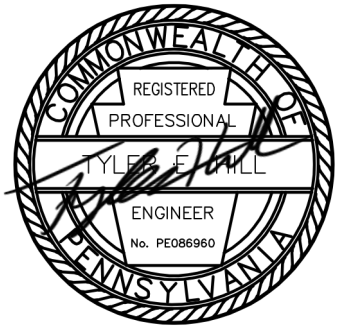
EROSION AND SEDIMENT CONTROL REPORT

FOR

THE WESTTOWN SCHOOL
OAK LANE PROJECT
WESTTOWN TOWNSHIP
CHESTER COUNTY, PA

PROJECT NO: 1091-001



January 27, 2023
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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF CLEAN WATER

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
DISCHARGES OF STORMWATER ASSOCIATED WITH CONSTRUCTION ACTIVITIES
EROSION AND SEDIMENT CONTROL (E&S) MODULE 1

Applicant: **The Westtown School**

Project Site Name: **The Westtown School - Oak Lane Project**

Surface Water Name(s): **East Branch Chester Creek**

Surface Water Use(s): **TSF, MF**

E&S PLAN INFORMATION

1. Describe the existing topographic features of the project site and the immediate surrounding area.

The project site is located near the center of the Westtown School campus, just south of Oak Lane. The site largely comprised of existing grass athletic fields which are bordered to the north by a partially forested area and the school's academic centers; to the east by a baseball field and residential area; the south by agricultural fields and a partially forested riparian area; and to the west by the school's working farm and agricultural area.

2. Complete the following table for soils present at the project site.

Map Unit Symbol	Map Unit Name	Acres	HSG	% of Disturbed Area	Depth (ft)	Hydric
CaB	**Califon loam**	**1.14**	**D**	**6.48**	**8-12**	☐
GgC	**Glenelg silt loam**	**0.87**	**B**	**4.95**	**7+**	☒
MaA/B/C	**Manor loam**	**15.58**	**B**	**88.57**	**5-12**	☐

Discuss any soil limitations and how the E&S Plan was designed to address those limitations.

See plan sheet 5 for the soil limitations information.

If Hydric soils are present, is a wetland determination attached to this module? ☒ Yes ☐ No ☐ N/A

If soils are known to be contaminated, 1) identify the pollutants exceeding Act 2 standards in the space provided below, 2) identify the extent of soil contamination on an E&S Plan Drawing that is attached to this module, and 3) describe the methods that will be used to avoid or minimize disturbance of the contaminated soils in the space provided below.

n/a

3. Describe the characteristics of the earth disturbance activity, including the past, present and proposed land uses and the proposed alteration to the project site.

The proposed improvements primarily involve the conversion of two (2) grass athletic fields to synthetic turf fields, construction of a paved parking lot in an existing gravel parking area, as well as additional access improvements, concession building, and a comprehensive stormwater management system

4. Describe the volume and rate of runoff from the project site and its upstream watershed area.

The project site consists primarily of grass athletic fields, with some existing gravel parking and a small portion of agricultural area. Runoff from the site generally flows to the southeast (DP001/EBCC) or southwest (DP002/UNT to EBCC) prior to entering the receiving surface waters.

Discharge point 001 (DP001) is considered to be a point in a roadside swale that receives surface runoff from the eastern portion of the project site. The calculated change in runoff for the 2-yr/24-hr storm from pre- to post-

development is approximately 10,516 CF, which is being fully mitigated by the proposed infiltration facilities. Peak flow rates for the 2-yr/24-hr storm is being reduced from 2.38 cfs to 1.27 CFS from pre- to post-developmetn as a result of the implementation of the proposed PCSM BMP's.

DP002 is considered to be a point in a natural drainageway upgradient of the headwaters of the reciving Unnamed Tributary to East Branch Chester Creek. The calculated change in runoff for the 2-yr/24-hr storm from pre- to post-development is approximately 49,535 CF, which is being fully mitigated by the proposed infiltration facilities. Peak flow rates for the 2-yr/24-hr storm is being reduced from 5.02 cfs to 2.51 CFS from pre- to post-developmetn as a result of the implementation of the proposed PCSM BMP's.

For complete information regarding the rate and volume of stormater from the project area refer to the Post Construction Stormwater Management Report.

5. Check boxes to indicate all BMPs that will be installed or implemented, identify plan numbers for the BMPs, and describe any deviations from the E&S Manual.

E&S BMPs	Plan No(s). Identified	Plan No(s). for O&M	Deviation(s) from E&S Manual
☒ Rock Construction Entrance	**18, 19, 32**	**32**	
☐ Rock Construction Entrance with Wash Rack			
☐ Rumble Pad			
☐ Wheel Wash			
☐ Temporary and Permanent Access Roads			
☐ Waterbar			
☐ Broad-based Dip			
☐ Open-top Culvert			
☐ Water Deflector			
☐ Roadside Ditch			
☐ Ditch Relief Culvert			
☐ Turnout			
☐ Compost Sock Sediment Trap			
☐ Temporary Stream Crossing			
☐ Temporary Wetland Crossing			
☐ Turbidity Barrier (Silt Curtain)			
☐ Dewatering Work Areas			
☒ Pumped Water Filter Bag	**33**	**33**	
☐ Sump Pit			
☐ Waste Management			
☒ Concrete Washout	**18, 32**	**32**	
☒ Compost Filter Sock	**18, 19, 33**	**33**	
☐ Compost Filter Berm			
☐ Weighted Sediment Filter Tube			
☒ Rock Filter Outlet	**33**	**33**	**Modified for use w/ compost filter sock**
☐ Silt Fence (Filter Fabric Fence)			
☐ Reinforced Silt Fence			
☐ Super Silt Fence (Super Filter Fabric Fence)			

E&S BMPs	Plan No(s). Identified	Plan No(s). for O&M	Deviation(s) from E&S Manual
☐ Sediment Filter Log (Fiber Log)			
☐ Wood Chip Filter Berm			
☐ Straw Bale Barrier			
☐ Rock Filter			
☐ Vegetative Filter Strip			
☐ Inlet Filter Bag			
☐ Stone Inlet Protection			
☐ Runoff Conveyance (Channel)			
☐ Bench			
☐ Top-of-Slope Berm			
☐ Temporary Slope Pipe			
☒ Sediment Basin	**18, 19, 34**	**34**	
☒ Sediment Trap	**18, 34**	**34**	
☒ Riprap Apron	**18, 19, 37**	**37**	
☐ Flow Transition Mat			
☐ Stilling Basin (Plunge Pool)			
☐ Stilling Well			
☐ Energy Dissipater			
☐ Drop Structure			
☐ Earthen Level Spreader			
☐ Structural Level Spreader			
☐ Surface Roughening			
☒ Vegetative Stabilization	**35**	**4 & 5**	
☒ Erosion Control Blanket	**18, 19, 32**	**4 & 5**	
☐ Soil Binders			
☐ Sodding			
☐ Cellular Confinement Systems			
☐ Alternative:			
☐ Alternative:			

Table 1 – For PAG-01 applicants, complete the requested information for each selected E&S BMP, where applicable.

Site Access BMPs									
BMP Name	**No.**	**Length (ft)**	**Width (ft)**	**% Slope**	**Spacing (ft)**	**Length of Upslope Drainage (ft)**	**Culvert Diameter (in)**	**Soil Type in Ditch**	**E&S Manual Figure/Detail No.**
Rock Construction Entrance (RCE)									
RCE with Wash Rack									
Temporary and Permanent Access Roads – Crowned Roadway									
Temporary and Permanent Access Roads – Insloped Roadway									
Waterbar									
Broad-based Dip									
Open-top Culvert									
Water Deflector									
Roadside Ditch									
Ditch Relief Culvert									

Sediment Barriers / Filters								
BMP Name	**DA (ac)**	**Diameter (in)**	**Storage Capacity (cf)**	**Trap Height (in)**	**% Slope**	**Slope Length Above Barrier (ft)**	**Barrier Height (in)**	**E&S Manual Figure/Detail No.**
Compost Sock Sediment Trap								
Compost Filter Sock								
Compost Filter Berm								
Silt Fence (Filter Fabric Fence)								
Super Silt Fence								
Sediment Filter Log								
Weighted Sediment Filter Tube								
Straw Bale Barrier								
Wood Chip Filter Berm								
Toe-of-Slope Berm								

Table 1 – For PAG-01 applicants, complete the requested information for each selected E&S BMP, where applicable.

Runoff Conveyance BMPs													
BMP Name	**Temporary**	**Design Storm**	**DA (ac)**	**Multiplier**	**Qr (cfs)**	**Q (cfs)**	**Manning's n**	**Va (fps)**	**V (fps)**	**D (ft)**	**d (ft)**	**Flow Depth Ratio**	**E&S Manual Figure/Detail No.**
Vegetated Channel	☐												
Sodded Channel	☐												
Riprap Channel	☐												

Energy Reduction BMPs								
BMP Name	**Downstream Distance to Drainage Course (ft)**	**Downstream % Slope**	**DA (ac)**	**Discharge (cfs)**	**Manhole Depth (ft)**	**Inflow Pipe Diameter (in)**	**Outlet Pipe Diameter (in)**	**E&S Manual Figure/Detail No.**
Level Spreader								
Drop Structure								

Stilling Basins / Wells								
BMP Name	**Pipe Diameter (in)**	**Discharge (cfs)**	**Well Diameter (in)**	**Depth of Well Below Invert (ft)**	**Basin Depth (ft)**	**Median Riprap Size (in)**	**Distance from Discharge Pipe to Basin Center (ft)**	**E&S Manual Figure/Detail No.**
Stilling Basin								
Stilling Well								

Other BMPs												
BMP Name	**DA (ac)**	**Pipe Diameter (in)**	**Berm Height (in)**	**Length (ft)**	**% Slope**	**Vertical Spacing (ft)**	**Channel Depth (ft)**	**Riprap Size**	**Riprap Thickness (in)**	**Initial Width (ft)**	**Terminal Width (ft)**	**E&S Manual Figure/Detail No.**
Temporary Slope Pipe												
Bench												
Rock Filter												
Riprap Apron												

For selected BMPs not identified in Table 1, report the name of the BMP and the Figure or Detail No. from the E&S Manual that will be used for design and implementation (PAG-01 only).

BMP Name	E&S Manual Figure/Detail No.	BMP Name	E&S Manual Figure/Detail No.

6. ☒ All applicable Standard E&S Worksheets from Appendix B of the E&S Manual have been completed and are attached.

7. ☐ Other worksheets or calculations equivalent to Appendix B of the E&S Manual have been completed and are attached.

8. Identify the E&S Plan Drawing number(s) that describes the sequence of BMP installation and removal in relation to the scheduling of earth disturbance activities, prior to, during and after earth disturbance activities that ensure the proper functioning of all BMPs.

   Plan sheet 5

9. ☐ Supporting E&S calculations have been completed and are available upon request (PAG-01 only).

10. ☒ Supporting E&S calculations are attached to the NOI/application.

11. ☐ Plan drawings consist of standard Figures/Construction Details in E&S Manual (PAG-01 only).

12. ☒ Plan drawings have been developed for the project and are attached to the NOI/application.

13. ☒ BMPs will be inspected on a weekly basis and after measurable storm events (i.e., at least 0.25 inch).

14. Identify the following information relating to temporary stabilization measures on an E&S Plan Drawing and identify the Drawing No. below: 1) vegetative species, 2) % pure live seed, 3) seed application rate, 4) fertilizer type, 5) fertilizer application rate, 6) mulch type, 7) mulching rate, and 8) liming rate.

    E&S Plan Drawing No(s).: **35**

15. Identify the following information relating to permanent stabilization measures on an E&S Plan Drawing and identify the Drawing No. below: 1) vegetative species, 2) % pure live seed, 3) seed application rate, 4) fertilizer type, 5) fertilizer application rate, 6) mulch type, 7) mulching rate, 8) liming rate, 9) anchor material, 10) anchoring method, 11) rate of anchor material application, 12) topsoil placement depth, and 13) seeding season dates.

    E&S Plan Drawing No(s).: **35**

16. Describe the procedures that will be taken to ensure that recycling or disposal of materials associated with or from the project site will be conducted properly.

    See plan sheet 4

17. Identify the presence of any naturally occurring geologic formations or soil conditions that may have the potential to cause pollution during earth disturbance activities. If such formations or conditions exist, identify BMPs that will be implemented to avoid or minimize potential pollution.

    See plan sheet 5

18. Identify whether the potential exists for thermal impacts to surface waters from the earth disturbance activity. If such potential exists, identify BMPs that will be implemented to avoid, minimize, or mitigate potential thermal impacts.

    See plan sheet 5

19. ☒ The E&S Plan has been planned, designed, and will be implemented to be consistent with the PCSM Plan.

20. If applicable, identify existing and proposed riparian forest buffers on E&S and PCSM Plan Drawings and identify the Drawing No(s) below (select N/A if not applicable).

E&S Plan Drawing No(s): ☒ N/A

PCSM Plan Drawing No(s):

E&S PLAN DEVELOPER

☒ I am trained and experienced in E&S control methods. ☒ I am a licensed professional.

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City, State, ZIP:	**Lititz, PA 17543**	License No.:	**PE086960**
License Type:	**Professional Engineer**	Exp. Date:	**09/30/2023**

E&S Plan Developer Signature

9/19/2023

Date

APPENDIX A
EROSION & SEDIMENT
CONTROL NARRATIVE

EROSION & SEDIMENT CONTROL NARRATIVE

Site Description

The project site is located near the center of the Westtown School campus, just south of Oak Lane. The existing site is largely comprised of existing grass athletic fields which are bordered to the north by a partially forested area and the school's academic centers; to the east by a baseball field and residential area; the south by agricultural fields (i.e. row crops) and a partially forested riparian area; and to the west by the school's working farm and agricultural area.

