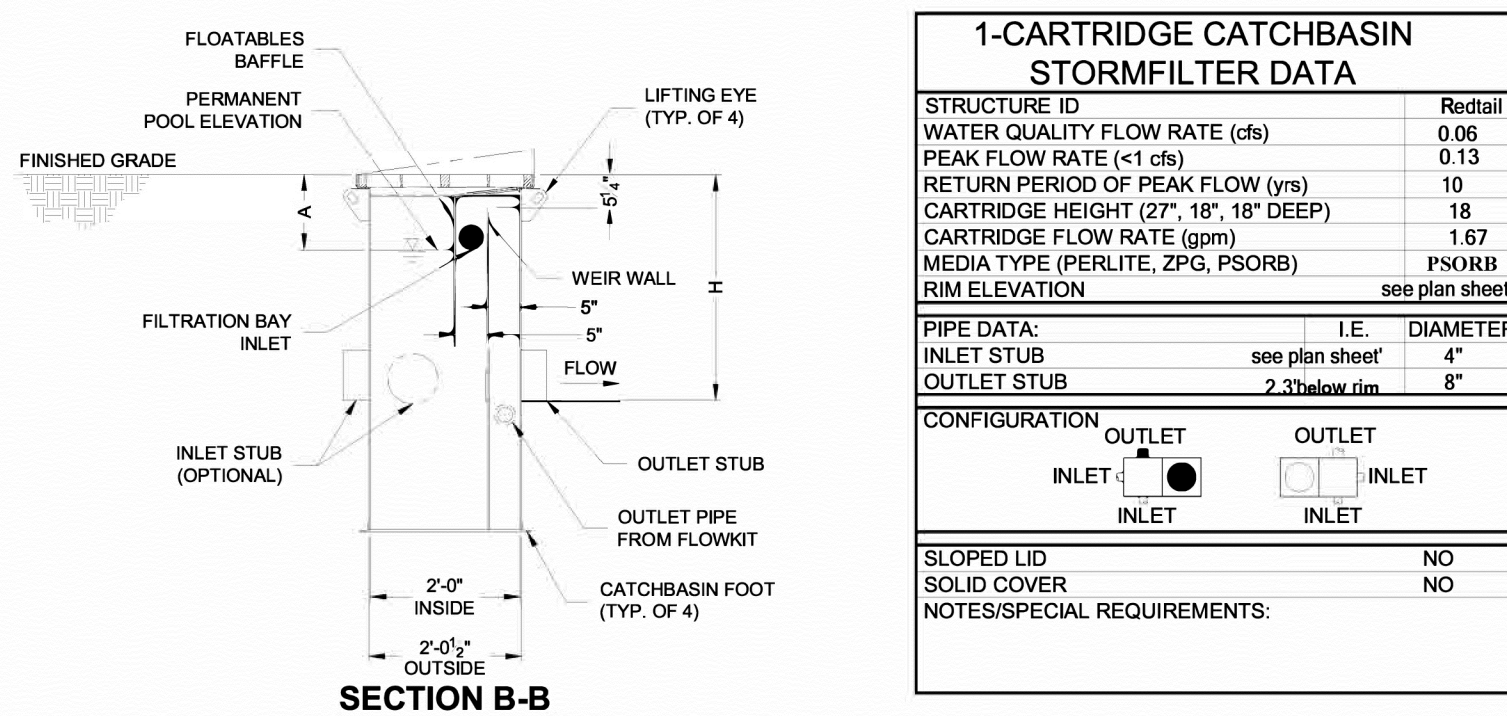
SLOPED LID	NO
SOLID COVER	NO
NOTES/SPECIAL REQUIREMENTS:	

1 CARTRIDGE CATCHBASIN STORMFILTER STANDARD DETAIL

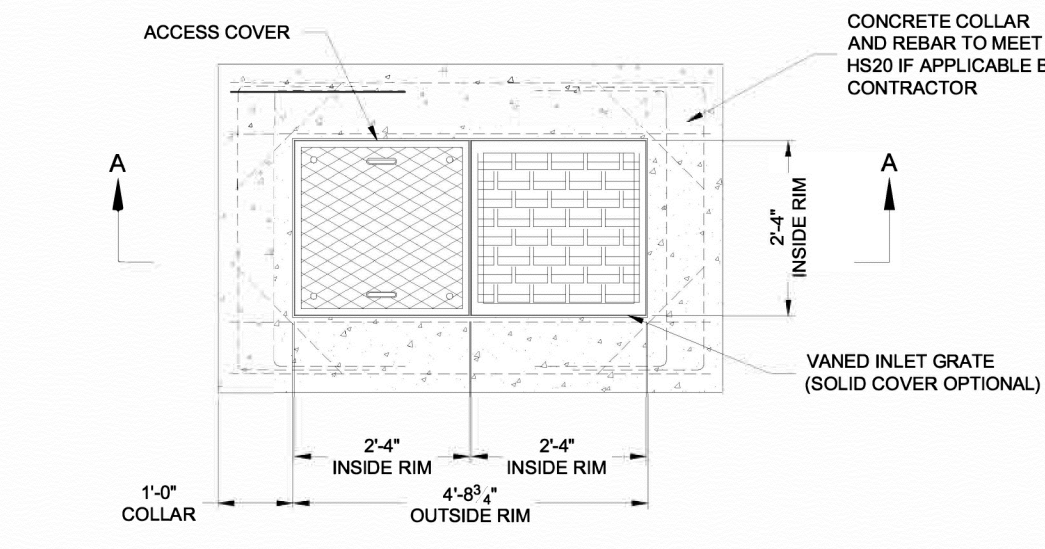


CONTECH
ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 300, West Chester, OH 45069
800-526-3999 513-645-7000 513-645-7993 FAX

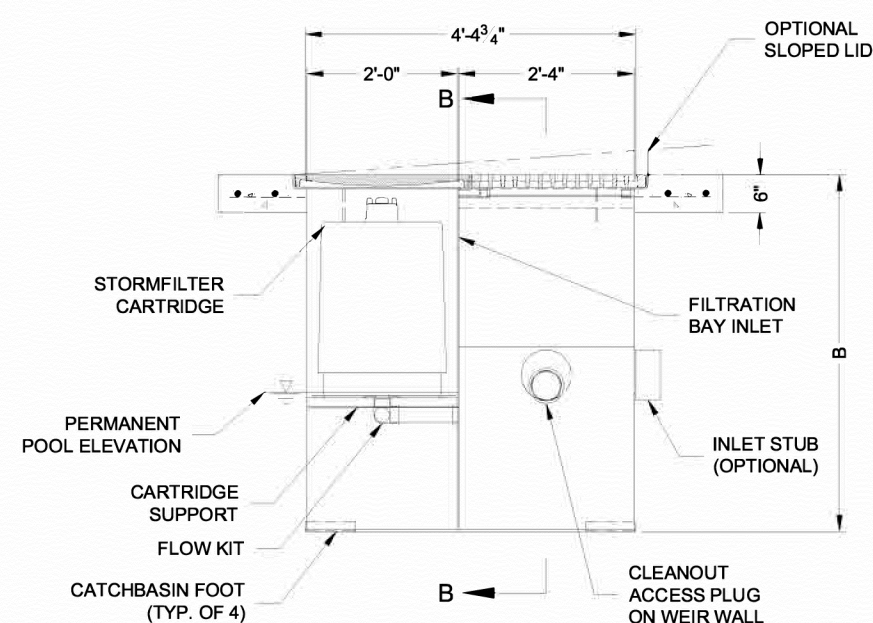
STORMFILTER DETAIL 1



PLAN VIEW



SECTION A-A



PROPOSED LAYOUT

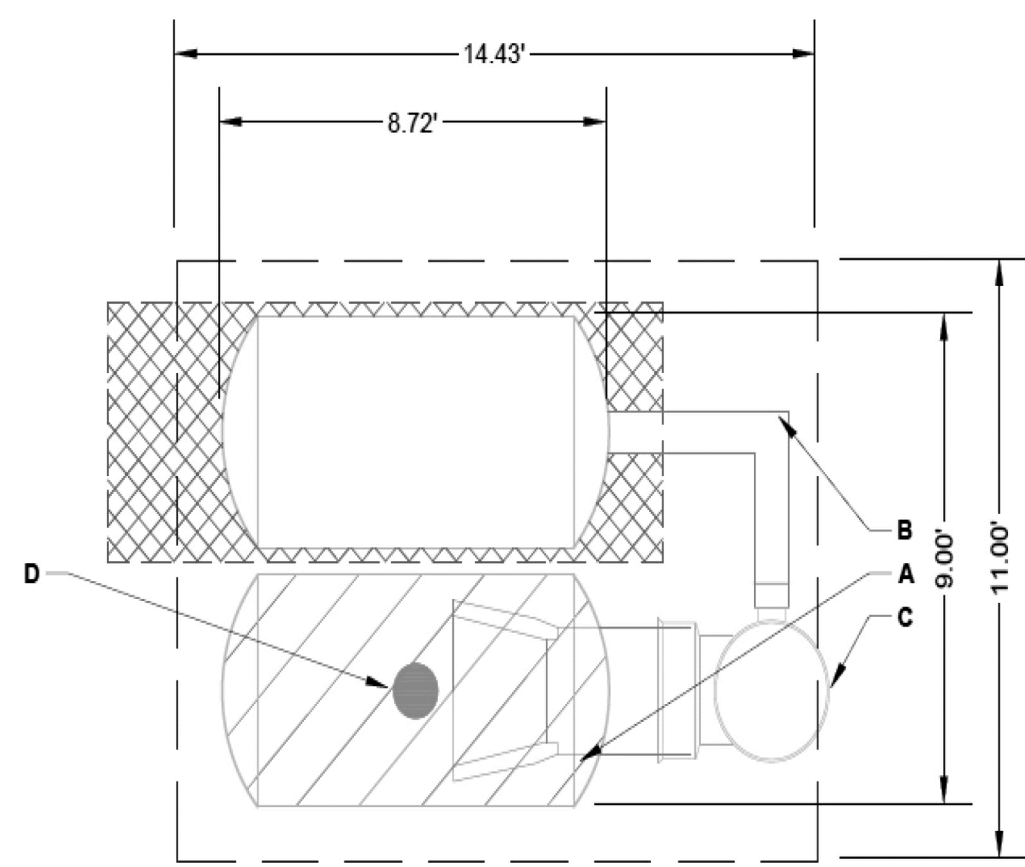
2	STORMTECH SC-740 CHAMBERS
4	STORMTECH SC-740 END CAPS
6	STONE ABOVE (in)
6	STONE BELOW (in)
40	STONE VOID
277	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)
159	SYSTEM AREA (SF)
50.9	SYSTEM PERIMETER (ft)