During the past 50 years, the site's primary use has been agricultural (i.e. row crops). The site is currently utilized primarily for athletic fields, with row crops along the southeastern portion of the project site. The site has been utilized as such for at least the past five years, with no significant improvements being constructed during that time.

The Westtown School is proposing to improve upon the existing athletic facilities on campus by constructing two new synthetic turf multipurpose fields, along with reconfiguring the remaining area to maximize field space. Additional components of the project involve the construction of a field house, parking lot, improved pedestrian access and a comprehensive stormwater management system.

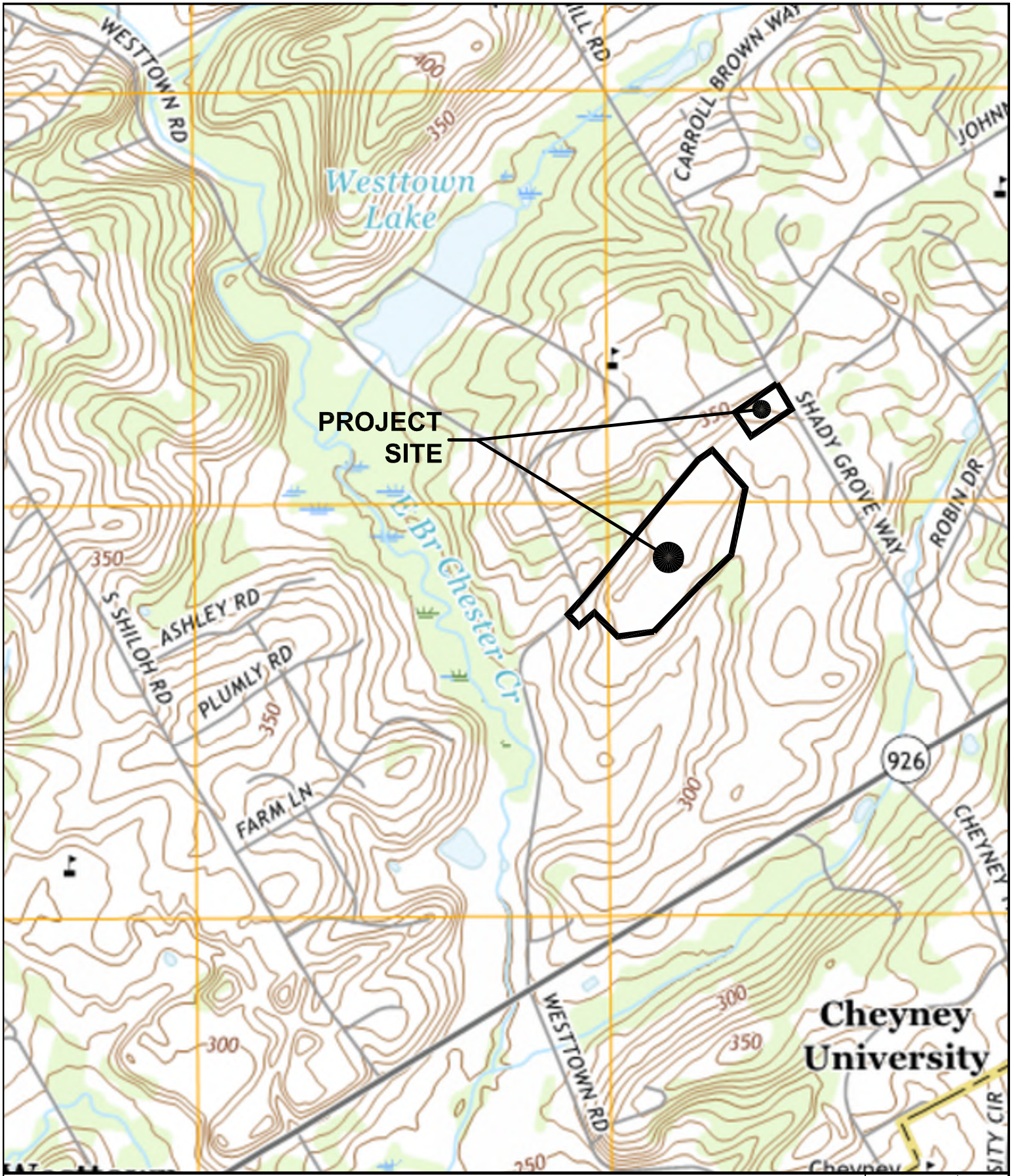
102.4(b)(5)(vi) Narrative description of perimeter and onsite BMPs

In order to prevent and control sediment pollution resulting from the proposed earthwork operations several onsite BMPs are being proposed. These BMPs include multiple rock construction entrances, compost filter sock, silt fence, erosion control matting/slope stabilization, a sediment trap, and a sediment basin.

Based on the topography of the site, along with the intentional sequencing of earthmoving activities, the proposed BMPs are adequate to protect the receiving watercourse and offsite locations from sediment or other pollution produced during construction.

APPENDIX B

REFERENCE MATERIAL
AND
SUPPORTING DOCUMENTS

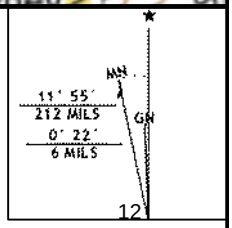


USGS 7.5 MINUTE

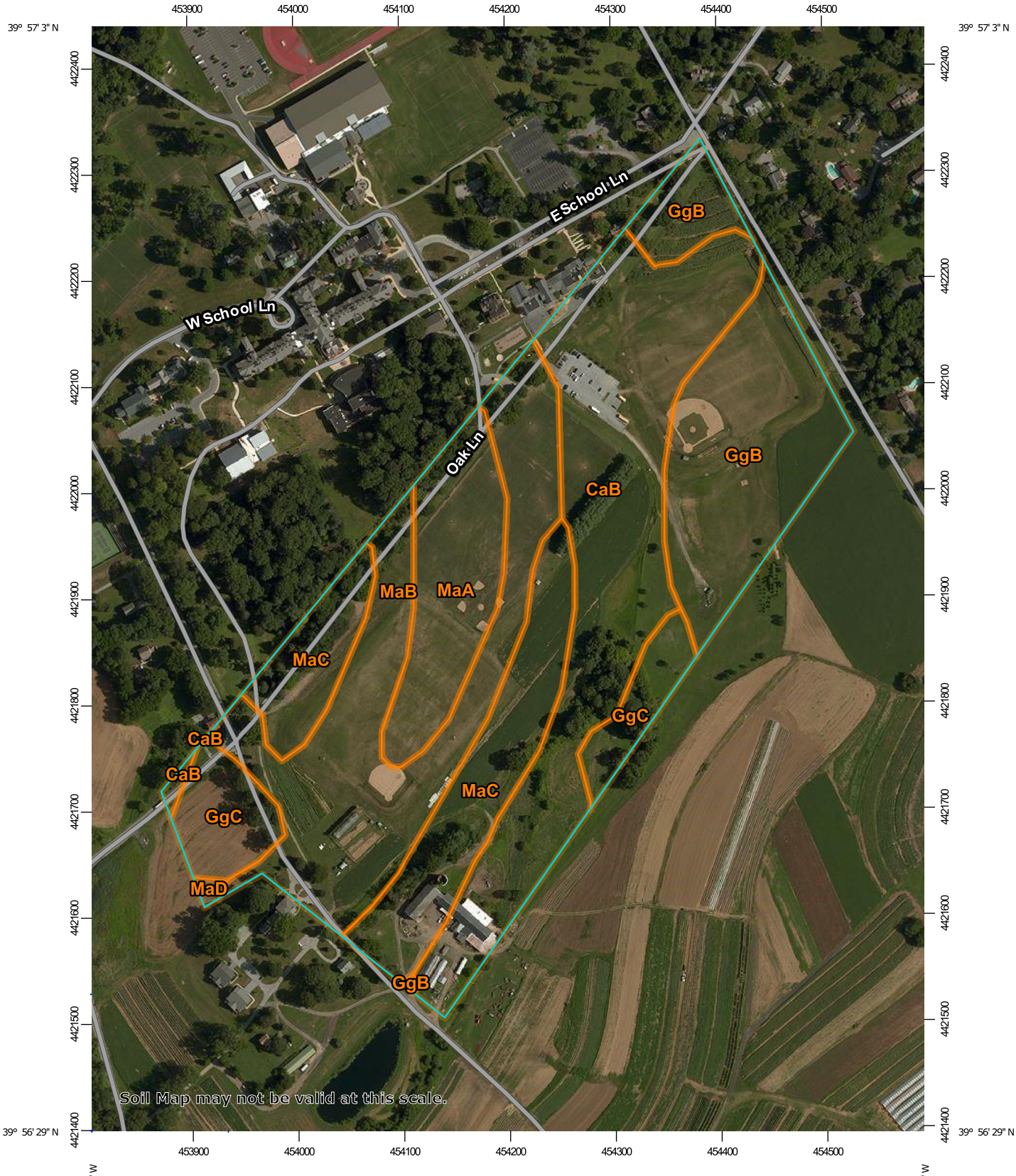
WEST CHESTER, PA QUADRANGLE

SCALE IN FEET: 1" = 1000

1:1 500 1000 2000 3000



Soil Map



Map Scale: 1:5,070 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CaB	Califon loam, 3 to 8 percent slopes	16.5	28.4%
GgB	Glenelg silt loam, 3 to 8 percent slopes	10.4	17.9%
GgC	Glenelg silt loam, 8 to 15 percent slopes	4.0	6.9%
MaA	Manor loam, 0 to 3 percent slopes	5.5	9.4%
MaB	Manor loam, 3 to 8 percent slopes	12.9	22.2%
MaC	Manor loam, 8 to 15 percent slopes	8.7	15.0%
MaD	Manor loam, 15 to 25 percent slopes	0.1	0.2%
Totals for Area of Interest		**58.1**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit

Job Number: 1091-001
Date: 10/25/2018

SOILS INFORMATION FACT SHEET

SOIL						SUITABILITY				SOIL CONDITIONS FOR CONSTRUCTION			
SYMBOL NAME	TEXTURE	SLOPE, %	HYDRO. SOIL GROUP	HYDRIC (INCLUSIONS)	ERODIBILITY (K)	DEPTH OF WATER TABLE (IN)	DEPTH TO BEDROCK (IN)	WINTER GRADING	FROST ACTION	SURFACE WATER MANAGEMENT	BUILDING SITE	ROADFILL	TOPSOIL
CaB Califon	Loam	3 to 8	D		0.32	6 to 36	72 to 99	Limited	High	Somewhat Limited	Very Limited	Fair	Fair
GgB Glenelg	Silt Loam	3 to 8	B		0.37	80+	80+	Somewhat Limited	Moderate	Very Limited	Somewhat Limited	Fair	Fair
GgC Glenelg	Silt Loam	8 to 15	B		0.37	80+	80+	Somewhat Limited	Moderate	Very Limited	Very Limited	Fair	Fair
MaA Manor	Loam	0 to 3	B		0.28	80+	72 to 99	Somewhat Limited	Moderate	Not Limited	Somewhat Limited	Poor	Fair
MaB Manor	Loam	3 to 8	B		0.28	80+	72 to 99	Somewhat Limited	Moderate	Very Limited	Somewhat Limited	Poor	Fair
MaC Manor	Loam	8 to 15	B		0.28	80+	59 to 100	Somewhat Limited	Moderate	Very Limited	Very Limited	Poor	Poor

Job Number: 1091-001
Date: 10/25/2018

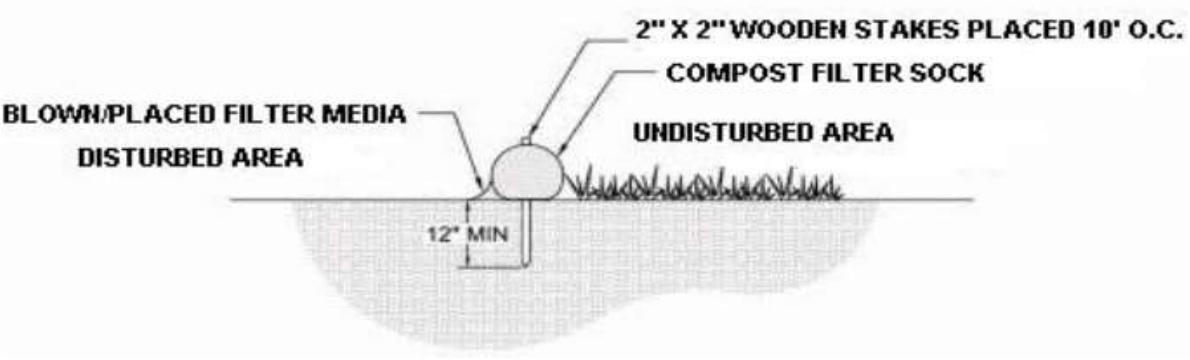
SOIL LIMITATIONS & RESOLUTIONS

SOIL	LIMITATIONS		CHARACTERISTICS	RESOLUTIONS	COMMENTS
CaB GgB GgC MaA MaB MaC	Cutbanks Cave	Excavations	The walls of excavations tend to cave in or slough	It is imperative that appropriate precautions be taken to safeguard workers during all trenching and excavation operations.	All applicable OSHA standards and regulations must be implemented at all times.
CaB (C/S) GgB (C) GgC (C) MaA (C) MaB (C) MaC (C)	Corrosive to Concrete/ Steel	Foundation and other infrastructural materials that may contact the soil	Weakening or dissolution of concrete or uncoated steel caused by soil-induced electrochemical or chemical action.	Suitable precautions should be taken to protect all underground pipes, conduits, and storage tanks from concrete and steel corrosion. If potential corrosive properties are encountered during construction, impacted utilities in that area shall be backfilled with processed aggregate to reduce the potential of corrosion from soil	Refer to the Geotechnical Report
GgB GgC MaA MaB MaC	Erodibility	Grassed Waterways Terraces Slopes Stabilization Landscaping	Easily Erodible Rill and/or Gully Erosion	Excavation should occur during low-rainfall periods when possible Minimize duration of earth disturbance Immediately stabilize with erosion control matting, mulch, or sod. Avoid concentrating runoff in disturbed areas	See Erosion and Sediment Control Plan
CaB	Depth to Saturated Zone/ Seasonal High Water Table	Buildings w/ basements Excavations Stormwater Facilities	High table Wetness Soil mottling	Suitable precautions should be taken if water is Contractor is to utilize pumping techniques and other methods as recommended by a Geotechnical Engineer.	Contact Geotechnical Engineer if shallow groundwater is encountered
CaB GgB GgC MaA MaB MaC	Frost Action	Winter Grading	Frost heaving or upward swelling of soil during freezing conditons.	Do not grade, fill, or backfill during periods of freezing temperatures. Proper precautions should be taken to prevent damage, especially to roadways.	
GgB GgC	Hydric/ Hydric Inclusions	unless authorized by DEP and/or ACOE if wetlands present	Wetlands Wetness	Delineate and Protect Wetlands Obtain all permits/authorizations Utilize pumping techniques where appropriate	See wetland delineation repot
CaB GgB GgC MaA MaB MaC	Low Strength/ Landslide Prone	Steep Slopes Structural Fill	Low strength soils are prone failure on steep slopes.	Precautions should be taken to prevent slope failures due to improper construction practices such as over-steepening and overloading of slopes, removal of lateral support, and failure to prevent saturation of slopes. Setbacks should comply with the standards contained in Chapter 16 unless it can be shown that proposed cuts and fills do not pose a hazard to public safety or to surface Road fill/other structural fill material will likely need to be imported in areas where soils have low strength.	See geotechnical engineering report or consult the geotechnical professional on record
CaB GgB GgC MaA MaB MaC	Slow Percolation	Stormwater Infiltration On-lot Sewage Facilities	Wetness Soil mottling Shallow groundwater	Soil testing should be performed if infiltration BMPs or on-lot sewage facilities are proposed. Ammend soils with compost and/or sand.	See geotechnical engineering report or consult the geotechnical professional on record See Appendix A of the PA Stormwater BMP Manual
GgB GgC MaA MaB MaC	Piping		Formation of subsurface tunnels or pipelike cavities by water moving through the soil	Avoid concentrating runoff. Avoid infiltrating in areas with excessive infiltration rates. Install trench plugs, anti-seep collars, key trenches, etc.	See plans See geotechnical engineering report or consult the geotechnical professional on record
GgB GgC MaA MaB MaC	Poor Source of Topsoil	Vegetative Growth/ Stabilization	Low Fertility Droughty or Wet High Acidity	Soil Testsing and appropriate supplementation. Soil amendment/restoration practices	See plan notes
CaB GgB GgC	Wetness	Site work/grading Fill operations	Slow percolation Soil Mottling Shallow groundwater	Concrete stabilization Undercut and replace with suitable material Provide positive drainage	See geotechnical report or consult geotechnical engineer on record

APPENDIX C
PERIMETER
CONTROLS

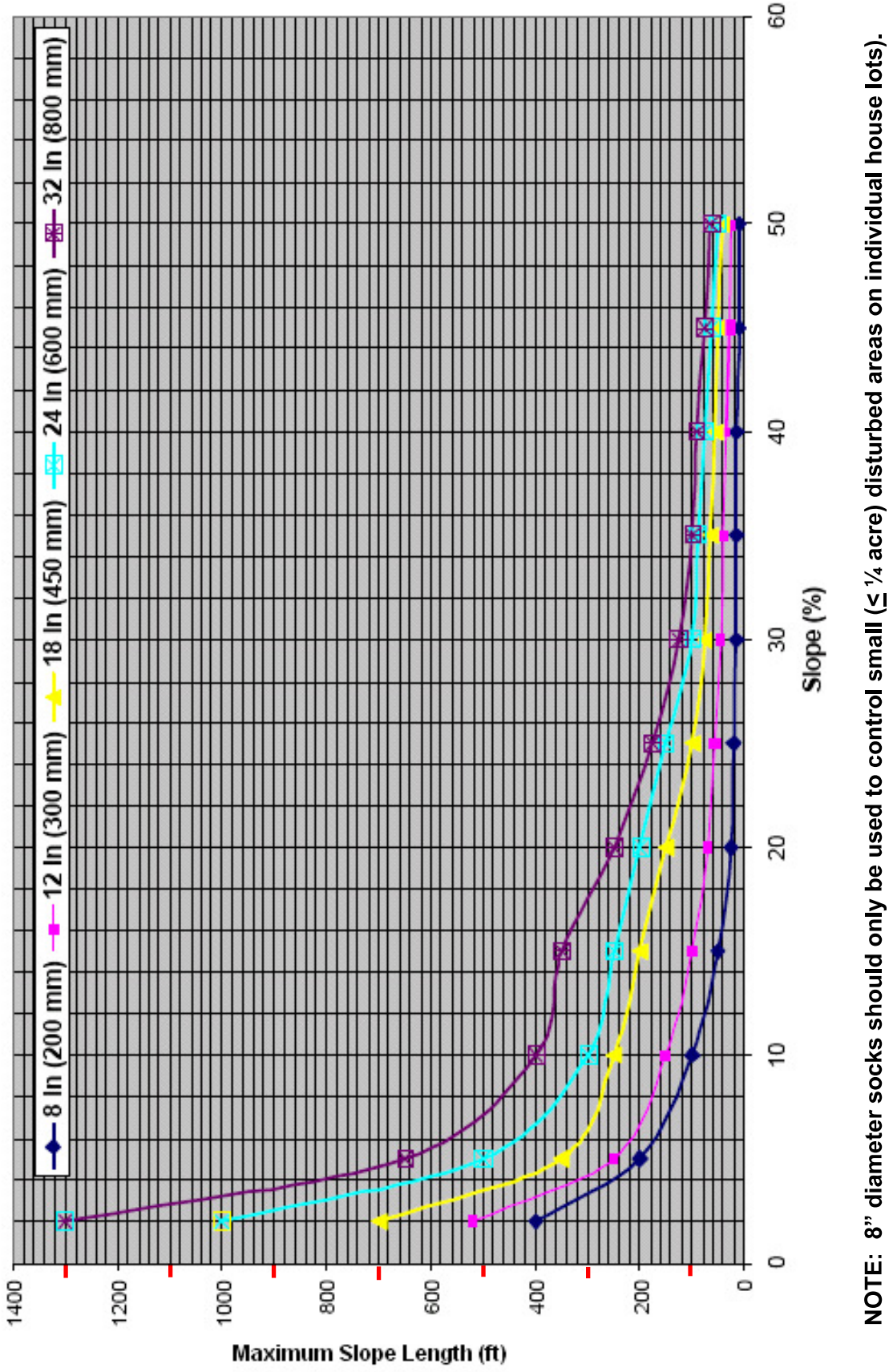
STANDARD E&S WORKSHEET #1
Compost Filter Socks

PROJECT:	The Westtown School - Oak Lane Project	JOB#	1091-001
LOCATION:	Westtown Township	DATE:	1/11/2023
COUNTY:	Chester	REVISED:	9/18/2023



BARRIER NO.	SOCK SIZE (IN.)	LOCATION	SLOPE %	SLOPE LENGTH ABOVE BARRIER (FT)
12-1	12	Below Sediment Trap 1	33	27
12-2	12	Below Sediment Trap 1	33	22
12-3	12	Below Sediment Trap 1	33	33
12-4	12	NW of Oak Lane	10	12
18-1	18	NE of RCE #1	5,23	159,64
18-2	18	NE of CFS 18-1	9, 21	53, 71
18-3	18	NE of CFS 18-2	7,18,1.3	44,74,43
18-4	18	NE of CFS 18-3	7,12,25,1.3	42,58,24,43
18-5	18	NE of CFS 18-4	9	193
18-6	18	NE of CFS 18-5	3, 33	65, 45
18-7	18	NE of CF 18-6	33	31
18-8	18	Around Topsoil Stockpile	33	50
24-1	24	Below Sediment Basin 4	5,15,1.5	122,52,375
24-2	24	Below Sediment Basin 4	5,10,1.5	145,77,375
24-3	24	Below Sediment Basin 4	7,1.2	253,375
24-4	24	SW of CFS 24-3	13,8,1.5	55,165,407
24-5	24	SW of CFS 24-4	12,1.5	102,380
24-6	24	SW of CFS 24-5	7,1.5	165,335

FIGURE 4.2
MAXIMUM PERMISSIBLE SLOPE LENGTH ABOVE COMPOST FILTER SOCKS



NOTE: 8" diameter socks should only be used to control small (≤ ¼ acre) disturbed areas on individual house lots).

Adapted from Filtrexx

APPEND D
SEDIMENT TRAP
DESIGN

STANDARD E&S WORKSHEET # 14
Sediment Basin/Sediment Trap Storage Data

PROJECT: The Westtown School - Oak Lane Project
LOCATION: Westtown Township
COUNTY: Chester
CHECKED BY:

JOB #: 1091-001
DATE: 1/11/2023
REVISED: 9/19/2023

SEDIMENT TRAP #1

WATER SURFACE ELEVATION (FEET)	AREA (SQ.FT.)	AVERAGE AREA (SQ.FT.)	Δ ELEV. (FEET)	STORAGE VOLUME INCR.	Σ (CU.FT.)	(AC.FT.)
288.5	10675				0	0
		11087	0.50	5,543		
289	11498				5,543	0.1273
		11927	0.50	5,964		
289.5	12356				11,507	0.2642
		12784	0.50	6,392		
290	13211				17,899	0.4109
		14118	1.00	14,118		
291	15025				32,017	0.735
		15977	1.00	15,977		
292	16928				47,993	1.1018
		18020	1.00	18,020		
293	19112				66,013	1.5154

EROSION AND SEDIMENT POLLUTION CONTROL

STANDARD WORK SHEET # 17
SEDIMENT BASIN DISCHARGE CAPACITY

PROJECT: The Westtown School - Oak Lane Project
LOCATION: Westtown Township
COUNTY: Chester

JOB # 1091-001
DATE: 1/12/2023
REVISED: 9/19/2023

SEDIMENT TRAP A

PRINCIPAL SPILLWAY DISCHARGE CAPACITY

WATER SURFACE ELEVATION	Flow Into Top of TEMPORARY RISER HEAD ft.	TEMPORARY RISER ORIFICE FLOW Q (cfs)[1]	TEMPORARY RISER WEIR FLOW Q (cfs)	Flow Into Top of PERMANENT RISER HEAD ft.	PERMANENT RISER ORIFICE FLOW Q (cfs)[1]	PERMANENT RISER WEIR FLOW Q (cfs)[1]	BARREL PIPE FLOW HEAD[2] ft.	BARREL PIPE FLOW Q (cfs)	PRINCIPAL SPILLWAY CAPACITY[3] (cfs)	EMERGENCY SPILLWAY WEIR FLOW Q (cfs) ****	TOTAL FLOW Q (cfs) ****
290.75							5.75	21.8			
290.85	0.10	0.3	0.2				5.85	22.0	0.2		0.15
290.95	0.20	0.4	0.4				5.95	22.1	0.4		0.42
291.05	0.30	0.5	0.8	0.05	8.12	0.39	6.05	22.3	0.9		0.91
291.15	0.40	0.6	1.2	0.15	14.06	2.03	6.15	22.5	2.6		2.63
291.25	0.50	0.7	1.7	0.25	18.15	4.37	6.25	22.7	5.0		5.04
291.35	0.60	0.7	2.3	0.35	21.48	7.24	6.35	22.9	8.0	2.66	10.63
291.45	0.70	0.8	2.9	0.45	24.35	10.55	6.45	23.1	11.3	7.51	18.85
291.55	0.80	0.8	3.5	0.55	26.92	14.26	6.55	23.2	15.1	13.8	28.91
291.65	0.90	0.9	4.2	0.65	29.27	18.32	6.65	23.4	19.2	21.25	40.47
291.75	1.00	0.9	4.9	0.75	31.44	22.71	6.75	23.6	23.7	29.7	53.35
291.85	1.10	1.0	5.6	0.85	33.47	27.40	6.85	23.8	24.7	39.04	63.78
291.95	1.20	1.0	6.4	0.95	35.39	32.38	6.95	23.9	25.0	49.2	74.15
292.05	1.30	1.1	7.2	1.05	37.20	37.62	7.05	24.1	25.2	60.11	85.28
292.15	1.40	1.1	8.1	1.15	38.93	43.12	7.15	24.3	25.4	71.72	97.11
292.25	1.50	1.2	8.9	1.25	40.59	48.87	7.25	24.4	25.6	84	109.59
292.35	1.60	1.2	9.9	1.35	42.18	54.84	7.35	24.6	25.8	96.91	122.70
292.45	1.70	1.2	10.8	1.45	43.72	61.05	7.45	24.8	26.0	110.42	136.42
292.55	1.80	1.3	11.8	1.55	45.20	67.47	7.55	24.9	26.2	124.51	150.71
292.65	1.90	1.3	12.7	1.65	46.63	74.11	7.65	25.1	26.4	139.15	165.55
292.75	2.00	1.3	13.8	1.75	48.03	80.95	7.75	25.3	26.6	154.32	180.91
292.85	2.10	1.4	14.8	1.85	49.38	87.98	7.85	25.4	26.8	170	196.80
292.95	2.20	1.4	15.9	1.95	50.70	95.21	7.95	25.6	27.0	186.19	213.18
293.05	2.30	1.4	17.0	2.05	51.98	102.63	8.05	25.8	27.2	202.86	230.04
293.15	2.40	1.5	18.1	2.15	53.23	110.23	8.15	25.9	27.4	219.99	247.36
293.25	2.50	1.5	19.2	2.25	54.46	118.01	8.25	26.1	27.6	237.59	265.14
293.35	2.60	1.5	20.4	2.35	55.65	125.96	8.35	26.2	27.7	255.63	283.37
293.45	2.70	1.6	21.6	2.45	56.83	134.09	8.45	26.4	27.9	274.1	302.03