ISOLATOR ROW PLUS
(SEE DETAIL)

PLACE MINIMUM 12.50' OF ADSPLUS125 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	24" BOTTOM PREFABRICATED END CAP, PART#: SC740EPE24BR / TYP OF ALL 24" ISOLATOR ROW PLUS CONNECTIONS	0.10"	
MANIFOLD	B	8" x 8" TOP MANIFOLD, MOLDED FITTINGS	16.50"	
NYLOPLAST (INLET W/ ISO PLUS ROW)	C	12" DIAMETER (6.00" SUMP MIN)		0.9 CFS IN
INSPECTION PORT	D	4" SEE DETAIL		

STORMTECH LAYOUT DETAIL 3

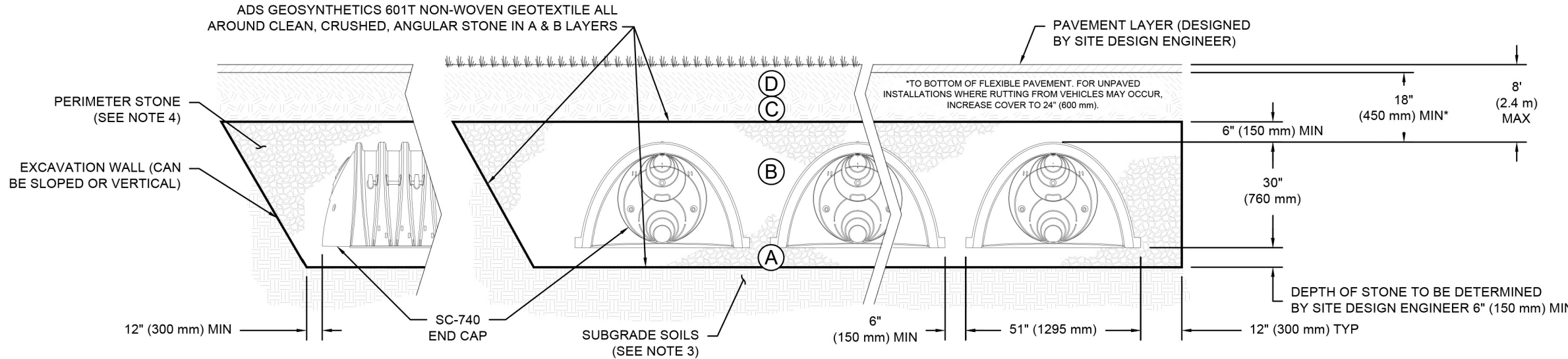


ACCEPTABLE FILL MATERIALS: STORMTECH SC-740 CHAMBER SYSTEMS

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.	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.	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 85% 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	EMBODIMENT STONE: FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	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.	AASHTO M43 ¹ 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. ^{2,3}

PLEASE NOTE:

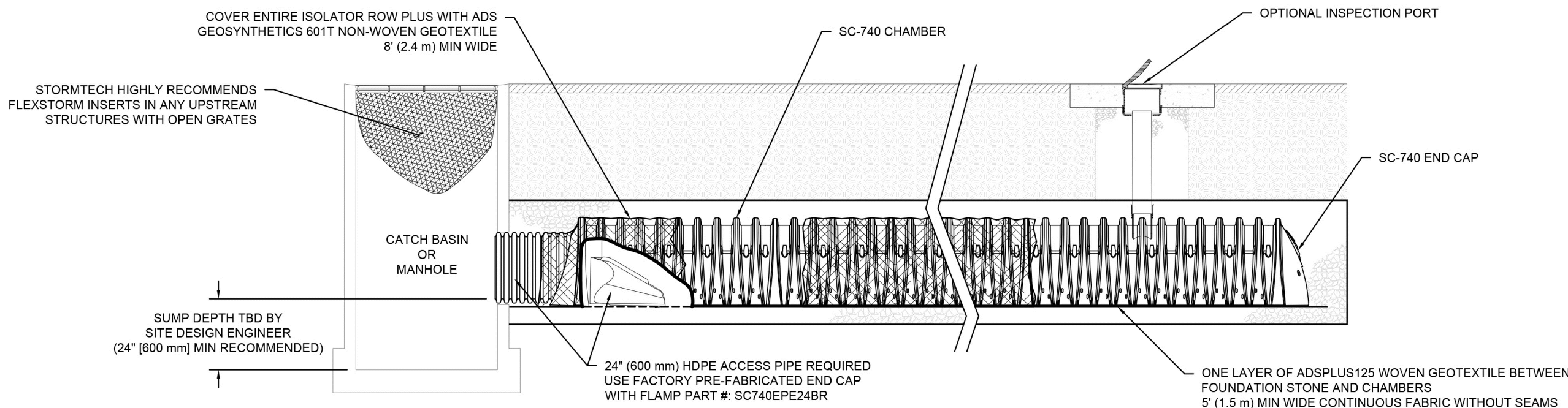
- THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
- STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
- 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.
- 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.



NOTES:

- CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
- SC-740 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
- 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.
- PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
- REQUIREMENTS FOR HANDLING AND INSTALLATION:
 - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
 - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
 - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.3.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 550 LBS/IN² AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

STORMTECH BACKFILL DETAIL 4



SC-740 ISOLATOR ROW PLUS DETAIL
NTS

INSPECTION & MAINTENANCE

- STEP 1) INSPECT ISOLATOR ROW PLUS 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 PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
- A.5. IF SEDIMENT IS AT, OR ABOVE, 3\"/>

B. ALL ISOLATOR PLUS ROWS

B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS

B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS 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\"/>

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS

A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45\"/>

B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN

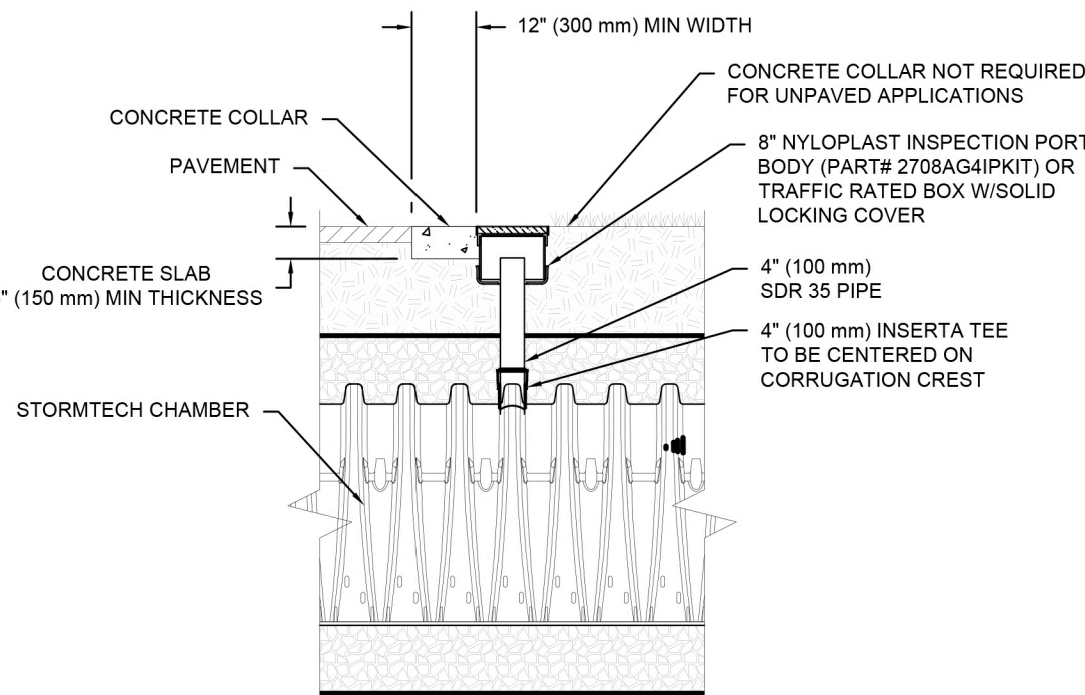
C. VACUUM STRUCTURE SUMP AS REQUIRED

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

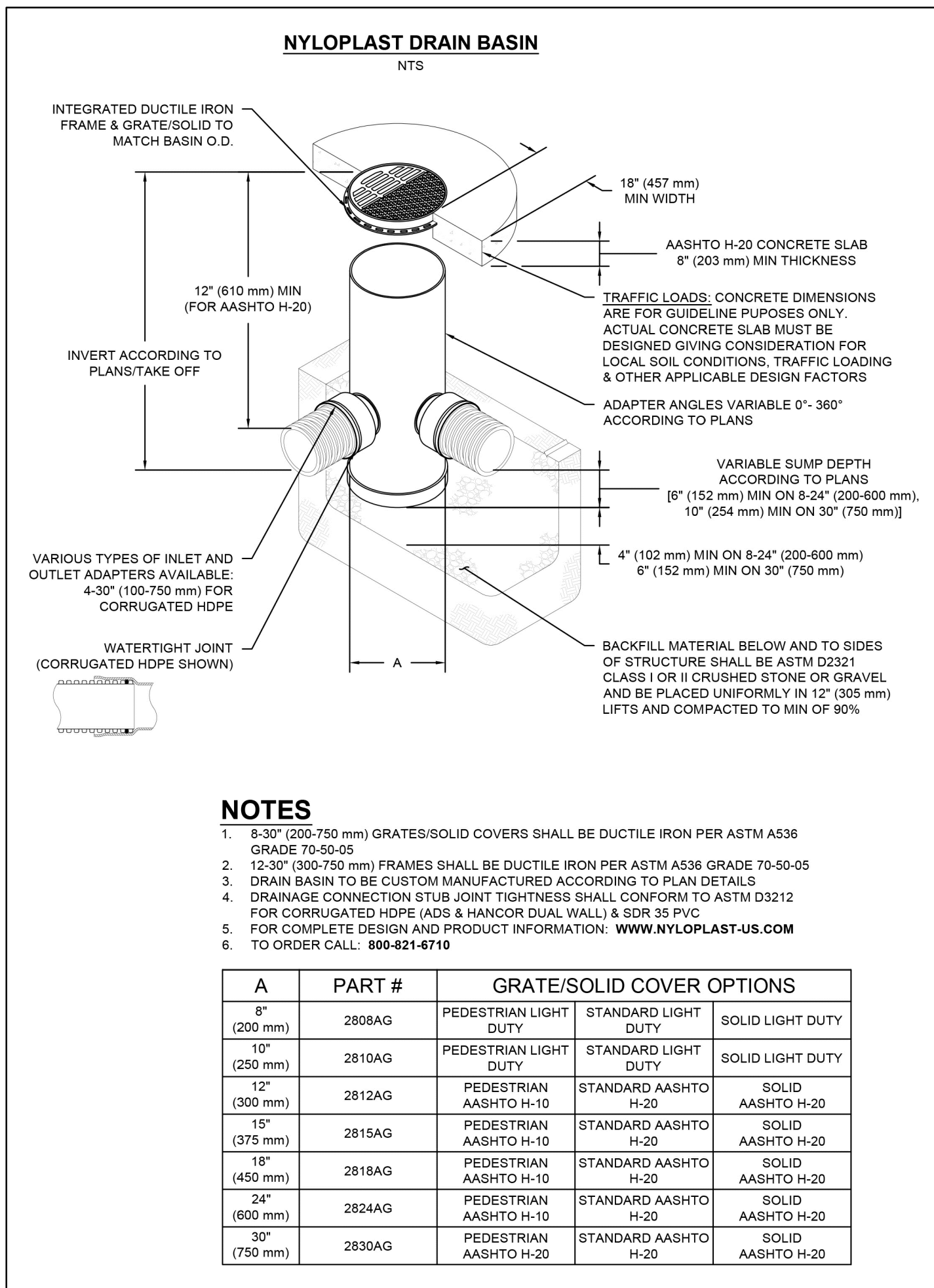
- INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
- CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



NOTE:
INSPECTION PORTS MAY BE CONNECTED THROUGH ANY CHAMBER CORRUGATION CREST.