* Flow into top of riser only (Flow through perforations not included)
** Water surface elevation minus elevation at centerline of pipe outlet
*** Least of orifice, weir or pipe flow

PARAMETERS

ORIFICE FLOW Q=CA(2gH)^1/2
TOP OF RISER: 290.75
CO1= 0.6

EMERGENCY SPILLWAY
Q=CLH^3/2
ELEVATION: 291.25
TOP OF BERM: 293.00

PIPE FLOW
Q=a[(2gH)/(1+Km+KpL)]^1/2
Kp=(5087*N^2)/D^4/3
INVERT OUT= 284.25
PIPE LENGTH (Lb) = 28.5

BROAD-CRESTED WEIR[6]: C= 2.8
WIDTH[5]: 30
STEP INCREMENT: 0.1

PIPE SIZE (IN) : 18
SLOPE: 0.0053 ft/ft

WEIR FLOW Q=CLH^3/2
RISER DIAMETER (IN)= 6
C= 3.1

SIDE SLOPES: 8

MANNING'S N= 0.012
Kp= 0.0155
Km= 1

PERMANENT RISER PARAMETERS

ORIFICE FLOW Q=CA(2gH)^1/2
TOP OF OSC: 291.00
CO1= 0.6

WEIR FLOW Q=CLH^3/2
RISER LENGTH (FT)= 3.77
RISER WIDTH 2
C= 3.33

1. Flow into top of riser only (Flow through perforations not included)
2. Water surface elevation minus elevation at centerline of pipe outlet.
3. Least of orifice, weir or pipe flow (Peak flow from 10 yr/24 hr storm Min.)
4. 24" below top of embankment (12" if 100-yr storm routed through basin)
5. 8 Ft minimum
6. Use Tables 7.5 through 7.8 or equation for broad-crested weir [$Q=CLH^{1.5}$, where $C \leq 2.8$ (MAX)]; for Riprap larger than R-3 or flows less than 1.5' deep adjust C downward]
7. Principal Spillway Capacity + Emergency Spillway Capacity

EROSION AND SEDIMENT POLLUTION CONTROL

STANDARD E&S WORKSHEET #19
Sediment Trap Design Data

PROJECT:	The Westtown School - Oak Lane Project	JOB #	1091-001
LOCATION:	Westtown Township	DATE:	1/12/23
COUNTY:	Chester	REVISED:	9/19/2023
CHECKED BY:			

TRAP NUMBER		ST #1			
DRAINAGE AREA (5 ACRES MAX)	(AC)	4.98			
REQUIRED CAPACITY (2000 CF/AC)	(CF)	9,960			
CAPACITY PROVIDED AT ELEVATION h	(CF)	28,488			
SOIL TYPES IN DRAINAGE AREA		Silt Loam			
REQUIRED SURFACE AREA (5,300 X AC)[1]	(SF)	-	-		
*AVERAGE BOTTOM LENGTH	(FT)	165			
*AVERAGE BOTTOM WIDTH	(FT)	43			
*AVERAGE TRAP LENGTH AT ELEVATION h	(FT)	165			
*AVERAGE TRAP WIDTH AT ELEVATION h	(FT)	49			
SURFACE AREA AT ELEVATION h	(SF)	14571			
BOTTOM ELEVATION	(FT)	288.80			
CLEAN-OUT ELEVATION (@700 CF/AC)[2]	(FT)	289.50			
TOP OF EMBANKMENT ELEVATION[3]	(FT)	293.00			
EMBANKMENT HEIGHT	(FT)	4.20			
CREST OF SPILLWAY ELEVATION, h[4]	(FT)	290.75			
FLOW LENGTH AT ELEVATION h	(FT)	125			
FLOW LENGTH/WIDTH RATIO AT ELEV. h[5]	(2:1 MIN)	2.6 :1			

1. If sandy clays, silty clays, silty clay loams, clay loams, or clays predominate soil types.
2. Minimum 12" above bottom of trap
3. Minimum 12" above elevation at which 1.5 cfs/acre discharge capacity is provided.
4. Minimum 24" above bottom of trap.
5. 4:1 Flow Length:Width ratio required for HQ and EV watersheds.

RISER PIPE SPILLWAYS

Dr (RISER DIAMETER, 8"MIN.)	(IN)	6" Perf. Riser + Permanent 2'x4' Conc. OCS			
Db (BARREL DIAMETER, 6" MIN.)	(IN)	18			
SPILLWAY CAPACITY WITH 12" FREEBOARD	(CFS)	8.4			
BARREL OUTLET ELEVATION	(FT)	284.25			
MAX. WATER SURFACE ELEVATION (@1.5 CFS/AC DISCHARGE)	(FT)	291.35			

APPENDIX E
SEDIMENT BASIN
DESIGN

STANDARD E&S WORKSHEET # 12

Sediment Basin Capacity Requirements

PROJECT:	The Westtown School - Oak Lane Project	JOB #	1091-001
LOCATION:	Westtown Township	DATE:	1/11/2023
COUNTY:	Chester	REVISED:	9/19/2023
CHECKED BY:			

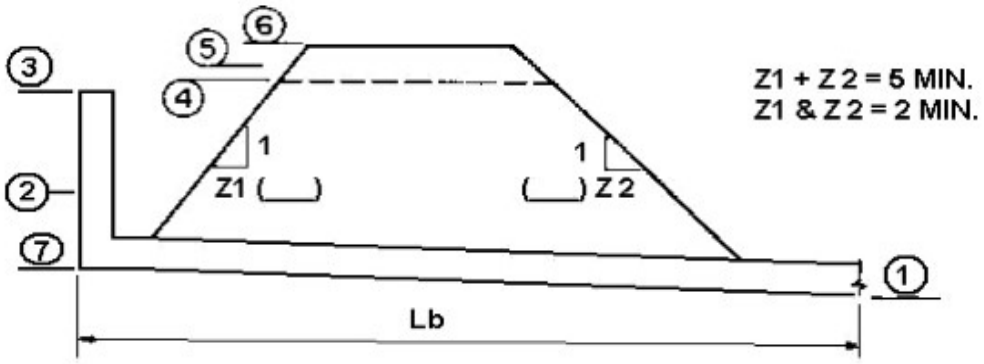
BASIN NUMBER		#4	
PERMANENT OR TEMPORARY BASIN?	(P or T)	P	
SPECIAL PROTECTION WATERSHED?	(YES OR NO)	NO	
KARST SOILS?	(YES OR NO)	NO	
(A) MAXIMUM TOTAL DRAINAGE AREA (AC)	(AC)	9.74	
IS DRAINAGE AREA (A) MORE THAN 10% LARGER THAN THE			
PRECONSTRUCTION CONDITION?	(YES OR NO)	YES	
(A_1) DISTURBED ACRES IN DRAINAGE AREA	(AC)	7.24	
(I) INITIAL REQUIRED SETTLING VOLUME (5000 X A)	(CF)	48,700	
(T) REDUCTION FOR TOP DEWATERING (-700 X A)	(CF)	6,818	
(P) REDUCTION FOR PERMANENT POOL (-700 X A)	(CF)		
(L) REDUCTION FOR 4:1 FLOW LENGTH:WIDTH (-350 X A)	(CF)		
(D) REDUCTION FOR 4 TO 7 DAY DEWATERING (-350 X A)	(CF)		
(Sv) REQUIRED DEWATERING ZONE [I - (T+P+L+D)] [1]	(CF)	41,882	
(Sd) REQUIRED SEDIMENT STORAGE VOLUME (1000 X A_1)	(CF)	7,240	
(St) TOTAL REQUIRED STORAGE VOLUME (Sv+Sd)	(CF)	49,122	
SEDIMENT STORAGE VOLUME PROVIDED (@ ELEV 2)	(CF)	22,536	
TOTAL STORAGE VOLUME PROVIDED (@ ELEV 3)[2]	(CF)	68,686	
DEWATERING TIME FOR DEWATERING ZONE	(DAYS)	3.06	
REQUIRED DISCHARGE CAPACITY (2 X A)	(CFS)[3]	19.48	
PRINCIPAL SPILLWAY TYPE (PERFORATED RISER, SKIMMER, etc.)		Type 'M' w/ Extension	
PEAK FLOW FROM 10YR/24HR STORM FOR DRAINAGE AREA (A)	(CFS)	14.9	
PRINCIPAL SPILLWAY CAPACITY (@ ELEV 5)	(CFS)[4]	0.52 (see routing)	
EMERGENCY SPILLWAY CAPACITY (@ ELEV 5)	(CFS)[4]	n/a	
TOTAL BASIN DISCHARGE CAPACITY (@ ELEV 5)	(CFS)	0.52 (see routing)	
EMERGENCY SPILLWAY PROTECTIVE LINING[5]		Flexamat	
OUTLET TO A SURFACE WATER?	(YES OR NO)[6]	NO	
PEAK FLOW FROM A 100 YR/24 HR STORM FOR DRAINAGE AREA (A)	(CFS)	36.71	

1 The minimum dewatering zone capacity for sediment basins is (3,600 X A). No reduction is permitted in Special Protection (HQ and EV) Watersheds.
2 Total Storage Volume provided at riser crest.
3 Or provide calculations to show peak flow from 25 yr./24 hr. storm for area (A) is routed through the basin.
4 Provide supporting computations.
5 If grass lining is proposed, spillway should be constructed in original ground unless a suitable TRM lining is used. Wherever a TRM is used, riprap should be placed at the bottom of the embankment to prevent scour.
6 If no, and basin is permanent or drainage area is more than 10% larger than pre-construction, provide supporting calculations to show accelerated erosion will not result from the proposed discharge. For discharges increasing volume or rate of flow onto a neighboring property prior to entering a surface water, an easement should be obtained prior to plan submittal.

STANDARD E&S WORKSHEET #13
Sediment Basin Dimensions and Elevations

PROJECT: The Westtown School - Oak Lane Project
LOCATION: Westtown Township
COUNTY: Chester
CHECKED BY:

JOB # 1091-001
DATE: 1/11/2023
REVISED: 9/19/2023



BASIN NUMBER		#4	
1. DISCHARGE PIPE ELEVATION	(FT)	307.25	
2. ELEVATION AT TOP OF SEDIMENT STORAGE ZONE (@Sd) (MIN. 1.0' ABOVE ELEVATION 7)	(FT)	311.00	
3. ELEVATION AT TOP OF DEWATERING ZONE (St) (CREST OF PRINCIPAL SPILLWAY)	(FT)	312.50	
4. EMERGENCY SPILLWAY CREST ELEVATION (MIN. 0.5' ABOVE ELEVATION 3)	(FT)	313.00	
5. 2 CFS/ACRE OR **25-YR/24-HR** FLOW ELEVATION	(FT)	312.55	
6. TOP OF EMBANKMENT ELEVATION (MIN. 24" ABOVE ELEVATION 5 OR 12" WITH ROUTED 100-YR/24-HR STORM)	(FT)	315.00	
7. BASIN BOTTOM ELEVATION	(FT)	310.00	
AVERAGE BOTTOM WIDTH	(FT)	40	
AVERAGE BOTTOM LENGTH	(FT)	400	
(SAmin) REQUIRED SURFACE AREA AT ELEVATION 2	(SF)	1,858	
SURFACE AREA PROVIDED AT ELEVATION 2	(SF)	25,262	
AVERAGE BASIN WIDTH (W) AT ELEVATION 3	(FT)	55	
FLOW LENGTH (L) AT ELEVATION 3	(FT)	516	
FLOW LENGTH:WIDTH RATIO AT ELEVATION 3	(L:W)	9.4 :1	
SILT CURTAIN OR FOREBAY? (IF YES INDICATE WHICH)		NO	
EMBANKMENT TOP WIDTH	(FT, 8' MIN)	8	
EMBANKMENT SOIL TYPE(S)		SILT/ LOAM	
KEY TRENCH DEPTH	(FT, 2' MIN)	2'	
KEY TRENCH WIDTH	(FT, 4' MIN)	4'	
RISER DIAMETER/TYPE	(15" MIN)	2'X4' CONC	
BARREL DIAMETER/TYPE	(12" MIN)	24" SLCPP	
Lb (BARREL LENGTH)	(FT)	37'	
EMERGENCY SPILLWAY WIDTH	(FT)	50	
EMERGENCY SPILLWAY SIDE SLOPES	(H:V)	8 :1	
EMERGENCY SPILLWAY DEPTH	(FT)	1.5'	

STANDARD E&S WORKSHEET # 14
Sediment Basin/Sediment Trap Storage Data

PROJECT: The Westtown School - Oak Lane Project
LOCATION: Westtown Township
COUNTY: Chester
CHECKED BY:

JOB #: 1091-001
DATE: 1/11/2023
REVISED: 9/19/2023

SEDIMENT BASIN #4

WATER SURFACE ELEVATION (FEET)	AREA (SQ.FT.)	AVERAGE AREA (SQ.FT.)	Δ ELEV. (FEET)	STORAGE VOLUME INCR.	Σ (CU.FT.)	(AC.FT.)
310	19809				0	0
		22536	1.00	22,536		
311	25262				22,536	0.5173
		28447	1.00	28,447		
312	31631				50,982	1.1704
		35407	1.00	35,407		
313	39183				86,389	1.9832
		42922	1.00	42,922		
314	46661				129,311	2.9686
		48071	0.50	24,036		
314.5	49481				153,347	3.5204
		50870	0.50	25,435		
315	52258				178,781	4.1043

STANDARD WORK SHEET # 17
SEDIMENT BASIN DISCHARGE CAPACITY

PROJECT: The Westtown School - Oak Lane Project
LOCATION: Westtown Township
COUNTY: Chester

JOB # 1091-001
DATE: 10/29/2022
REVISED: 9/19/2023

SEDIMENT BASIN 4

PRINCIPAL SPILLWAY DISCHARGE CAPACITY

WATER SURFACE ELEVATION	Flow Into Top of TEMPORARY RISER			Flow Into Top of PERMANENT RISER			BARREL PIPE FLOW		PRINCIPAL SPILLWAY CAPACITY[3] (cfs)	EMERGENCY SPILLWAY WEIR FLOW Q (cfs) ****	TOTAL FLOW Q (cfs) ****
	HEAD ft.	ORIFICE FLOW Q (cfs)[1]	WEIR FLOW Q (cfs)	HEAD ft.	ORIFICE FLOW Q (cfs)[1]	WEIR FLOW Q (cfs)[1]	HEAD[2] ft.	Q (cfs)			
312.50							4.25	33.6			
312.60	0.10			0.10	11.48	1.11	4.35	34.0	1.1		1.11
312.70	0.20			0.20	16.24	3.13	4.45	34.4	3.1		3.13
312.80	0.30			0.30	19.89	5.75	4.55	34.8	5.7		5.75
312.90	0.4			0.40	22.96	8.85	4.65	35.2	8.8		8.85
313.00	0.5			0.50	25.67	12.36	4.75	35.5	12.4		12.36
313.10	0.6			0.60	28.12	16.25	4.85	35.9	16.3	3.54	19.79
313.20	0.7			0.70	30.37	20.48	4.95	36.3	20.5	10.02	30.50
313.30	0.8			0.80	32.47	25.02	5.05	36.6	25.02	18.40	43.42
313.40	0.9			0.90	34.44	29.85	5.15	37.0	29.9	28.33	58.18
313.50	1.0			1.00	36.30	34.97	5.25	37.4	35.0	39.6	74.57
313.60	1.1			1.10	38.08	40.34	5.35	37.7	37.7	52.05	89.76
313.70	1.2			1.20	39.77	45.96	5.45	38.1	38.1	65.59	103.65
313.80	1.3			1.30	41.39	51.83	5.55	38.4	38.4	80.14	118.55
313.90	1.4			1.40	42.96	57.92	5.65	38.8	38.8	95.63	134.38
314.00	1.5			1.50	44.46	64.23	5.75	39.1	39.1	112	151.09
314.10	1.6			1.60	45.92	70.76	5.85	39.4	39.4	129.21	168.64
314.20	1.7			1.70	47.34	77.50	5.95	39.8	39.8	147.23	187.00
314.30	1.8			1.80	48.71	84.44	6.05	40.1	40.1	166.01	206.11
314.40	1.9			1.90	50.04	91.57	6.15	40.4	40.4	185.53	225.96
314.50	2.0			2.00	51.34	98.90	6.25	40.8	40.8	205.76	246.52
314.60	2.1			2.10	52.61	106.41	6.35	41.1	41.1	226.67	267.75
314.70	2.2			2.20	53.85	114.10	6.45	41.4	41.4	248.25	289.65
314.80	2.3			2.30	55.06	121.96	6.55	41.7	41.7	270.47	312.19
314.90	2.4			2.40	56.24	130.00	6.65	42.0	42.0	293.32	335.36
315.00	2.5			2.50	57.40	138.21	6.75	42.4	42.4	316.78	359.13
315.10	2.6			2.60	58.54	146.59	6.85	42.7	42.7	340.84	383.51
315.20	2.7			2.70	59.66	155.12	6.95	43.0	43.0	365.47	408.45

* Flow into top of riser only (Flow through perforations not included)
** Water surface elevation minus elevation at centerline of pipe outlet
*** Least of orifice, weir or pipe flow

PARAMETERS - TEMPORARY RISER

ORIFICE FLOW $Q=CA(2gH)^{1/2}$
TOP OF RISER:
CO1= 0.6

WEIR FLOW $Q=CLH^{3/2}$
RISER LENGTH (FT)=
C= 3.1

EMERGENCY SPILLWAY
$Q=CLH^{3/2}$
ELEVATION: 313.00
TOP OF BERM: 315.00
BROAD-CRESTED WEIR[6]: C= 2.8
WIDTH[5]: 40
STEP INCREMENT: 0.1
SIDE SLOPES: 8

PIPE FLOW
$Q=a[(2gH)/(1+Km+KpL)]^{1/2}$
$Kp=(5087*N^2)/D^{4/3}$
INVERT OUT= 307.25
PIPE LENGTH (Lb) = 37
PIPE SIZE (IN) : 24
SLOPE: 0.0067 ft/ft
MANNING'S N= 0.012
Kp= 0.0106
Km= 1

1. Flow into top of riser only (Flow through perforations not included)
2. Water surface elevation minus elevation at centerline of pipe outlet.
3. Least of orifice, weir or pipe flow (Peak flow from 10 yr/24 hr storm Min.)
4. 24" below top of embankment (12" if 100-yr storm routed through basin)
5. 8 Ft minimum
6. Use Tables 7.5 through 7.8 or equation for broad-crested weir [$Q=CLH^{1.5}$, where C $\leq$ 2.8 (MAX)]; for Riprap larger than R-3 or flows less than 1.5' deep adjust C downward]
7. Principal Spillway Capacity + Emergency Spillway Capacity

PARAMETERS - PERMANENT RISER

ORIFICE FLOW $Q=CA(2gH)^{1/2}$
TOP OF OSC: 312.50
CO1= 0.6

WEIR FLOW $Q=CLH^{3/2}$
RISER LENGTH (FT)= 3.77
RISER WIDTH 2
C= 3.33

ELA SPORT
ATHLETIC FACILITIES
DESIGN & CONSULTING

737 S. BROAD STREE
LITITZ, PA 17543
(717) 626-72713

NRCS (SCS) TR-55- WATERSHED WEIGHTED CURVE NUMBER FOR SEDIMENT TRAPS/BASINS

PROJECT: The Westtown School - Oak Lane Project
LOCATION: Westtown Township
COUNTY: Chester

	LAND USE	Parking, Other Impervious (Disturbed Area)	Parking, Other Impervious (Undisturbed Area)	Open Space (Disturbed Area)	Open Space (Undsturbed Area)	Open Space (Disturbed Area)	Open Space (Undsturbed Area)	Bare Soil			
	HSG	B	B	B	B	D	D	D			
	Slope	< 2%	< 2%	2-6%	>6%	< 2%	2-6%	2-6%			
	"CN" Value	98	98	61	61	80	80	94	Total Area (ac.)	Composite 'CN' Value	Tc Min.
WATERSHED		Area (ac)									
Basin B-1		0.36	0.00	6.01	1.94	0.87	0.56	0.00	9.74	65	22
B-1 Bare Earth		0.00	0.00	0.00	1.94	0.00	0.56	7.24	9.74	87	22

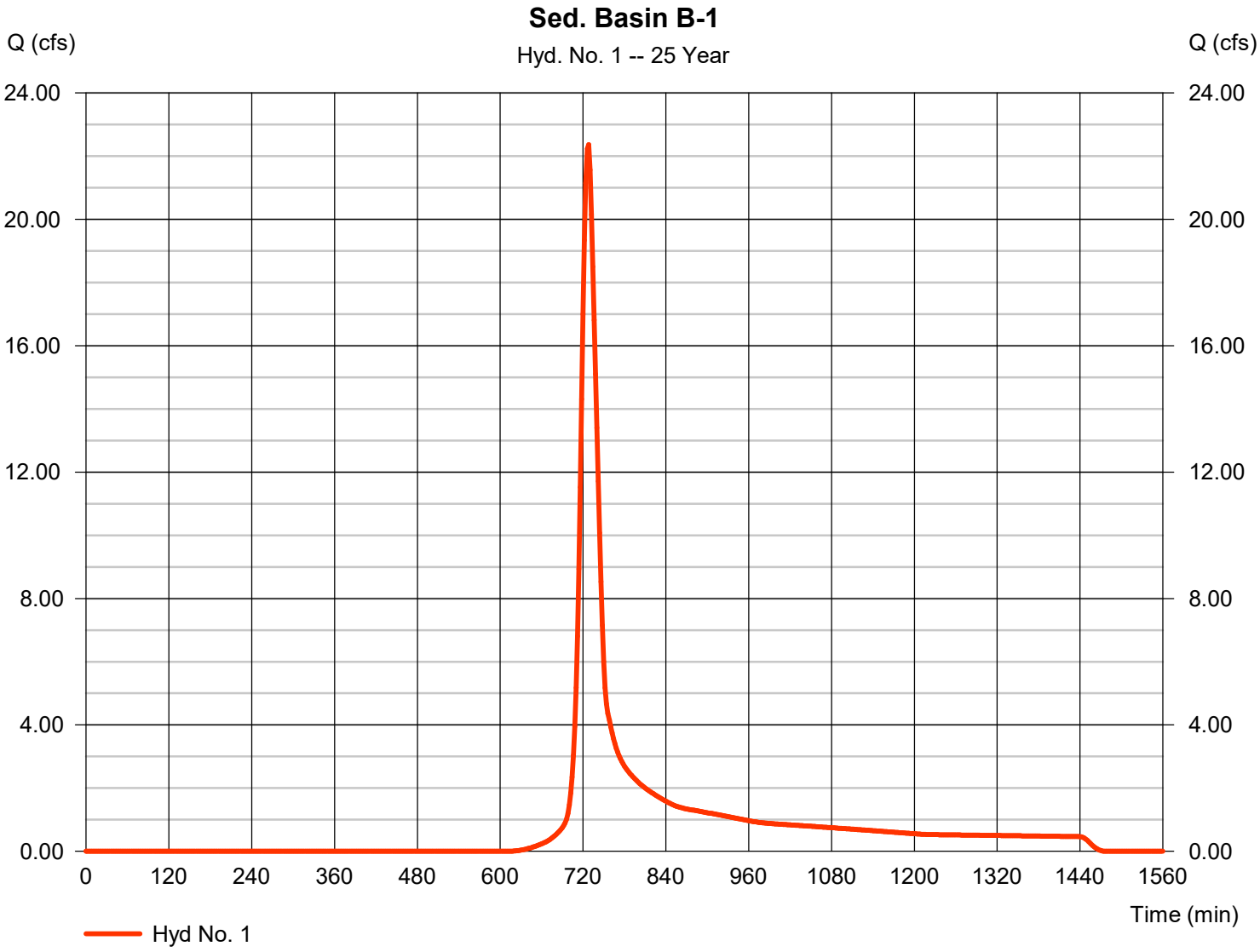
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Tuesday, 09 / 19 / 2023

Hyd. No. 1

Sed. Basin B-1

Hydrograph type	= SCS Runoff	Peak discharge	= 22.37 cfs
Storm frequency	= 25 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 79,682 cuft
Drainage area	= 9.740 ac	Curve number	= 65
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 22.00 min
Total precip.	= 5.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

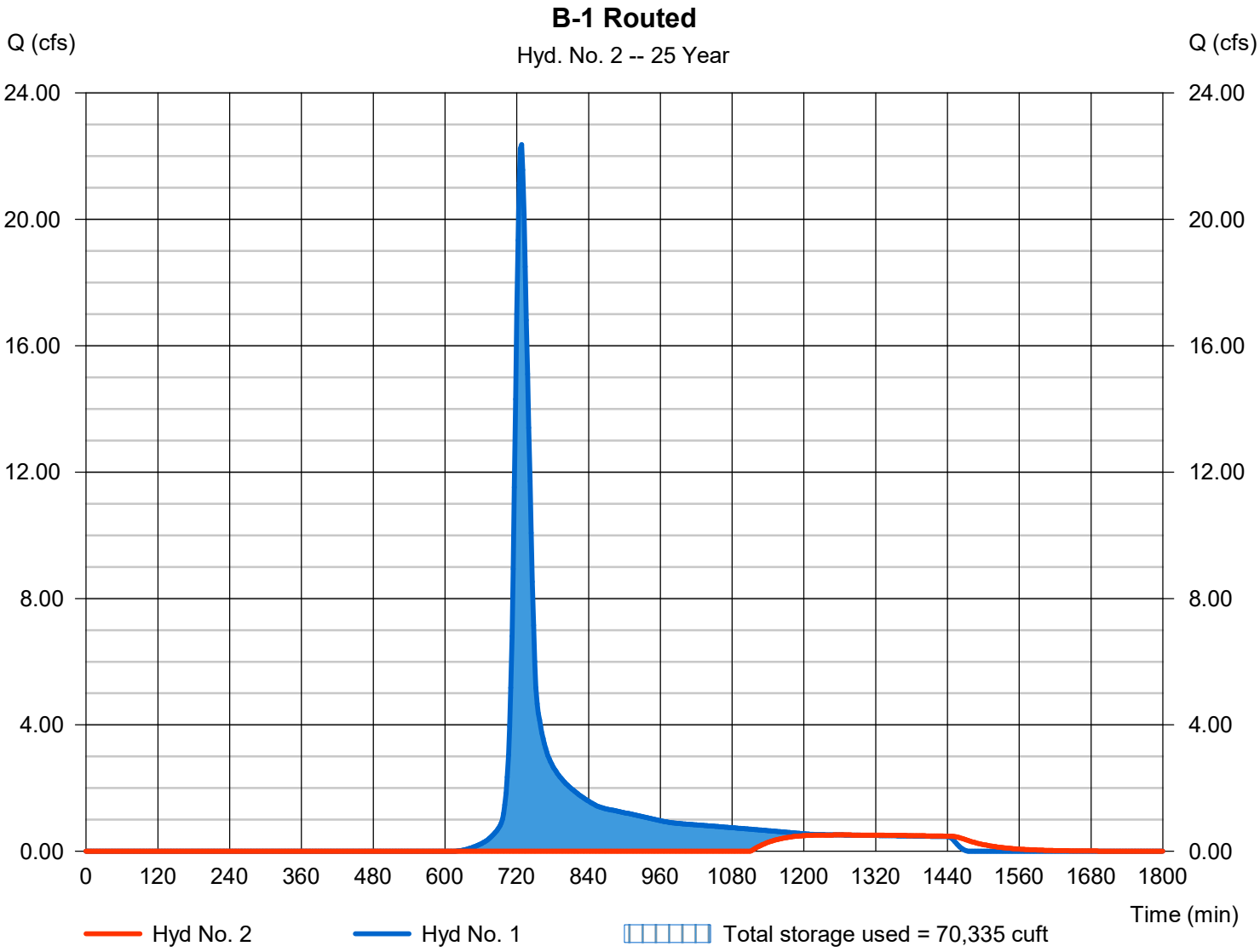
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Tuesday, 09 / 19 / 2023