4\"/>

STORMTECH SECTION
DETAIL 5
NTS



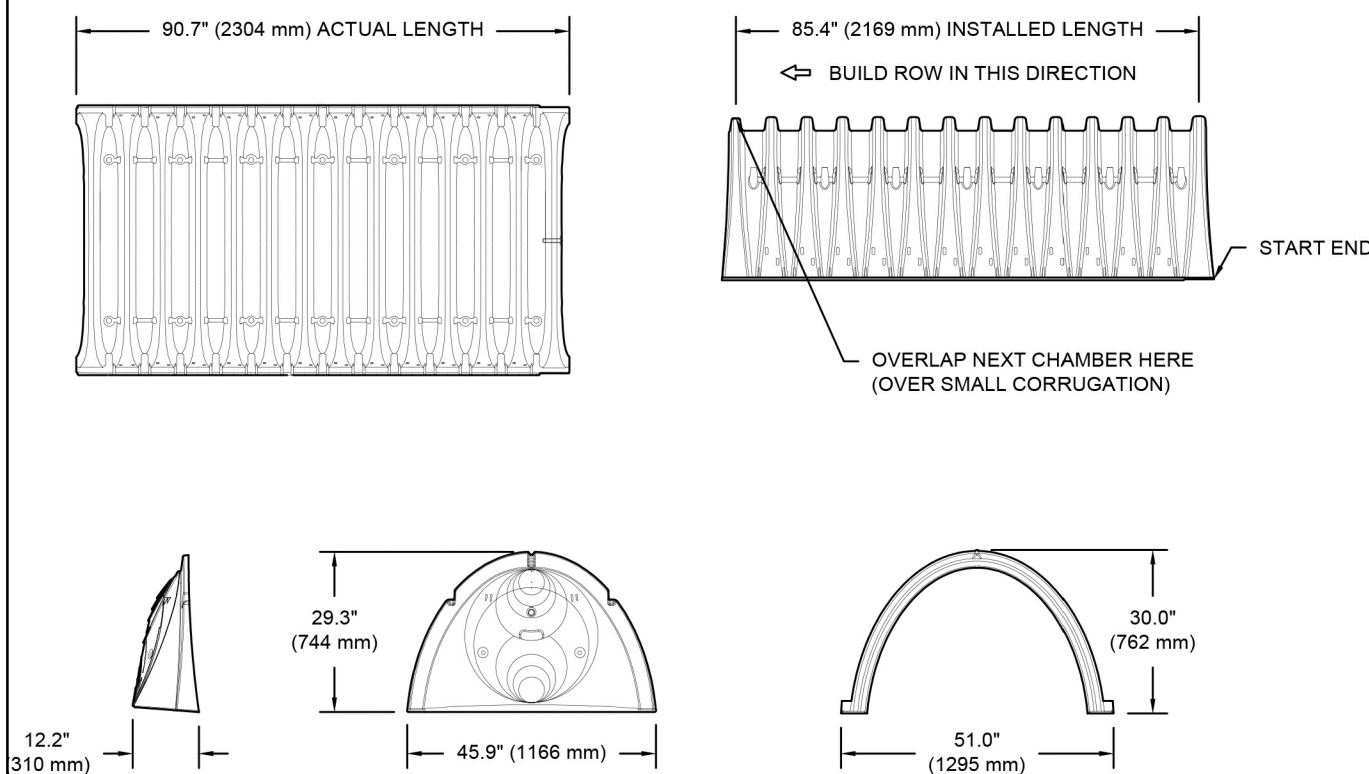
NOTES

- 8-30\"/>
- 12-30\"/>
- DRAIN BASIN TO BE CUSTOM MANUFACTURED ACCORDING TO PLAN DETAILS
- DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS & HANCOR DUAL WALL) & SDR 35 PVC
- FOR COMPLETE DESIGN AND PRODUCT INFORMATION: WWW.NYLOPLAST-US.COM
- TO ORDER CALL: 800-821-6710

A	PART #	GRATE/SOLID COVER OPTIONS		
8" (200 mm)	2808AG	PEDESTRIAN LIGHT DUTY	STANDARD LIGHT DUTY	SOLID LIGHT DUTY
10" (250 mm)	2810AG	PEDESTRIAN LIGHT DUTY	STANDARD LIGHT DUTY	SOLID LIGHT DUTY
12" (300 mm)	2812AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
15" (375 mm)	2815AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
18" (450 mm)	2818AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
24" (600 mm)	2824AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
30" (750 mm)	2830AG	PEDESTRIAN AASHTO H-20	STANDARD AASHTO H-20	SOLID AASHTO H-20

DRAIN BASIN
DETAIL 7
NTS

SC-740 TECHNICAL SPECIFICATION NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	51.0\"/>
---------------------------------	----------

*ASSUMES 6\"/>

PRE-FAB STUB AT BOTTOM OF END CAP WITH FLAMP END WITH \"BR\"
PRE-FAB STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH \"B\"
PRE-FAB STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH \"T\"
PRE-CORED END CAPS END WITH \"PC\"

PART #	STUB	A	B	C
SC740EPE08T / SC740EPE08TPC	6" (152 mm)	10.9" (277 mm)	18.5" (470 mm)	---
SC740EPE08B / SC740EPE08BPC	---	---	---	0.5" (13 mm)
SC740EPE10T / SC740EPE10TPC	8" (200 mm)	12.2" (310 mm)	16.5" (419 mm)	---
SC740EPE10B / SC740EPE10BPC	---	---	---	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	---	---	---	---
SC740EPE12B / SC740EPE12BPC	12" (300 mm)	14.7" (373 mm)	12.5" (318 mm)	1.2" (30 mm)
SC740EPE15T / SC740EPE15TPC	---	---	---	---
SC740EPE15B / SC740EPE15BPC	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 / SC740EPE24BPC	24" (600 mm)	18.5" (470 mm)	---	0.1" (3 mm)
SC740EPE24B / SC740EPE24BPC	24" (600 mm)	18.5" (470 mm)	---	0.1" (3 mm)

ALL STUBS, EXCEPT FOR THE SC740EPE24B/SC740EPE24BR 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/SC740EPE24BR THE 24\"/>

NOTE: ALL DIMENSIONS ARE NOMINAL.

STORMTECH SPECIFICATIONS
DETAIL 6
NTS



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WHITE PELICAN CONSULTING
PORTLAND, OREGON
503-847-9455

www.whitepelicanconsulting.com
email: dbeck@whitepelicanconsulting.com

RETAIL NEST LLC
1037-1041 SE 11TH AVENUE
PORTLAND, OREGON
STORMWATER MANAGEMENT
DETAILS

DATE
5/6/21

SCALE NTS	PROJ. NO.
DRAWN BY TT	CHECKED BY DB

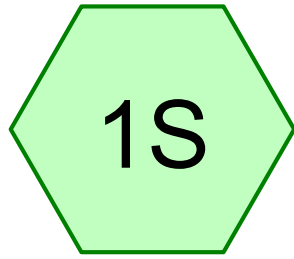
SW3

White Pelican Consulting, LLC

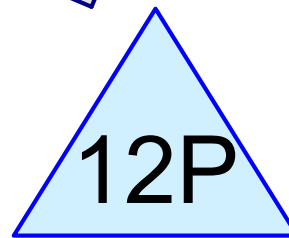
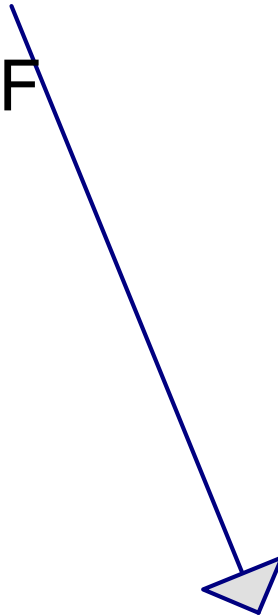
Environmental Engineering & Data Analysis

WBE, DBE, ESB Oregon Certified # 12223

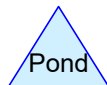
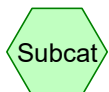
APPENDIX A: HYDROCAD MODELING OUTPUT



All SF



SC740 StormTech



Redtail Revised SF

Prepared by White Pelican Consulting

HydroCAD® 10.10-4a s/n M32063 © 2020 HydroCAD Software Solutions LLC

Type IA 24-hr 2 year Rainfall=2.40"

Printed 5/6/2021

Page 2

Summary for Pond 12P: SC740 StormTech

Inflow Area = 7,258 sf, 100.00% Impervious, Inflow Depth = 2.17" for 2 year event
 Inflow = 0.09 cfs @ 7.90 hrs, Volume= 1,313 cf
 Outflow = 0.04 cfs @ 7.55 hrs, Volume= 1,313 cf, Atten= 60%, Lag= 0.0 min
 Discarded = 0.04 cfs @ 7.55 hrs, Volume= 1,313 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= -3.18' @ 8.47 hrs Surf.Area= 159 sf Storage= 109 cf

Plug-Flow detention time= 10.8 min calculated for 1,311 cf (100% of inflow)
 Center-of-Mass det. time= 10.8 min (686.0 - 675.2)

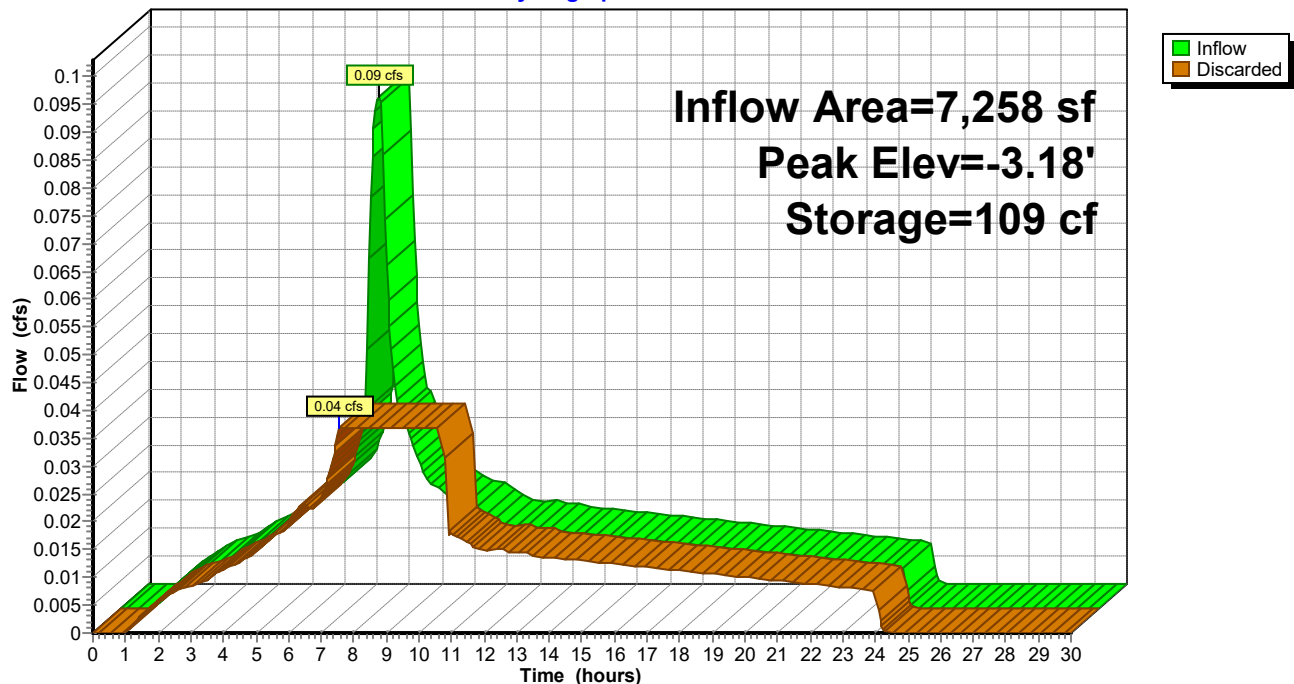
Volume	Invert	Avail.Storage	Storage Description
#1	-4.50'	185 cf	11.00'W x 14.43'L x 3.50'H Prismatic 556 cf Overall - 92 cf Embedded = 464 cf x 40.0% Voids
#2	-4.00'	92 cf	ADS_StormTech SC-740 +Cap x 2 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
			277 cf Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	-4.50'	10.000 in/hr Exfiltration over Surface area Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 7.55 hrs HW=-4.45' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Pond 12P: SC740 StormTech

Hydrograph



Redtail Revised SF

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Type IA 24-hr 5 year Rainfall=2.90"

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Page 3

Summary for Pond 12P: SC740 StormTech

Inflow Area = 7,258 sf, 100.00% Impervious, Inflow Depth = 2.67" for 5 year event
 Inflow = 0.11 cfs @ 7.90 hrs, Volume= 1,614 cf
 Outflow = 0.04 cfs @ 7.35 hrs, Volume= 1,614 cf, Atten= 67%, Lag= 0.0 min
 Discarded = 0.04 cfs @ 7.35 hrs, Volume= 1,614 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= -2.49' @ 8.92 hrs Surf.Area= 159 sf Storage= 170 cf

Plug-Flow detention time= 20.1 min calculated for 1,611 cf (100% of inflow)
 Center-of-Mass det. time= 20.0 min (689.3 - 669.2)

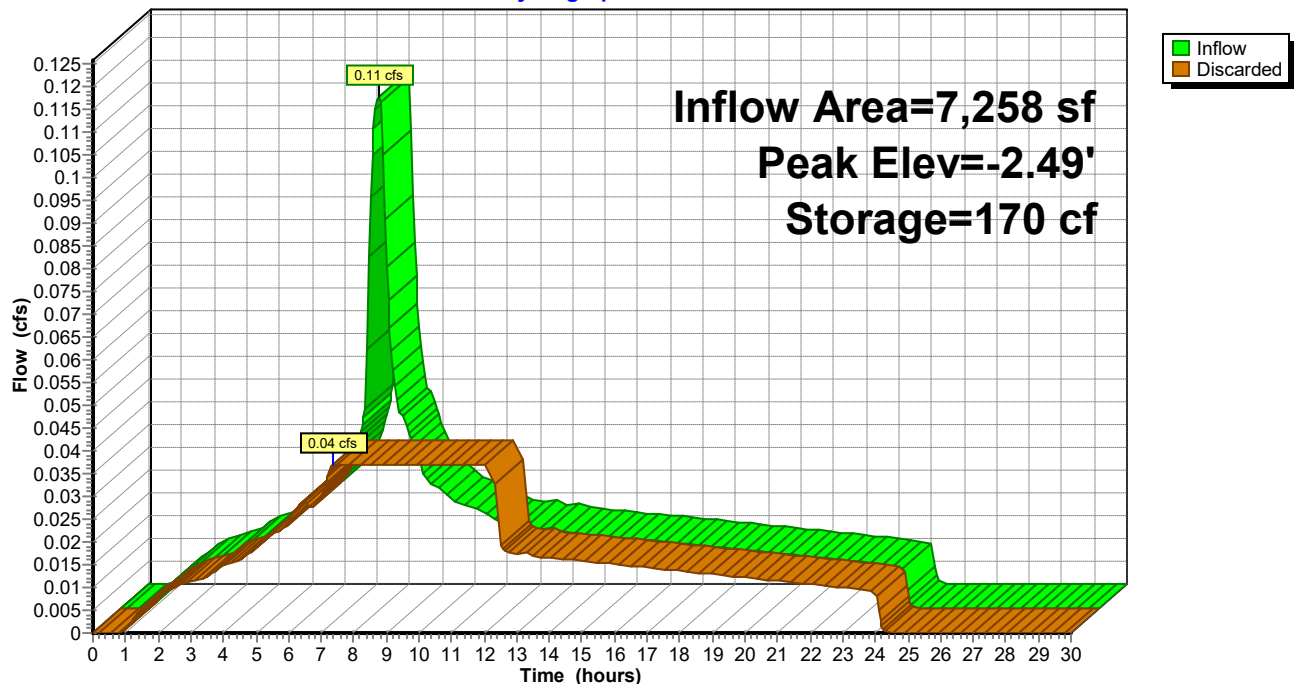
Volume	Invert	Avail.Storage	Storage Description
#1	-4.50'	185 cf	11.00'W x 14.43'L x 3.50'H Prismatoid 556 cf Overall - 92 cf Embedded = 464 cf x 40.0% Voids
#2	-4.00'	92 cf	ADS_StormTech SC-740 +Cap x 2 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
			277 cf Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	-4.50'	10.000 in/hr Exfiltration over Surface area Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 7.35 hrs HW=-4.46' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Pond 12P: SC740 StormTech

Hydrograph



Redtail Revised SF

Prepared by White Pelican Consulting

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Type IA 24-hr 10 year Rainfall=3.40"

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Page 4

Summary for Pond 12P: SC740 StormTech

Inflow Area = 7,258 sf, 100.00% Impervious, Inflow Depth = 3.17" for 10 year event
 Inflow = 0.13 cfs @ 7.90 hrs, Volume= 1,915 cf
 Outflow = 0.04 cfs @ 7.10 hrs, Volume= 1,915 cf, Atten= 72%, Lag= 0.0 min
 Discarded = 0.04 cfs @ 7.10 hrs, Volume= 1,915 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= -1.51' @ 9.19 hrs Surf.Area= 159 sf Storage= 245 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 34.2 min (699.0 - 664.8)

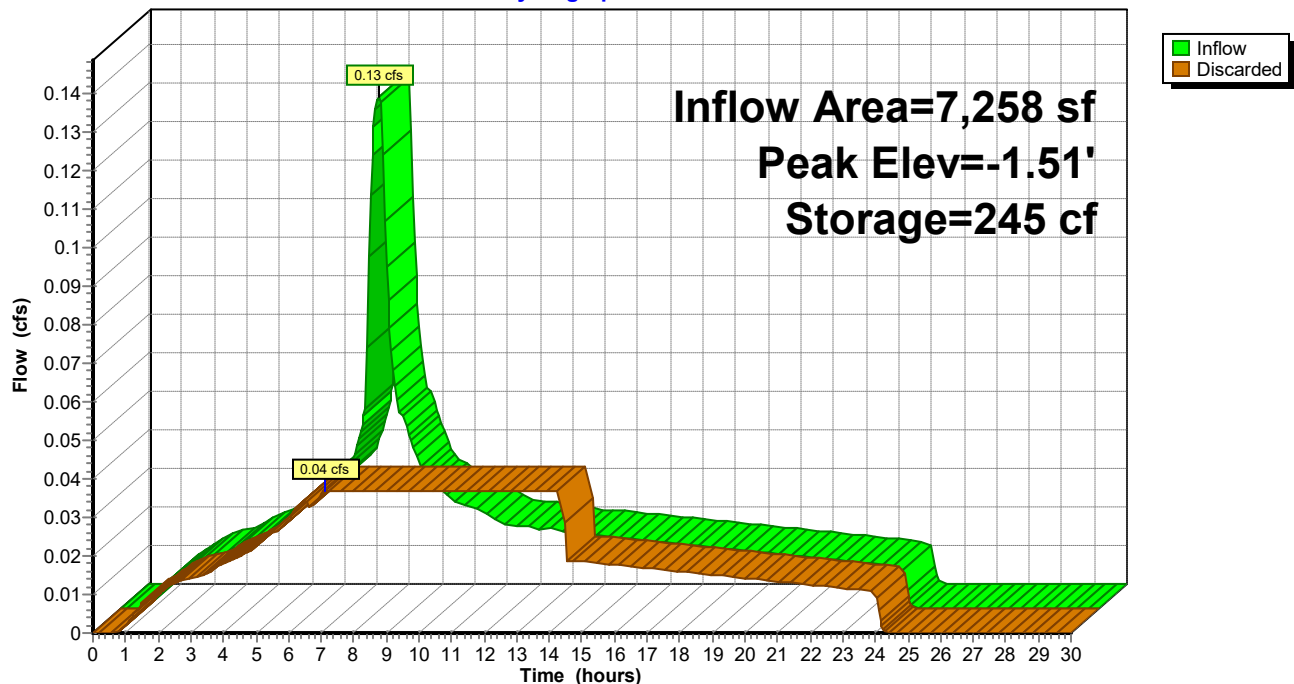
Volume	Invert	Avail.Storage	Storage Description
#1	-4.50'	185 cf	11.00'W x 14.43'L x 3.50'H Prismatoid 556 cf Overall - 92 cf Embedded = 464 cf x 40.0% Voids
#2	-4.00'	92 cf	ADS_StormTech SC-740 +Cap x 2 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
			277 cf Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	-4.50'	10.000 in/hr Exfiltration over Surface area Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 7.10 hrs HW=-4.46' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Pond 12P: SC740 StormTech