Hyd. No. 2

B-1 Routed

Hydrograph type	=	Reservoir	Peak discharge	=	0.515 cfs
Storm frequency	=	25 yrs	Time to peak	=	1264 min
Time interval	=	2 min	Hyd. volume	=	10,993 cuft
Inflow hyd. No.	=	1 - Sed. Basin B-1	Max. Elevation	=	312.55 ft
Reservoir name	=	Sed. Basin 4	Max. Storage	=	70,335 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Tuesday, 09 / 19 / 2023

Pond No. 5 - Sed. Basin 4

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 310.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	310.00	19,809	0	0
1.00	311.00	25,262	22,536	22,536
2.00	312.00	31,631	28,447	50,982
3.00	313.00	39,183	35,407	86,389
4.00	314.00	46,661	42,922	129,311
4.50	314.50	49,481	24,036	153,347
5.00	315.00	52,258	25,435	178,781

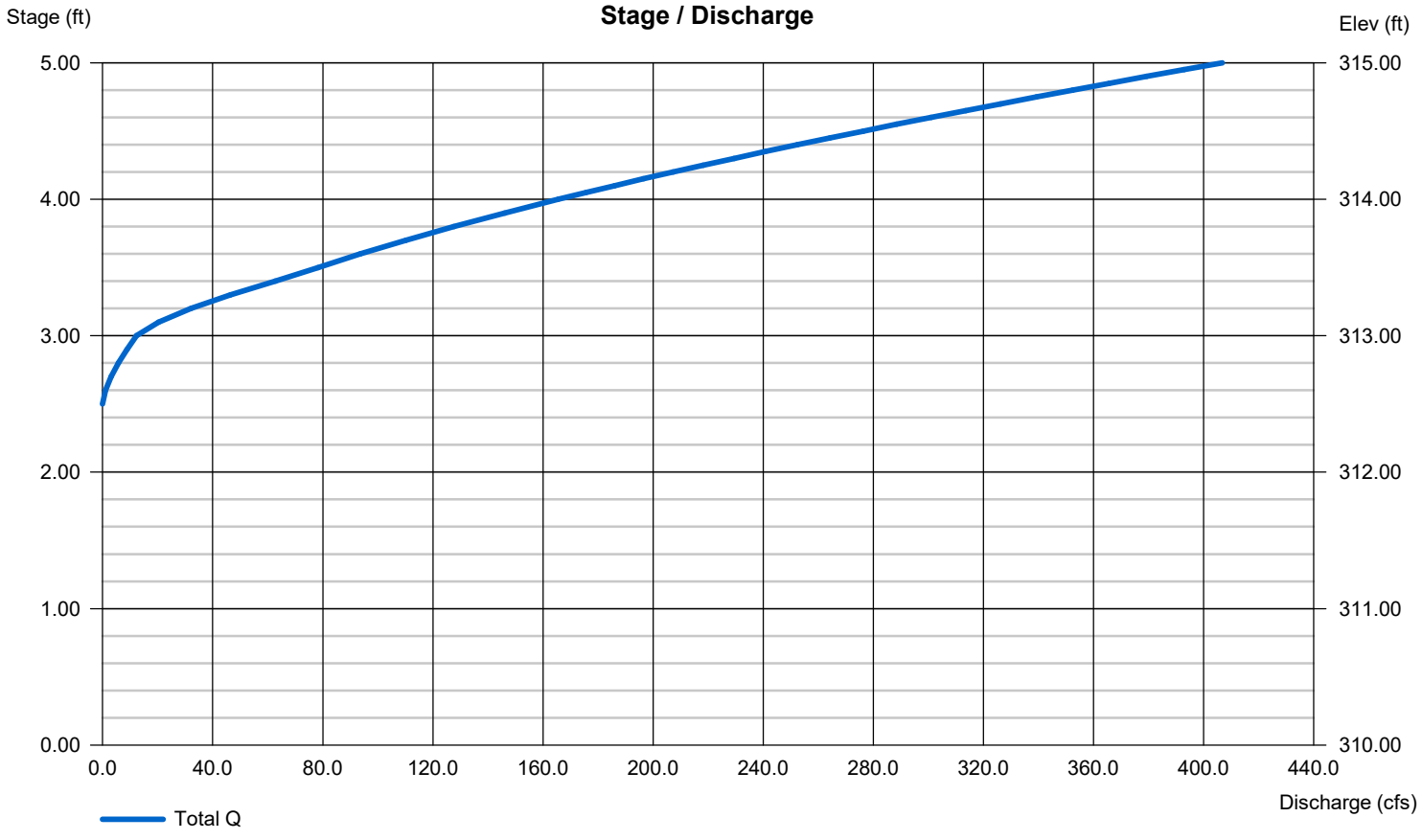
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 307.25	0.00	0.00	0.00
Length (ft)	= 36.00	0.00	0.00	0.00
Slope (%)	= 0.69	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.50	Inactive	50.00	0.00
Crest El. (ft)	= 312.50	311.00	313.00	0.00
Weir Coeff.	= 3.33	3.33	2.60	3.33
Weir Type	= 1	Rect	Broad	---
Multi-Stage	= Yes	Yes	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



SEDIMENT BASIN #4

FLOW CAPACITIES (IN CU. FT.) FOR THE *FAIRCLOTH SKIMMER®*

Skimmer size	1.5"	2"	2.5"	3"	4"	5"	6"	8"
24 hours	1,728	3,283	6,234	9,774	20,109	32,832	51,840	97,978
2 day	3,456	6,566	12,468	19,548	40,218	65,664	103,680	195,956
3 day	5,184	9,849	18,702	29,322	60,327	98,496	155,520	293,934
4 day	6,912	13,132	24,936	39,096	80,436	131,328	207,360	391,912
5 day	8,640	16,415	31,170	48,870	100,545	164,160	259,200	489,890
6 day	10,368	19,698	37,404	58,644	120,654	196,992	311,040	587,868
7 day	12,096	22,981	43,638	68,418	140,763	229,824	362,880	685,846

Important note: The orifice sizing chart in the Pennsylvania Erosion Control Manual DOES NOT APPLY to Faircloth Skimmer® surface drains. It will give the wrong size skimmer. Please use these instructions to choose the size skimmer required for the basin volume and the orifice size.

Dewatering Volume = 68,686 - 7,240 CF = 61,446 CF

Dewatering Time = $\frac{61,446 \text{ CF}}{20,109 \text{ CF/Day}}$ 3.06 Days

APPENDIX F
SPILLWAY/ANTI-SEEP
COLLAR DESIGN

BMP 1 EMERGENCY SPILLWAY

PROJECT:	The Westtown School - Oak Lane Project	JOB #	1091-001
LOCATION:	Westtown Township	DATE:	1/12/2023
COUNTY:	Chester	REVISED:	9/17/2023

Flow into basin for 100-year storm frequency:

Q = 29.58 cfs cfs (From Post-Development analysis)

Capacity of the Emergency Spillway:

Q = CLH^1.5

C = 2.8
L = 30 ft.
H = 1.00

Q = 84.00 cfs > 30 cfs cfs OK

Check actual depth and velocity:

Top of Berm Elevation = 293.00
Spillway Elevation = 291.25

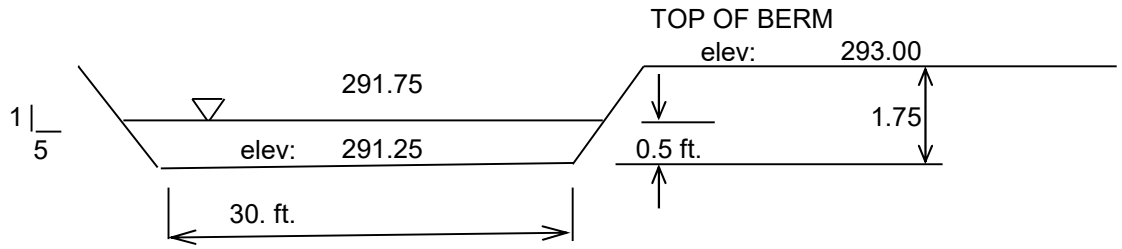
H = [Q/C*L]^2/3

= 0.5 ft. at elevation 291.75

Freeboard: 293.00 - 291.75 = 1.25 ft.

V = Q/A Side Slope (H:V) = 4.5

= 1.8 fps



N.T.S.

BMP 4 EMERGENCY SPILLWAY

PROJECT:	The Westtown School - Oak Lane Project	JOB #	1091-001
LOCATION:	Westtown Township	DATE:	1/12/2023
COUNTY:	Chester	REVISED:	9/17/2023

Flow into basin for 100-year storm frequency:

Q = 38.87 cfs cfs (From Post-Development analysis)

Capacity of the Emergency Spillway:

Q = CLH^1.5

C = 2.8
L = 40 ft.
H = 1.00

Q = 112.00 cfs > 39 cfs cfs OK

Check actual depth and velocity:

Top of Berm Elevation = 315.00
Spillway Elevation = 313.00

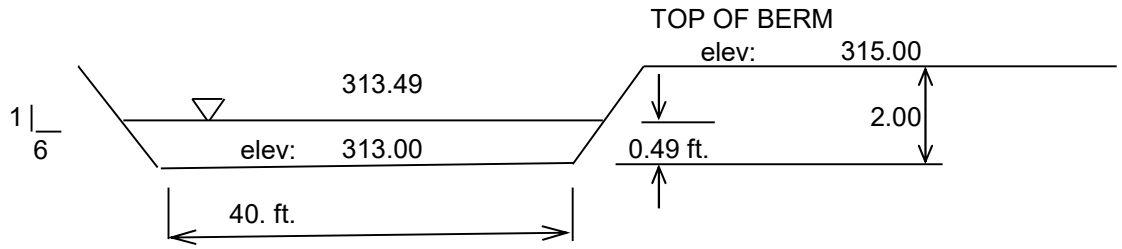
H = [Q/C*L]^2/3

= 0.49 ft. at elevation 313.49

Freeboard: 315.00 - 313.49 = 1.51 ft.

V = Q/A Side Slope (H:V) = 6

= 1.8 fps



N.T.S.

MODIFIED WORK SHEET # 11
SPILLWAY STABILITY CALCULATIONS

PROJECT:	The Westtown School - Oak Lane Project	JOB #	1091-001
LOCATION:	Westtown Township	Date	9/18/23
COUNTY:	Chester	Revised	

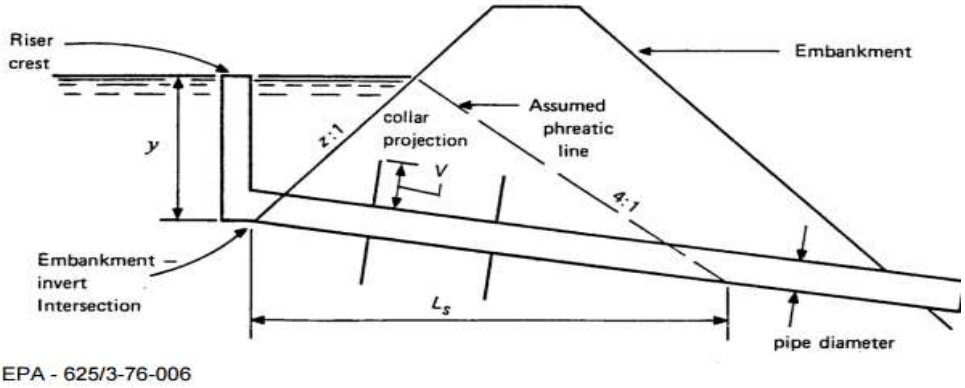
x	BASIN SPILLWAY ID		BMP 1	BMP 4		
	TEMPORARY OR PERMANENT?	(T OR P)	P	P		
	DESIGN STORM		100	100		
	Qr (REQUIRED CAPACITY)*	(CFS)	29.58	38.61		
	Q (CALCULATED AT FLOW DEPTH d)	(CFS)	29.59	38.62		
x	PROTECTIVE LINING[2]		Flexamat	Flexamat		
	n (MANNING'S COEFFICIENT)[2]		0.058	0.059		
	Va (ALLOWABLE VELOCITY)	(FPS)	19	19		
	V (CALCULATED AT FLOW DEPTH d)	(FPS)	4.05	4.69		
	ta (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	24.00	24.00		
	td (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	2.49	3.62		
	SPILLWAY BOTTOM WIDTH	(FT)	30.0	40.0		
	SIDE SLOPES	(H:V)	4.5:1	6:1		
	D (TOTAL DEPTH)	(FT)	1.75	2.00		
	d (CALCULATED FLOW DEPTH)	(FT)	0.24	0.20		
x	d_{50} STONE SIZE (IN)	(IN)	N/A	N/A		
x	A (CROSS-SECTIONAL AREA)	(SQ. FT.)	7.30	8.23		
x	R (HYDRAULIC RADIUS)		0.24	0.20		
x	S (BED SLOPE)[3]	(FT/FT)	0.167	0.286		
x	FREEBOARD PROVIDED	(FT)	1.51	1.80		
x	DESIGN METHOD FOR PROTECTIVE LINING **** PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		S	S		