Hydrograph



Redtail Revised SF

Prepared by White Pelican Consulting

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Type IA 24-hr water quality Rainfall=1.61"

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Page 5

Summary for Pond 12P: SC740 StormTech

Inflow Area = 7,258 sf, 100.00% Impervious, Inflow Depth = 1.39" for water quality event
 Inflow = 0.06 cfs @ 7.91 hrs, Volume= 840 cf
 Outflow = 0.04 cfs @ 7.65 hrs, Volume= 840 cf, Atten= 38%, Lag= 0.0 min
 Discarded = 0.04 cfs @ 7.65 hrs, Volume= 840 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= -3.96' @ 8.20 hrs Surf.Area= 159 sf Storage= 36 cf

Plug-Flow detention time= 2.8 min calculated for 838 cf (100% of inflow)
 Center-of-Mass det. time= 2.8 min (693.2 - 690.3)

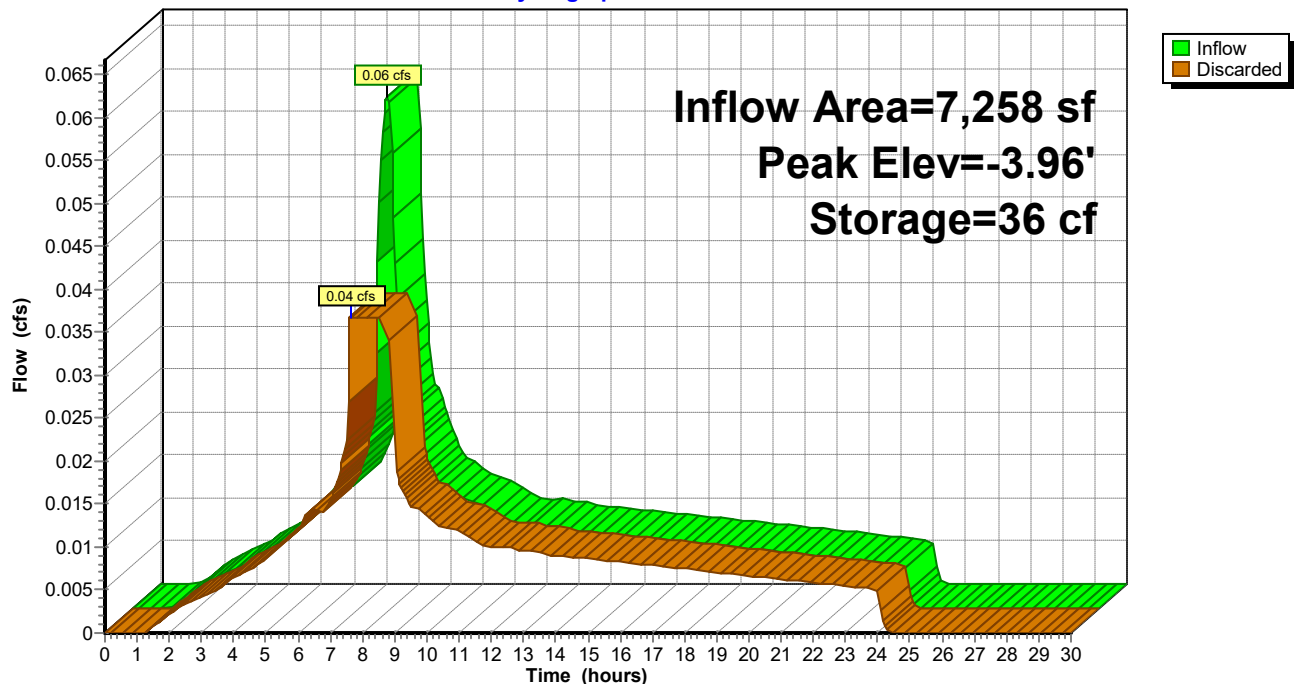
Volume	Invert	Avail.Storage	Storage Description
#1	-4.50'	185 cf	11.00'W x 14.43'L x 3.50'H Prismaoid 556 cf Overall - 92 cf Embedded = 464 cf x 40.0% Voids
#2	-4.00'	92 cf	ADS_StormTech SC-740 +Cap x 2 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
			277 cf Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	-4.50'	10.000 in/hr Exfiltration over Surface area Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 7.65 hrs HW=-4.44' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Pond 12P: SC740 StormTech

Hydrograph



Redtail Revised SF

Prepared by White Pelican Consulting

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Multi-Event Tables

Printed 5/6/2021

Page 6

Events for Pond 12P: SC740 StormTech

Event	Inflow (cfs)	Discarded (cfs)	Elevation (feet)	Storage (cubic-feet)
2 year	0.09	0.04	-3.18	109
5 year	0.11	0.04	-2.49	170
10 year	0.13	0.04	-1.51	245
water quality	0.06	0.04	-3.96	36

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Environmental Engineering & Data Analysis

WBE, DBE, ESB Oregon Certified # 12223

APPENDIX B: GEOTECH ANALYSIS AND INFILTRATION

Max Brunke
KLK Consulting, LLC
503-227-5000 (o)
503-550-1639 (c)
mbrunke@klkarlsson.com
906 NW 23rd Ave, Portland, Oregon 97210

27 November 2020

Re: Infiltration test at 1037-1041 SE 111th Avenue, Portland, OR

Field Investigation:

Rapid Soil Solutions (RSS) has performed one (4) infiltration test for future storm water and partition approval. Figure 1 below shows the project site location. Soils found on site match those in by DOGMI. RSS course grained flood deposits of sands, gravels and rounded cobbles.



Figure 1

Infiltration Testing:

RSS performed four (4) infiltration tests on the site in open test pits due to the course grained soils. A summary of the rates and soils is in the below table. All the test pits have a rate of infinity but the storm water manual only allows of a rate of 20in/hr. This rate will include a SF=2.

Test #	Test Depth (ft)	Infiltration rate (in/hr)	Soil Classification
TP#1	3	20 *	CP/ CB
TP#2	6	20 *	CP/ CB
TP#3	6	20 *	CP/ CB
TP#4	3	20 *	CP/ CB

The analysis, conclusions and recommendations contained in this report are based on site conditions as they existed at the time of explorations. Any questions regarding this report please contact me at the below number or email.

Sincerely,



Mia Mahedy, PE GE.



503-816-3689

mia@rapidsoilsolutions.com

Rapid Soil Solutions Infiltration Test Results



Preliminary Information

Location:	1037-1041 SE 111 th Avenue Portland, OR	Performed By: Mia Mahedy, PE, GE	
Date & Time:	11/26/20	Instrument Used:	Excavator
Weather:	Partly Sunny	Depth:	varies

TP #1 at 3ft

Soil Profile Detail

Depth (ft)	Description
0'-3.0'	Damp, brown, course grained SAND mixed with rounded river cobbles, and course gravels

RSS was unable to attain a measurable head of water in the test pit. Water was added to the pit at a rate of 5 gallons per minute, and no head was achieved. **RATE = INFINITY**

TP #2 at 6ft

Soil Profile Detail

Depth (ft)	Description
0'-3.0''	Damp, brown, course grained medium dense SAND mixed with rounded river cobbles, and course gravels
3.0'-6'	Damp, brown, medium dense, course grained gravels and rounded river cobbles

RSS was unable to attain a measurable head of water in the test pit. Water was added to the pit at a rate of 5 gallons per minute, and no head was achieved. **RATE = INFINITY**

TP #3 at 6ft	
Soil Profile Detail	
Depth (ft)	Description
0'-3.0''	Damp, brown, course grained SAND mixed with rounded river cobbles, and course gravels
3.0'-6'	Damp, brown, medium dense, course grained gravels and rounded river cobbles
RSS was unable to attain a measurable head of water in the test pit. Water was added to the pit at a rate of 5 gallons per minute, and no head was achieved. RATE= INFINTY	

TP #4 at 3ft	
Soil Profile Detail	
Depth (ft)	Description
0'-3.0'	Damp, brown, course grained SAND mixed with rounded river cobbles, and course gravels
RSS was unable to attain a measurable head of water in the test pit. Water was added to the pit at a rate of 5 gallons per minute, and no head was achieved. RATE= INFINTY	

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Environmental Engineering & Data Analysis

WBE, DBE, ESB Oregon Certified # 12223

APPENDIX C: GEOTECH FIELD MEMO

Field Memo

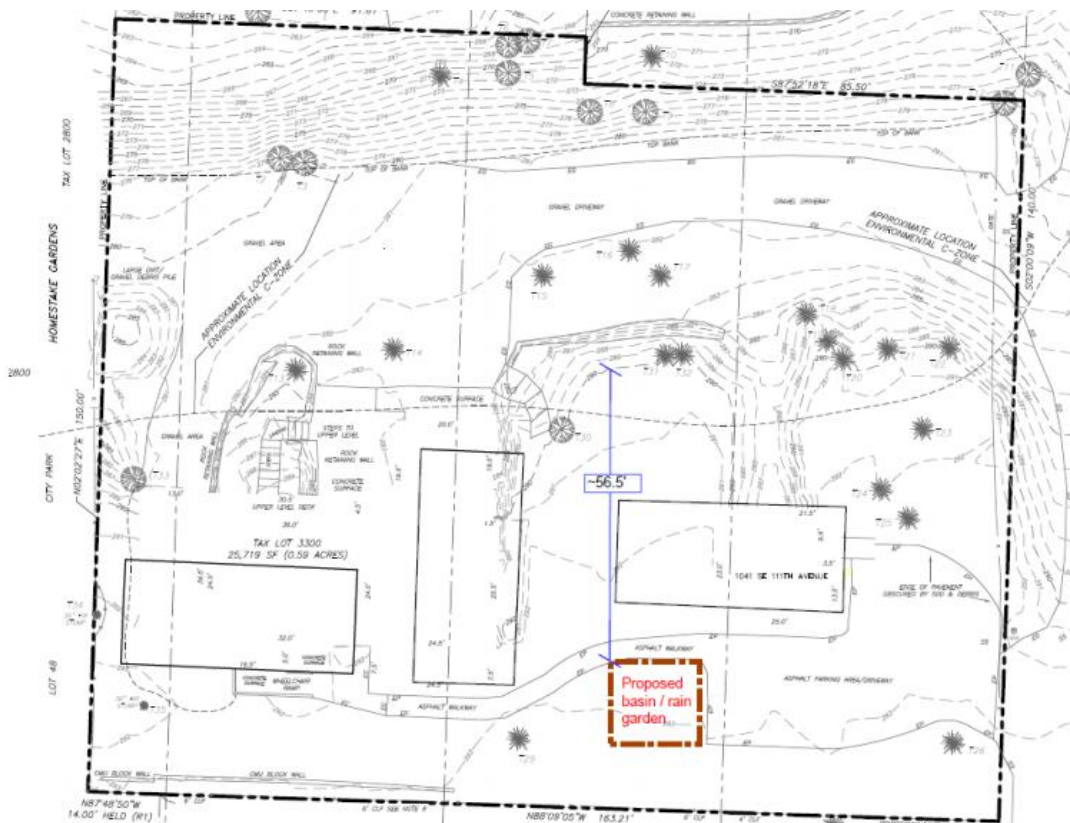
Project: 1037-1041 SE 111th Avenue
Location: Portland, OR

Date: 12/10/20
Developer: KLK Consulting

Rapid Soil Solutions (RSS) is showing below the planed location for the site infiltration facility. Due to site constraint with slopes conservation area the proposed facility is being located 56.5ft away from a 20% slope.