ANTI-SEEP COLLAR DESIGN

Infiltration BMP 1/Sediment Trap 1

PA DEP

FIGURE 7.6
Anti-seep Collar Design



EPA - 625/3-76-006

1. Determine length of pipe in saturated zone (Ls)

$$L_s = y(z+4)\left[1+\frac{S}{(0.25-S)}\right]$$

y =	6.25
z =	3
s=	0.005

Where y = Distance from upstream invert of spillway riser to top of dewatering volume (ft)
z = Horizontal component of upstream embankment slope (ft)
S = Pipe slope ft/ft

L_s = 44.64 ft

2. Determine the required increase in flow path

L_F= 1.15*L_s = 51.34 ft

3. The minimum collar projection (V) is equal to 1/2 the increase in flow length (for one collary). If more than one collar is used, it is the increase divided by twice the number of collars

Number of collars: 2

Vmin = 1.67 ft

4. The maximum spacing between collars should be 14 x V or Ls ÷ (number of collars minus 1)

Minimum spacing should be 5 X V

V = 1.67 ft

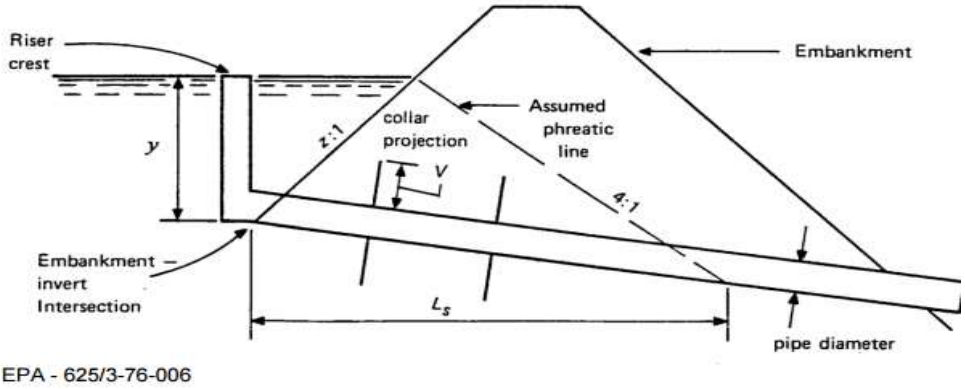
Max = 22 ft
Min = 8.4 ft

ANTI-SEEP COLLAR DESIGN

Infiltration BMP 4/Sediment Basin 4

PA DEP

FIGURE 7.6
Anti-seep Collar Design



EPA - 625/3-76-006

1. Determine length of pipe in saturated zone (Ls)

$$L_s = y(z+4)\left[1+\frac{S}{(0.25-S)}\right]$$

y =	3.75
z =	3
s=	0.0069

Where y = Distance from upstream invert of spillway riser to top of dewatering volume (ft)
z = Horizontal component of upstream embankment slope (ft)
S = Pipe slope ft/ft

L_s = 27.00 ft

2. Determine the required increase in flow path

$L_F = 1.15 * L_s$ = 31.04 ft

3. The minimum collar projection (V) is equal to 1/2 the increase in flow length (for one collary). If more than one collar is used, it is the increase divided by twice the number of collars

Number of collars: 1

Vmin = 2.00 ft

4. The maximum spacing between collars should be 14 x V or Ls ÷ (number of collars minus 1)

Minimum spacing should be 5 X V

V = 1 ft

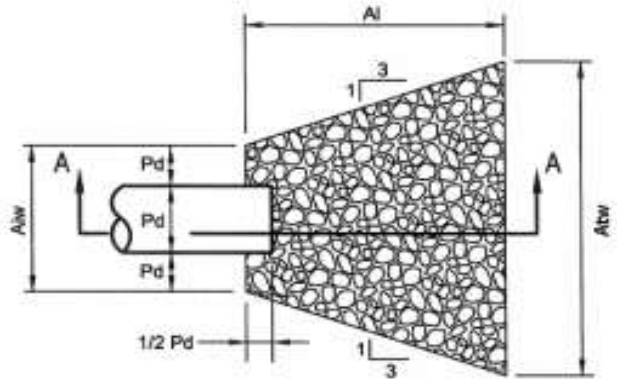
Max = 14 ft
Min = 5 ft

APPENDIX G

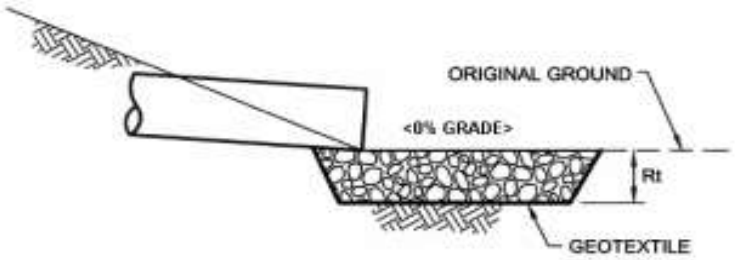
RIP-RAP
DESIGN

STANDARD E&S WORKSHEET #20
Riprap Apron Outlet Protection

PROJECT:	The Westtown School - Oak Lane Project	JOB #	1091-001
LOCATION:	Westtown Township	DATE:	1/16/2023
COUNTY:	Chester	REVISED:	9/19/2023
CHECKED BY:			



PLAN VIEW

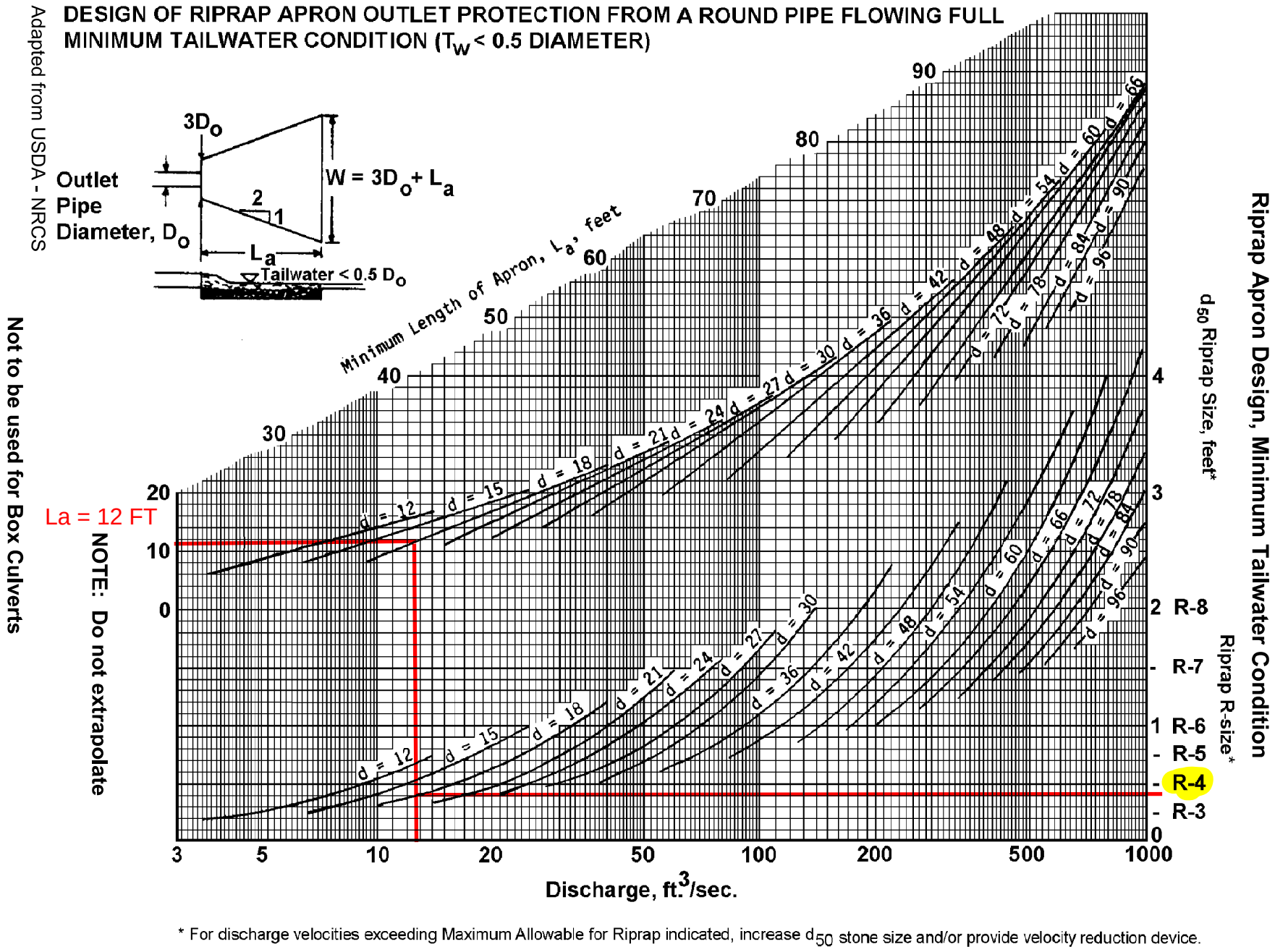


SECTION A - A

NO.	PIPE DIA. Do (in.)	TAIL WATER COND. (Max or Min.)	MAN. "n" FOR PIPE	PIPE SLOPE (%)	Q (CFS)	V* (FPS)	RIPRAP SIZE	Rt (in)	Al (ft)	Aiw (ft)	Atw (ft)
EW-A1	18	Min.	0.012	0.50	11.5	6.49	R-4	18	12	4.50	16.50
EW-A2	18	Min.	0.012	1.00	12.0	6.83	R-4	18	12	4.50	16.50
EW-B1	24	Min.	0.012	0.67	23.7	7.56	R-4	18	14	6.00	20.00
EW-B2	15	Min.	0.012	0.51	4.51	3.73	R-3	9	9	3.75	12.75

*The anticipated velocity (V) should not exceed the maximum permissible shown in Table 6.6 for the proposed riprap protection. Adjust for less than full pipe flow. SEE TABLE 9, March 2000 E&S PROGAM MANUAL. Use Manning's equation to calculate velocity for pipe slopes > 0.05 ft/ft.velocity for pipe slopes > 0.05 ft/ft.
** Based on sediment basin flow through principle spillway
*** See attached Hydraflow Storm Sewers

EW-A1



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition

EW-A2

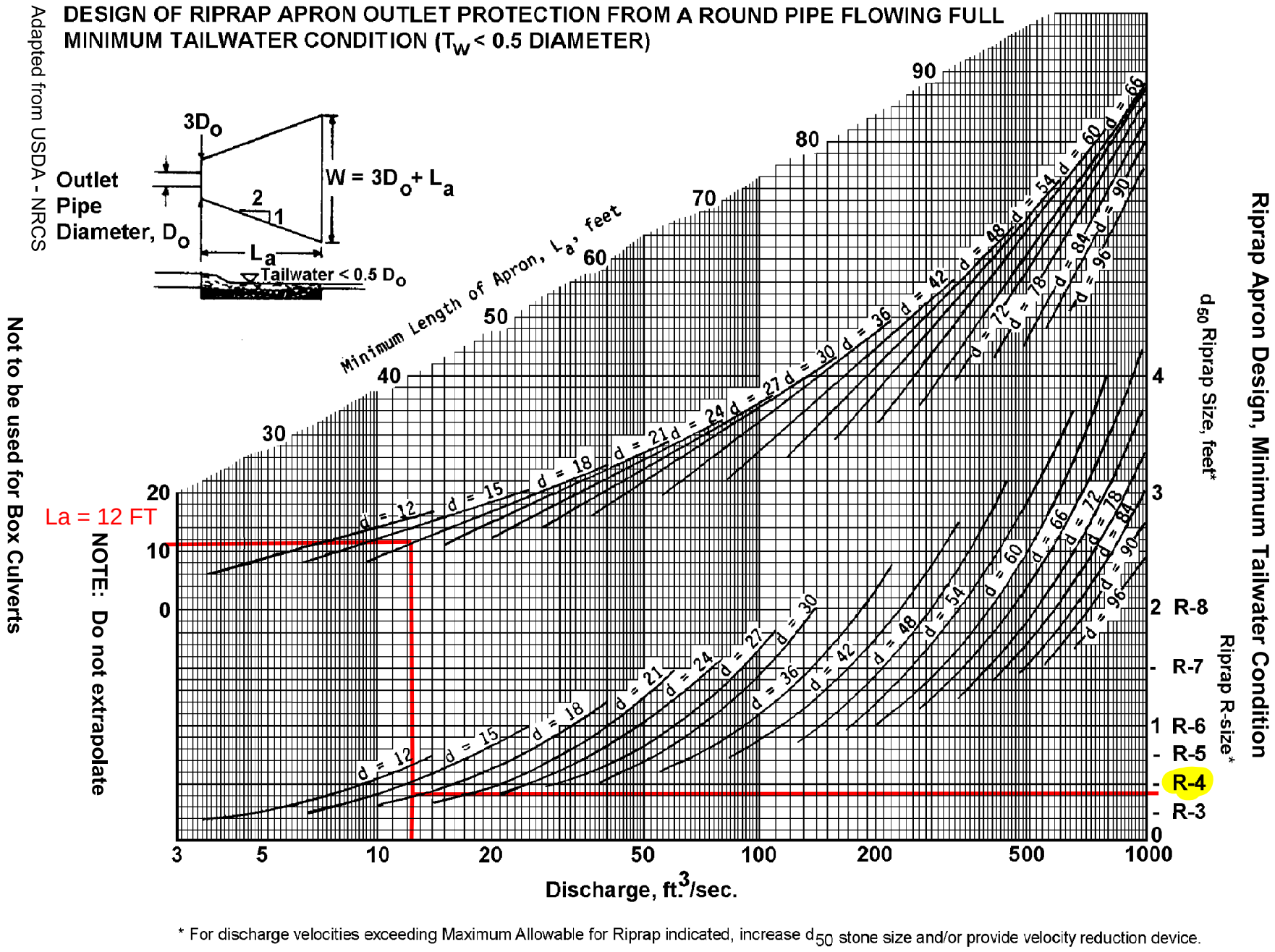


FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition

EW-B1

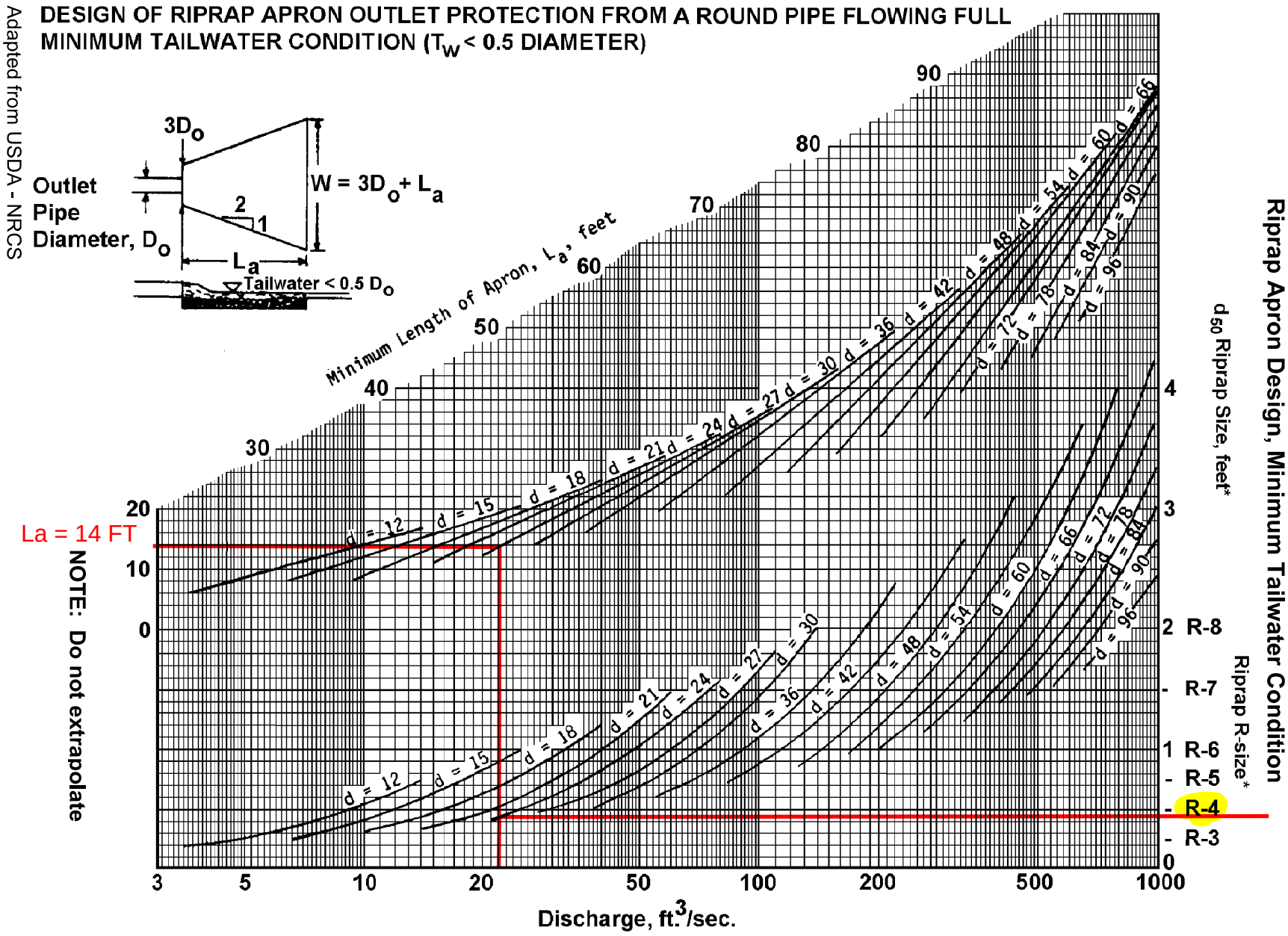


FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition

* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

EW-B2

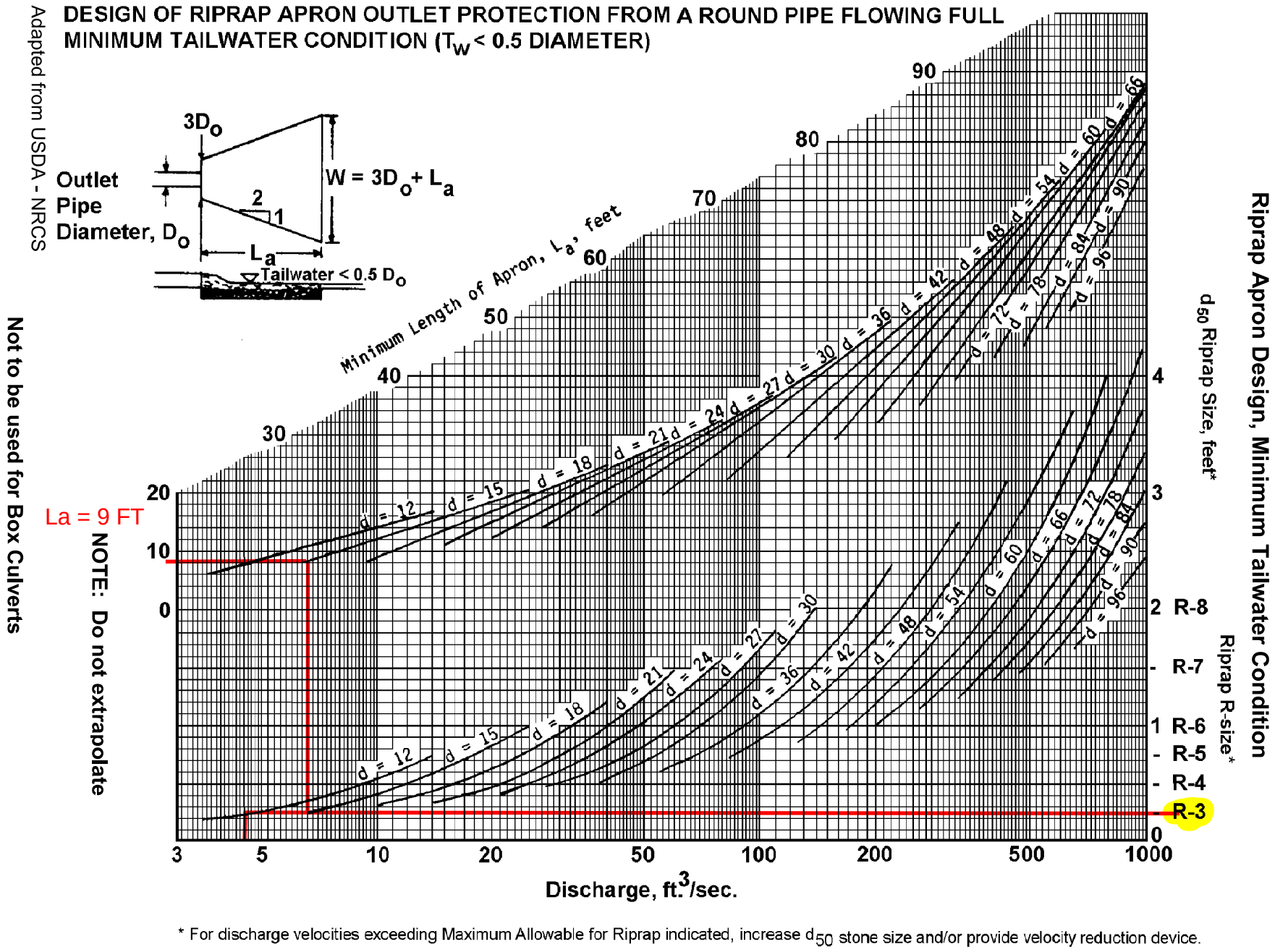


FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition

* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

Anticipated Velocity Calculation for Less Than Full Pipe Flow

Outfall EW-B2

Full Flow Discharge: $Q_f = \frac{0.464}{n} D^{8/3} S^{1/2}$ = 5.01 cfs

Continuity Equation to determine full-flow velocity:

$$V_f = \frac{Q_f}{A} = 4.08 \text{ ft/sec}$$

Where: A = 1.23 = Cross Sectional Area (ft^2)

Ratio of Partial to Full-Flow Discharge:

$$d/D = \frac{Q_d}{Q_f} = 0.899$$

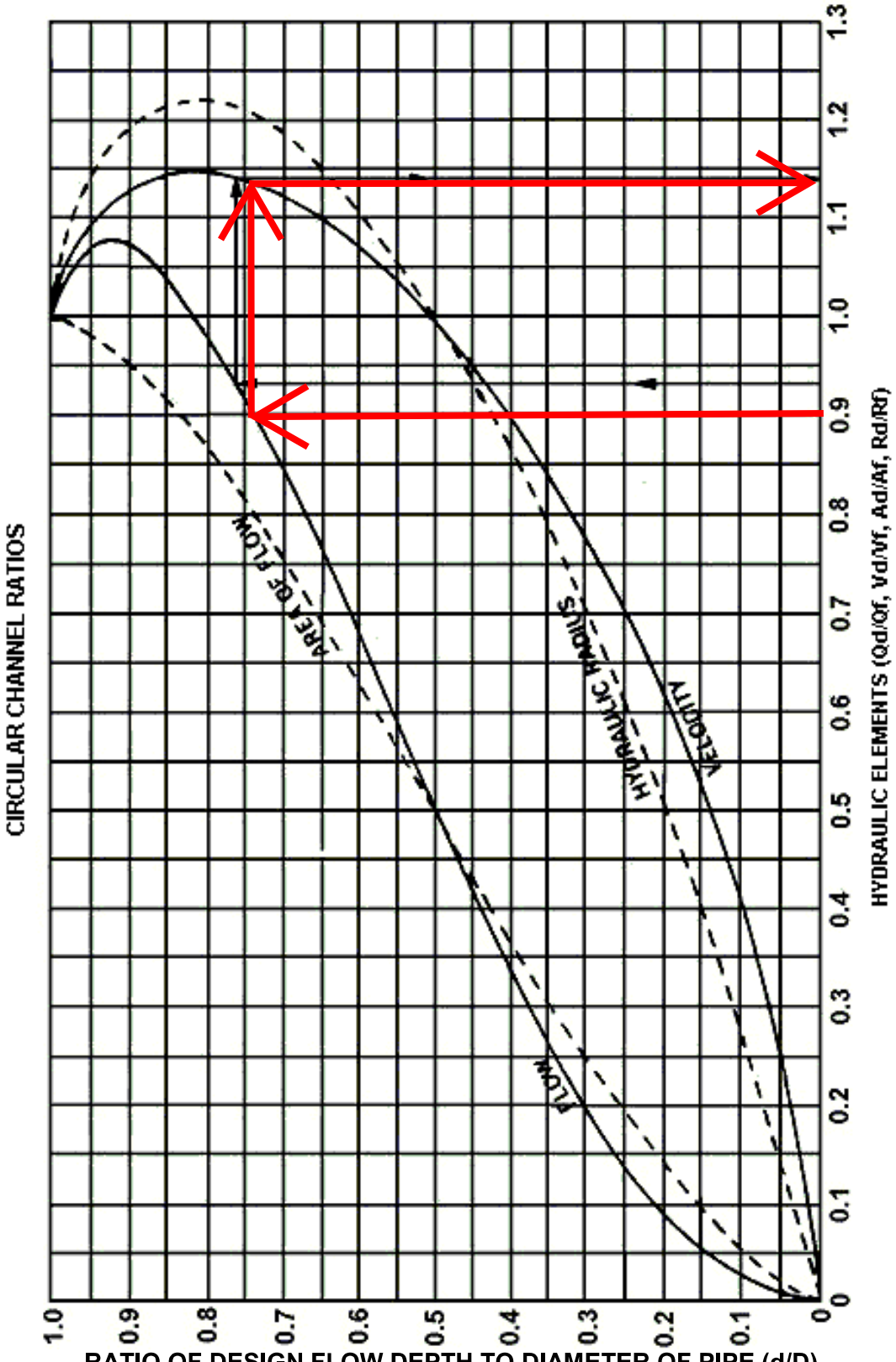
Where:	d/D =	0.90	= Ratio of Part-Full to Full-Flow Discharge
	Qd =	4.50	= Design Discharge (cfs)
	Qf =	5.01	= Full-Flow Discharge (cfs)
	D =	1.25	= Diameter (ft)
	S =	0.01	= Slope of pipe (ft/ft)
	n =	0.012	= Mannings Coefficient

Velocity Ratio from Figure 9.1: 1.14

Design Velocity V_d = 4.65 ft/s

EW-B2

FIGURE 9.1
Velocity Adjustment Nomograph for Less Than Full Pipe Flow



Adapted from *Design and Construction of Sanitary and Storm Sewers,* p. 87, ASCE, 1969

Do not use this nomograph to determine "equivalent pipe sizes" for discharges (Q_d) that do not intersect curves corresponding to proposed pipe sizes on Figures 9.3 and 9.4.