I found the soils in the all the infiltration test pits to be densely packed coarse grained gravels and cobbles. The placement of the facility will not cause any slope hazards as the water does not run horizontally though the course grained soils but down with gravity.

The existing site slopes due to the conservation zone will remain terraced and are have large trees, and the infiltration rate of the entire site is infinity.



EXPIRES: 12-31-2022

White Pelican Consulting, LLC

Environmental Engineering & Data Analysis

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APPENDIX D: SC-740 2-CHAMBER STORMTECH DRAWING PACKAGE

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	



SiteASSIST™
FOR STORMTECH
INSTRUCTIONS,
DOWNLOAD THE
INSTALLATION APP



REDTAIL PORTLAND, OR

SC-740 STORMTECH CHAMBER SPECIFICATIONS

- CHAMBERS SHALL BE STORMTECH SC-740.
- CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
- CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
- CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
- 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.
- CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
- REQUIREMENTS FOR HANDLING AND INSTALLATION:
 - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
 - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
 - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 550 LBS/IN/IN. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
- ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
 - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
 - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE 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 SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
 - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
- CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

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

- STORMTECH SC-740 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
- STORMTECH SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
- 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.
- THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
- JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
- MAINTAIN MINIMUM - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
- EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm).
- THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
- 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

- STORMTECH SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
- THE USE OF CONSTRUCTION EQUIPMENT OVER 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".
- 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.

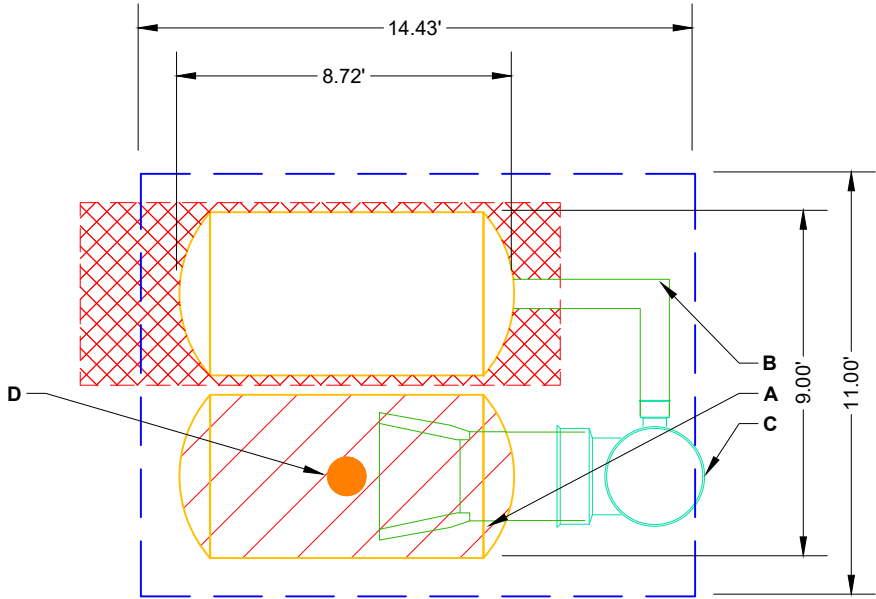
CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

PROPOSED LAYOUT		CONCEPTUAL ELEVATIONS		*INVERT ABOVE BASE OF CHAMBER				
				PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
2	STORMTECH SC-740 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	11.00					
4	STORMTECH SC-740 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	5.00					
6	STONE ABOVE (in)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	4.50	PREFABRICATED END CAP	A	24" BOTTOM PREFABRICATED END CAP, PART#: SC740EPE24BR / TYP OF ALL 24" ISOLATOR ROW PLUS CONNECTIONS	0.10"	
6	STONE BELOW (in)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	4.50	MANIFOLD	B	8" x 8" TOP MANIFOLD, MOLDED FITTINGS	16.50"	
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	4.50	NYLOPLAST (INLET W/ ISO PLUS ROW)	C	30" DIAMETER (24.00" SUMP MIN)		0.9 CFS IN
277	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	3.50	INSPECTION PORT	D	4" SEE DETAIL		
		TOP OF SC-740 CHAMBER:	3.00					
		8" x 8" TOP MANIFOLD INVERT:	1.88					
		24" ISOLATOR ROW PLUS INVERT:	0.51					
159	SYSTEM AREA (SF)	BOTTOM OF SC-740 CHAMBER:	0.50					
50.9	SYSTEM PERIMETER (ft)	BOTTOM OF STONE:	0.00					

ISOLATOR ROW PLUS
(SEE DETAIL)

PLACE MINIMUM 12.50' OF ADSPLUS125 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

— — — — — BED LIMITS



NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

StormTech®
Chamber System

888-892-2694 | WWW.STORMTECH.COM

RETAIL
PORTLAND, OR

DATE:
PROJECT #:

DRAWN: DB
CHECKED: N/A

DESCRIPTION

CHK

DRW

REV

10'

5'

0

SHEET
2 OF 6

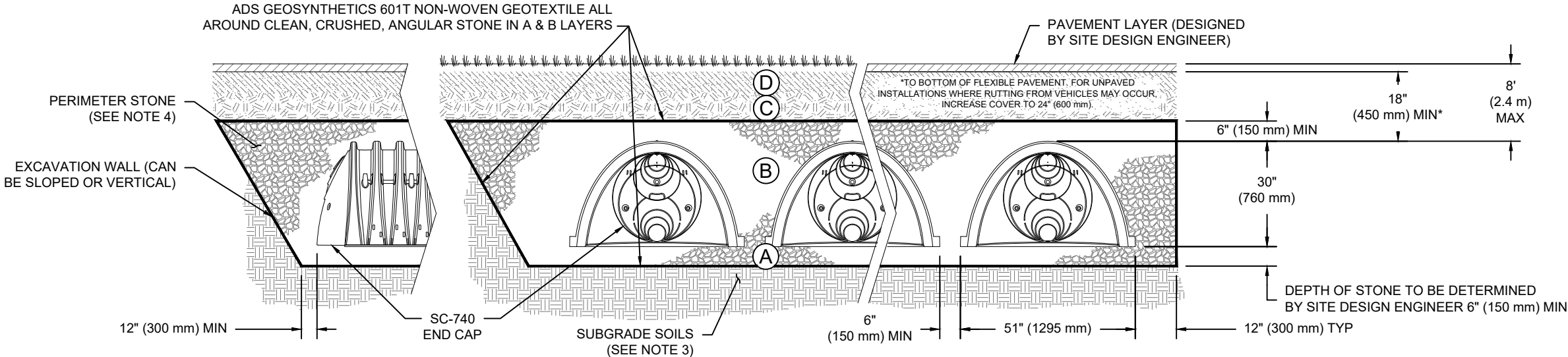
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ACCEPTABLE FILL MATERIALS: STORMTECH SC-740 CHAMBER SYSTEMS

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	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	AASHTO M43 ¹ 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. ^{2,3}

PLEASE NOTE:

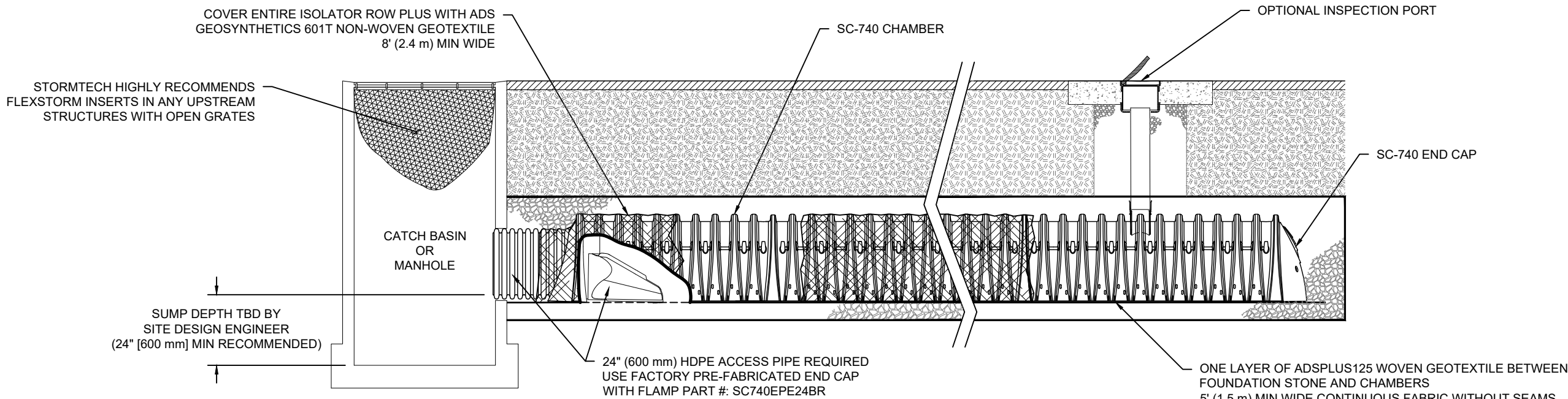
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND 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.
4. 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.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) 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. 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.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
 - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
 - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
 - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 550 LBS/IN/IN. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

 4640 TRUAMAN BLVD HILLIARD, OH 43026 1-800-733-7473	StormTech® Chamber System 888-892-2694 WWW.STORMTECH.COM	REV	DRW	CHK	DESCRIPTION	REDTAIL PORTLAND, OR
		DATE:		DRAWN: DB		PROJECT #: CHECKED: N/A
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SHEET 3 OF 6						



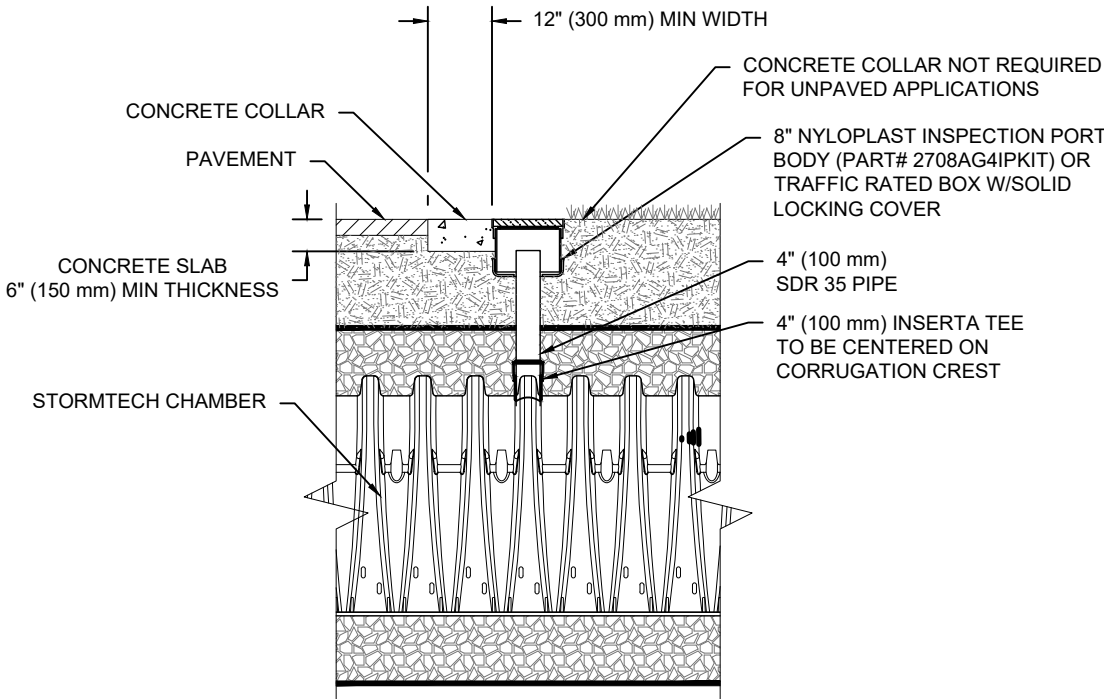
SC-740 ISOLATOR ROW PLUS DETAIL
NTS

INSPECTION & MAINTENANCE

- STEP 1) INSPECT ISOLATOR ROW PLUS 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 PLUS 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 PLUS ROWS
 - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
 - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS 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 PLUS 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

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



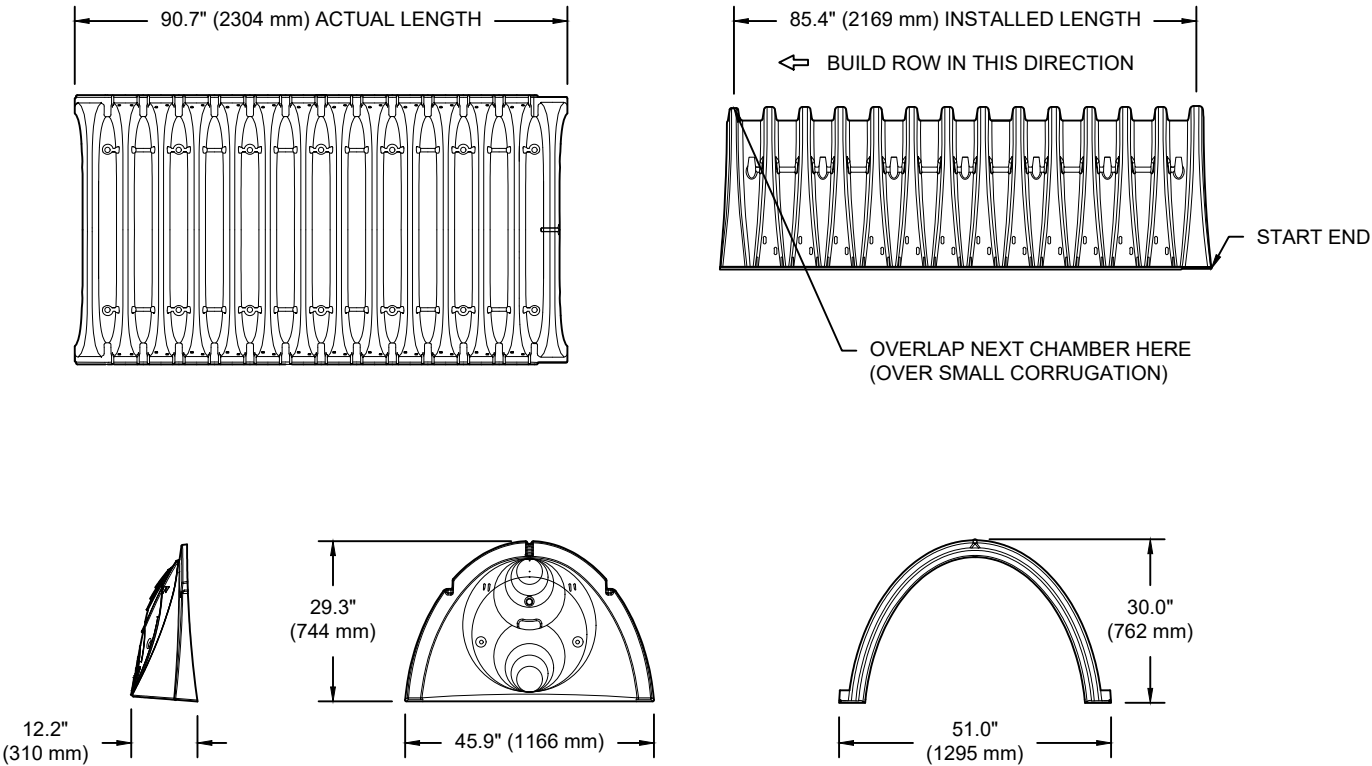
NOTE:
INSPECTION PORTS MAY BE CONNECTED THROUGH ANY CHAMBER CORRUGATION CREST.

4" PVC INSPECTION PORT DETAIL
(SC SERIES CHAMBER)
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SHEET 4 OF 6											

SC-740 TECHNICAL SPECIFICATION

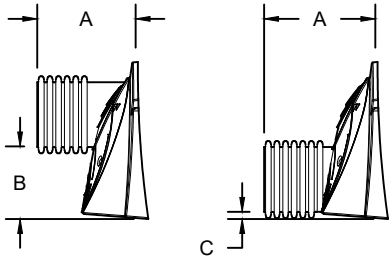
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NOMINAL CHAMBER SPECIFICATIONS

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



PRE-FAB STUB AT BOTTOM OF END CAP WITH FLAMP END WITH "BR"
PRE-FAB STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PRE-FAB STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
PRE-CORED END CAPS END WITH "PC"

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)
SC740EPE24BR*	24" (600 mm)	18.5" (470 mm)	---	0.1" (3 mm)

ALL STUBS, EXCEPT FOR THE SC740EPE24B/SC740EPE24BR 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/SC740EPE24BR 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

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HILLIARD, OH 43026
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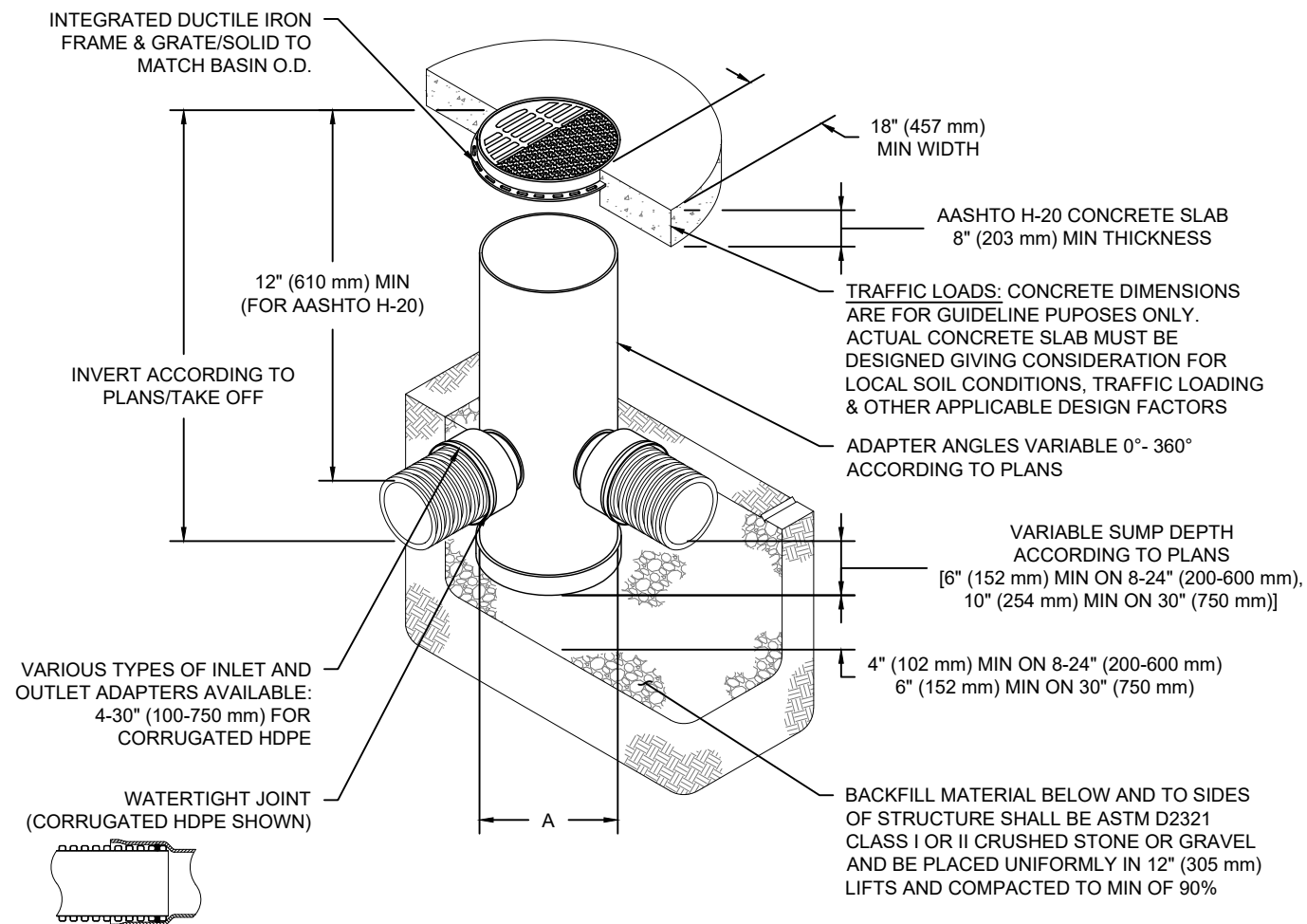
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SHEET
5 OF 6

NYLOPLAST DRAIN BASIN

NTS



NOTES

1. 8-30" (200-750 mm) GRATES/SOLID COVERS SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05
2. 12-30" (300-750 mm) FRAMES SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05
3. DRAIN BASIN TO BE CUSTOM MANUFACTURED ACCORDING TO PLAN DETAILS
4. DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS & HANCOR DUAL WALL) & SDR 35 PVC
5. FOR COMPLETE DESIGN AND PRODUCT INFORMATION: **WWW.NYLOPLAST-US.COM**
6. TO ORDER CALL: **800-821-6710**

A	PART #	GRATE/SOLID COVER OPTIONS		
8" (200 mm)	2808AG	PEDESTRIAN LIGHT DUTY	STANDARD LIGHT DUTY	SOLID LIGHT DUTY
10" (250 mm)	2810AG	PEDESTRIAN LIGHT DUTY	STANDARD LIGHT DUTY	SOLID LIGHT DUTY
12" (300 mm)	2812AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
15" (375 mm)	2815AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
18" (450 mm)	2818AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
24" (600 mm)	2824AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
30" (750 mm)	2830AG	PEDESTRIAN AASHTO H-20	STANDARD AASHTO H-20	SOLID AASHTO H-20

 4640 TRUEMAN BLVD HILLIARD, OH 43026 1-800-733-7473		 770-932-2443 WWW.NYLOPLAST-US.COM		REV	DRW	CHK	DESCRIPTION	REDTAIL	
								PORTLAND, OR	
								DATE:	DRAWN: DB
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6 OF 6

White Pelican Consulting, LLC

Environmental Engineering & Data Analysis

WBE, DBE, ESB Oregon Certified # 12223

APPENDIX E: OPERATIONS AND MAINTENANCE (O&M)

1. StormFilter Inspection and Maintenance Procedures
2. StormTech Isolator Row O&M Manual

StormFilter Inspection and Maintenance Procedures



Maintenance Guidelines

The primary purpose of the Stormwater Management StormFilter® is to filter 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 many effective maintenance options, we believe the following procedure to be efficient, using common equipment and existing maintenance protocols. The following two-step procedure is recommended::

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, during dryer months in late summer to early fall.

Maintenance Frequency

The primary factor for determining frequency of maintenance for 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.

The average maintenance lifecycle is approximately 1-5 years. 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.

Regulatory requirements or a chemical spill can shift maintenance timing as well. 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..





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 Engineered Solutions 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 and the unit's role, relative to detention or retention facilities onsite.

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 whether 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).

Please note Stormwater Management StormFilter devices installed downstream of, or integrated within, a stormwater storage facility typically have different operational parameters (i.e. draindown time). In these cases, the inspector must understand the relationship between the retention/detention facility and the treatment system by evaluating site specific civil engineering plans, or contacting the engineer of record, and make adjustments to the below guidance as necessary. Sediment deposition depths and patterns within the StormFilter are likely to be quite different compared to systems without upstream storage and therefore shouldn't be used exclusively to evaluate a need for maintenance.

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 above cartridge bottom for more than 24 hours after end of rain event, maintenance is required. (Catch basins have standing water in the cartridge bay.)
4. Plugged media.
 - a. While not required in all cases, inspection of the media within the cartridge may provide valuable additional information.
 - b. 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 $\geq 1/4"$ thick) is present above top cap, maintenance is required.

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 Engineered Solutions.

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 Engineered Solutions 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). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. 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 Engineered Solutions for suggested attachment devices.

- 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.

- 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. 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). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.
- B. Unscrew the cartridge cap.
- C. Remove the cartridge hood and float.
- D. At location under structure access, tip the cartridge on its side.
- 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. 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.
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 Engineered Solutions.

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.



Inspection Report

Date: _____ Personnel: _____

Location: _____ System Size: _____ Months in Service: _____

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

Sediment Thickness in Forebay: _____ Date: _____

Sediment Depth on Vault Floor: _____

Sediment Depth on Cartridge Top(s): _____

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 (if present): Yes ☐ No ☐

Sediment Depth in Forebay (if present): _____

Sediment Depth on Vault Floor: _____

Sediment Depth on Cartridge Top(s): _____

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:



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- Site-specific design support is available from our engineers.

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Isolator[®] Row O&M Manual



THE ISOLATOR[®] ROW

INTRODUCTION

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a technique to inexpensively enhance Total Suspended Solids (TSS) removal and provide easy access for inspection and maintenance.

THE ISOLATOR ROW

The Isolator Row is a row of StormTech chambers, either SC-160LP, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-4500 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC-310-3 and SC-740 models) allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of the underlying stone and remain intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber. The non-woven fabric is not required over the SC-160LP, DC-780, MC-3500 or MC-4500 models as these chambers do not have perforated side walls.

The Isolator Row is typically designed to capture the “first flush” and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole not only provides access to the Isolator Row but typically includes a high flow weir such that storm water flowrates or volumes that exceed the capacity of the Isolator Row overtop the over flow weir and discharge through a manifold to the other chambers.

The Isolator Row may also be part of a treatment train. By treating storm water prior to entry into the chamber system, the service life can be extended and pollutants such as hydrocarbons can be captured. Pre-treatment best management practices can be as simple as deep sump catch basins, oil-water separators or can be innovative storm water treatment devices. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

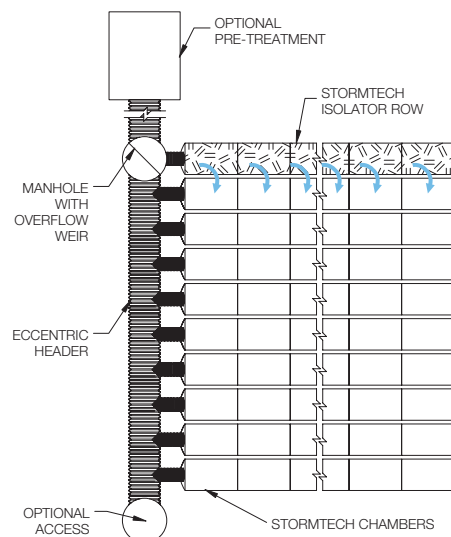
Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.



Looking down the Isolator Row from the manhole opening, woven geotextile is shown between the chamber and stone base.



StormTech Isolator Row with Overflow Spillway (not to scale)





ISOLATOR ROW INSPECTION/MAINTENANCE

INSPECTION

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

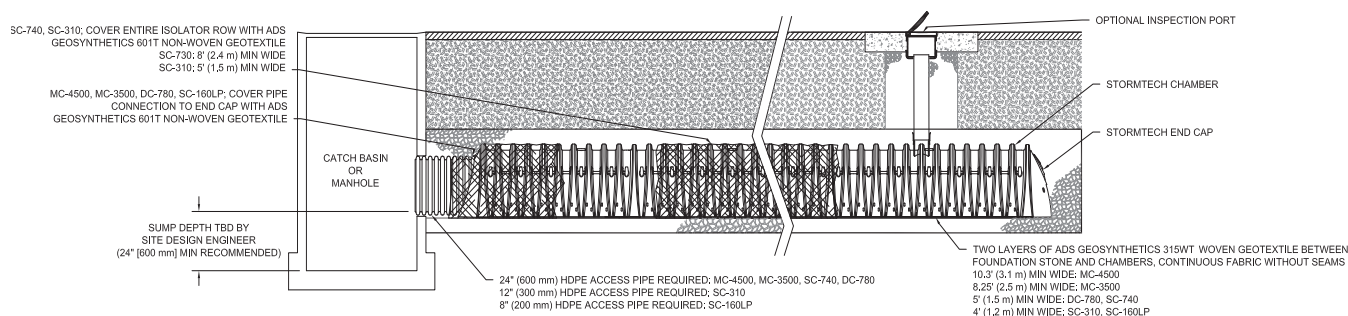
MAINTENANCE

The Isolator Row was designed to reduce the cost of periodic maintenance. By “isolating” sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45° are best. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**

StormTech Isolator Row (not to scale)

Note: Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500 and MC-4500 chamber models and is not required over the entire Isolator Row.



ISOLATOR ROW STEP BY STEP MAINTENANCE PROCEDURES

STEP 1

Inspect Isolator Row for sediment.

- A) Inspection ports (if present)
 - i. Remove lid from floor box frame
 - ii. Remove cap from inspection riser
 - iii. Using a flashlight and stadia rod, measure depth of sediment and record results on maintenance log.
 - iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.
- B) All Isolator Rows
 - i. Remove cover from manhole at upstream end of Isolator Row
 - ii. Using a flashlight, inspect down Isolator Row through outlet pipe
 1. Mirrors on poles or cameras may be used to avoid a confined space entry
 2. Follow OSHA regulations for confined space entry if entering manhole
 - iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2. If not, proceed to Step 3.

STEP 2

Clean out Isolator Row using the JetVac process.

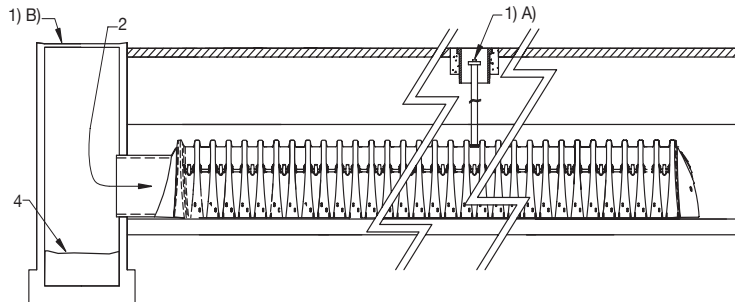
- A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
- B) Apply multiple passes of JetVac until backflush water is clean
- C) Vacuum manhole sump as required

STEP 3

Replace all caps, lids and covers, record observations and actions.

STEP 4

Inspect & clean catch basins and manholes upstream of the StormTech system.



SAMPLE MAINTENANCE LOG

Date	Stadia Rod Readings		Sediment Depth (1)-(2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM