ADDENDUM TO THE STORMWATER MANAGEMENT, GROUNDWATER RECHARGE AND WATER QUALITY ANALYSIS

For

BPS Development Company, LLC

Proposed Assisted Living & Memory Care Facility

Hartwick Drive & Village Drive
Block 28003, Lot 211
Township of Montgomery, Somerset County, NJ

Prepared by:

1904 Main Street
Lake Como, NJ 07719
(732) 974-0198

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NJ Professional Engineer License #53560

February 2023
DEC# 4496-22-01857

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I. EXECUTIVE SUMMARY

The subject site is located at the intersection of Hartwick Drive and Village Drive in the Township of Montgomery, Somerset County, New Jersey. The site is identified as Block 28003, Lot 211 on the Township of Montgomery Tax Map Sheet #55.02. The subject site is currently undeveloped, and consists mainly of gravel and open space with a portion of the south eastern side of the property consisting of wooded area. Furthermore, an existing detention basin is located on the northern portion of the site which was previously designed and approved as a stormwater management facility for the larger Tapestry drainage area. The site is bounded by residential/open space to the north, residential to the west, and townhomes in construction to the south and east. The existing conditions of the site have been verified by the ALTA/NSPS Land Title Survey as prepared by Dynamic Survey, dated 11/02/2022.

The scope of the study includes the proposed development of the parcel with one new assisted living and memory care facility with accompanying lighting, landscaping, grading, walkways, driveways, utilities, parking, and associated items.

II. DESIGN OVERVIEW

The purpose of this Stormwater Management Addendum is to address the review comments provided per the 1/31/23 Montgomery Township Engineering Review Letter prepared by Rakesh R. Darji, PE, PP, CME and the 1/11/23 Somerset-Union-SCD review letter. Specifically, this report provides a narrative and supplemental calculations for the following:

- Supporting calculations for the relocated grass swale waterway are provided within the appendix of this report. Please note that the swale has been designed in accordance with chapter 18 of the Standards for Soil Erosion and Sediment Control in New Jersey.
- The Soil Erosion and Sediment Control Plan has been revised such that it matches the supporting calculations for the conduit outlet protection.
- A capacity analysis for the existing 15" RCP pipe is provided in the appendix of this report.

APPENDIX

STORMWATER COLLECTION SYSTEM CALCULATIONS (PIPE SIZING)

DYNAMIC ENGINEERING

Stormwater Collection System Calculations

Project: BPS - Assisted Living Facility
Job #: 4496 22-01857

Computed By: SS
Checked By: JH

Location: Montgomery
Design Storm: 25 YR

Date: 12/14/2022
Revised: 2/22/2023

*Basin outfall is based on 100 YR

NOTES:
1) Design method used is Rational Method.
2) Refer to Weighted Runoff Coefficient table for calculation of incremental areas and C values.
3) 100YR storm outfall flows used for OCS structures.

PIPE SECTION		SUBCATCHMENT AREA	INCREMENTAL		CUMULATIVE	TIME OF CONCENTRATION			I	PEAK RUNOFF		PIPING INPUT			PIPING DATA			
FROM	TO	Area (Acres)	"C"	A x C Ac	A x C (acres)	Tc to Inlet (min)	Tc in Pipe (min.)	Final Tc (min)	(In/Hr)	Q to Inlet (CFS)	Q cum. for Pipe (CFS)	Dia. (In)	Length (Ft)	Man. "n"	Slope (ft/ft)	Pipe Capacity (cfs)	Full Pipe Velocity (fps)	Actual Pipe Velocity (fps)
Inlet 58	MH 59	0.46	0.95	0.44	0.44	10.00	0.52	10.00	6.80	2.99	2.99	15	205.0	0.012	0.0134	8.10	6.60	5.74

CONDUIT OUTLET PROTECTION CALCULATIONS

DYNAMIC ENGINEERING

245 Main Street, Suite 110, Chester, NJ 07930
(908) 879-9229

Date: 12/2/2022
Project: BPS
Project No: 4496 22-01857

Calculated By: SS
Checked By: JH

Conduit Outlet Protection Calculations

Rip Rap Pad # ES A

Design Parameters:

Design Storm Flow for 25 Year, Q	5.54	cfs
Vertical Dimension of Outlet Pipe, D_o	18	in
Horizontal Dimension of Outlet Pipe, W_o	18	in
Tailwater Depth, TW[1]	2.60	ft

Apron Dimension Calculations:

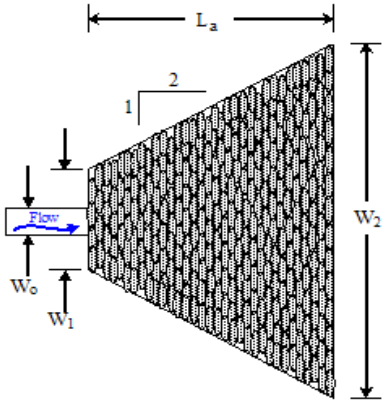
Unit Dicharge, $q = Q/D_o$ = 3.69 cfs per foot

- **Case I: $TW < 1/2\ D_o$**

Apron Length, $L_a = \frac{1.8q}{D_o^{1/2}} + 7D_o$ = L_a =

Width, $W_1 = 3W_o$ = W_1 =

Width, $W_2 = 3W_o + L_a$ = W_2 =

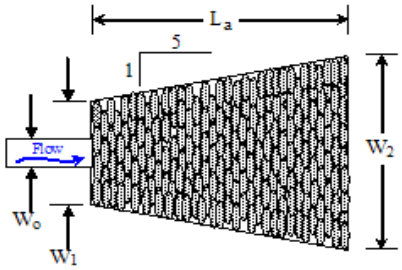


- **Case II: $TW \geq 1/2\ D_o$**

Apron Length, $L_a = \frac{3q}{D_o^{1/2}}$ = 9.05 ft or L_a = **10 ft**

Width, $W_1 = 3W_o$ = 4.5 ft or W_1 = **5 ft**

Width, $W_2 = 3W_o + 0.4L_a$ = 8.12 ft or W_2 = **9 ft**



Rip Rap Stone Size Calculations:

Median Stone, $d_{50} = \frac{0.02q^{1.33}}{TW}$ = 0.52 in d_{50} = **6 in**

Notes:

1. Where there is a well-defined channel downstream of the apron, the bottom width of the apron shall be at least equal to the bottom width of the channel and the structural lining shall extend at least one foot above the tailwater elevation, but no lower than two-thirds of the vertical conduit dimension above the conduit invert.
2. The side slopes shall be 2:1 or flatter.
3. The bottom grade shall be 0.0% (level).
4. There shall be no overfall at the end of the apron or at the end of the culvert.
5. Fifty (50) percent by weight of the rip-rap mixture shall be smaller than the median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size. The rip-rap shall be reasonably well graded.
6. The thickness of the rip-rap apron may be two (2) times the median stone diameter provided that the apron is constructed on a bedding of four (4) inches of 3/4 inch clean stone on approved filter fabric material.
7. Rip-rap and filter fabric shall meet the standards of the governing Soil Conservation District as well as the requirements of the local municipality.
8. No bends or curves at the intersection of the conduit and apron will be permitted.

Footnote:

1. Tailwater depth shall be the 2-year storm if discharging into a detention basin. For areas where tailwater cannot be computed, use $TW = 0.2D_o$.
2. For multiple pipes, increase rip-rap sizes by 25% when pipe spacing is greater than or equal to $1/4W_o$.

DYNAMIC ENGINEERING

245 Main Street, Suite 110, Chester, NJ 07930
(908) 879-9229

Date: 12/2/2022
Project: BPS
Project No: 4496 22-01857

Calculated By: SS
Checked By: JH

Conduit Outlet Protection Calculations

Rip Rap Pad # ES B

Design Parameters:

Design Storm Flow for 25 Year, Q	2.67	cfs
Vertical Dimension of Outlet Pipe, D_o	15	in
Horizontal Dimension of Outlet Pipe, W_o	15	in
Tailwater Depth, TW[1]	2.61	ft

Apron Dimension Calculations:

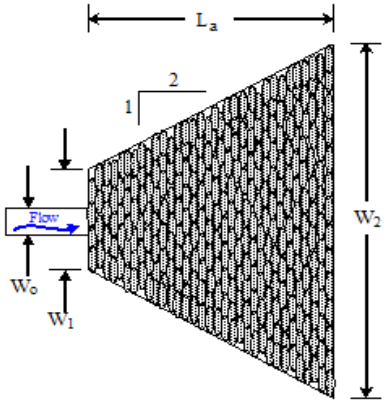
Unit Dicharge, $q = Q/D_o$ = 2.14 cfs per foot

- **Case I: $TW < 1/2\ D_o$**

Apron Length, $L_a = \frac{1.8q}{D_o^{1/2}} + 7D_o$ = L_a =

Width, $W_1 = 3W_o$ = W_1 =

Width, $W_2 = 3W_o + L_a$ = W_2 =

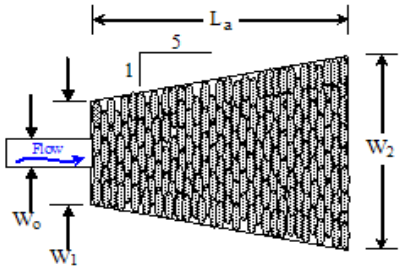


- **Case II: $TW \geq 1/2\ D_o$**

Apron Length, $L_a = \frac{3q}{D_o^{1/2}}$ = 5.73 ft or L_a = **6 ft**

Width, $W_1 = 3W_o$ = 3.75 ft or W_1 = **4 ft**

Width, $W_2 = 3W_o + 0.4L_a$ = 6.04 ft or W_2 = **7 ft**



Rip Rap Stone Size Calculations:

Median Stone, $d_{50} = \frac{0.02q^{1.33}}{TW}$ = 0.25 in d_{50} = **6 in**

Notes:

1. Where there is a well-defined channel downstream of the apron, the bottom width of the apron shall be at least equal to the bottom width of the channel and the structural lining shall extend at least one foot above the tailwater elevation, but no lower than two-thirds of the vertical conduit dimension above the conduit invert.
2. The side slopes shall be 2:1 or flatter.
3. The bottom grade shall be 0.0% (level).
4. There shall be no overfall at the end of the apron or at the end of the culvert.
5. Fifty (50) percent by weight of the rip-rap mixture shall be smaller than the median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size. The rip-rap shall be reasonably well graded.
6. The thickness of the rip-rap apron may be two (2) times the median stone diameter provided that the apron is constructed on a bedding of four (4) inches of 3/4 inch clean stone on approved filter fabric material.
7. Rip-rap and filter fabric shall meet the standards of the governing Soil Conservation District as well as the requirements of the local municipality.
8. No bends or curves at the intersection of the conduit and apron will be permitted.

Footnote:

1. Tailwater depth shall be the 2-year storm if discharging into a detention basin. For areas where tailwater cannot be computed, use $TW = 0.2D_o$.
2. For multiple pipes, increase rip-rap sizes by 25% when pipe spacing is greater than or equal to $1/4W_o$.

DYNAMIC ENGINEERING

245 Main Street, Suite 110, Chester, NJ 07930
(908) 879-9229

Date: 12/2/2022
Project: BPS
Project No: 4496 22-01857

Calculated By: SS
Checked By: JH

Conduit Outlet Protection Calculations

Rip Rap Pad # 1

Design Parameters:

Design Storm Flow for 25 Year, Q	4.03	cfs
Vertical Dimension of Outlet Pipe, D_o	15	in
Horizontal Dimension of Outlet Pipe, W_o	15	in
Tailwater Depth, TW[1]	5.97	ft

Apron Dimension Calculations:

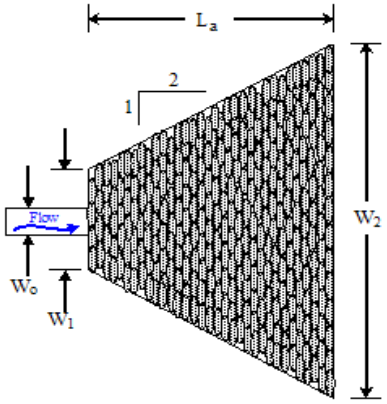
Unit Dicharge, $q = Q/D_o$ = 3.22 cfs per foot

- **Case I: $TW < 1/2\ D_o$**

Apron Length, $L_a = \frac{1.8q}{D_o^{1/2}} + 7D_o$ = L_a =

Width, $W_1 = 3W_o$ = W_1 =

Width, $W_2 = 3W_o + L_a$ = W_2 =

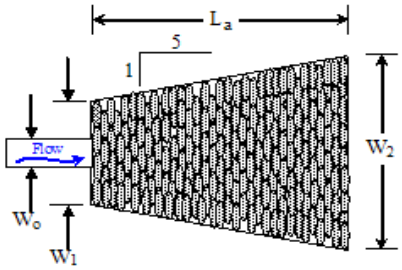


- **Case II: $TW \geq 1/2\ D_o$**

Apron Length, $L_a = \frac{3q}{D_o^{1/2}}$ = 8.65 ft or L_a = **9 ft**

Width, $W_1 = 3W_o$ = 3.75 ft or W_1 = **4 ft**

Width, $W_2 = 3W_o + 0.4L_a$ = 7.21 ft or W_2 = **8 ft**



Rip Rap Stone Size Calculations:

Median Stone, $d_{50} = \frac{0.02q^{1.33}}{TW}$ = 0.19 in d_{50} = **6 in**

Notes:

1. Where there is a well-defined channel downstream of the apron, the bottom width of the apron shall be at least equal to the bottom width of the channel and the structural lining shall extend at least one foot above the tailwater elevation, but no lower than two-thirds of the vertical conduit dimension above the conduit invert.
2. The side slopes shall be 2:1 or flatter.
3. The bottom grade shall be 0.0% (level).
4. There shall be no overfall at the end of the apron or at the end of the culvert.
5. Fifty (50) percent by weight of the rip-rap mixture shall be smaller than the median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size. The rip-rap shall be reasonably well graded.
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7. Rip-rap and filter fabric shall meet the standards of the governing Soil Conservation District as well as the requirements of the local municipality.
8. No bends or curves at the intersection of the conduit and apron will be permitted.

Footnote:

1. Tailwater depth shall be the 2-year storm if discharging into a detention basin. For areas where tailwater cannot be computed, use $TW = 0.2D_o$.
2. For multiple pipes, increase rip-rap sizes by 25% when pipe spacing is greater than or equal to $1/4W_o$.

GRASS SWALE CALCULATIONS

Grass Swale

Flow To Inlet, Q		
24" RCP @ 2.28% SL Fully Flowing	34.15	CFS
15" RCP @ 0.69% SL Fully Flowing	5.36	CFS
Peak Rate of Runoff (Q) =	39.51	CFS

Default Values			
Actual Flow=	39.51	CFS	
Slope of Swale =	0.015	ft/ft	
Max Allowable Velocity =	4.5	ft/s	
Side Slopes =	0.33	ft/ft	
Bottom Width =	10	ft	

Capacity			
Depth (Estimated Value)	1.20	ft	(From Figure A6-8)
Hydraulic Radius (R) =	0.90	ft	(From Figure A6-3)
Cross-Sect. Flow Area =	15.00	SF	(From Figure A6-8)
Velocity =	4.5	ft/s	Assumed Value
Calculated Flow Capcity =	67.50	CFS	**Capacity Achieved**

Stability			
Depth (Estimated Value)	0.75	ft	(From Figure A6-8)
Hydraulic Radius (R) =	0.62	ft	(From Figure A6-4)
Cross-Sect. Flow Area =	9.00	SF	(From Figure A6-8)
Velocity =	4.5	ft/s	Assumed Value
Calculated Flow Capcity =	40.50	CFS	**Stability Achieved**

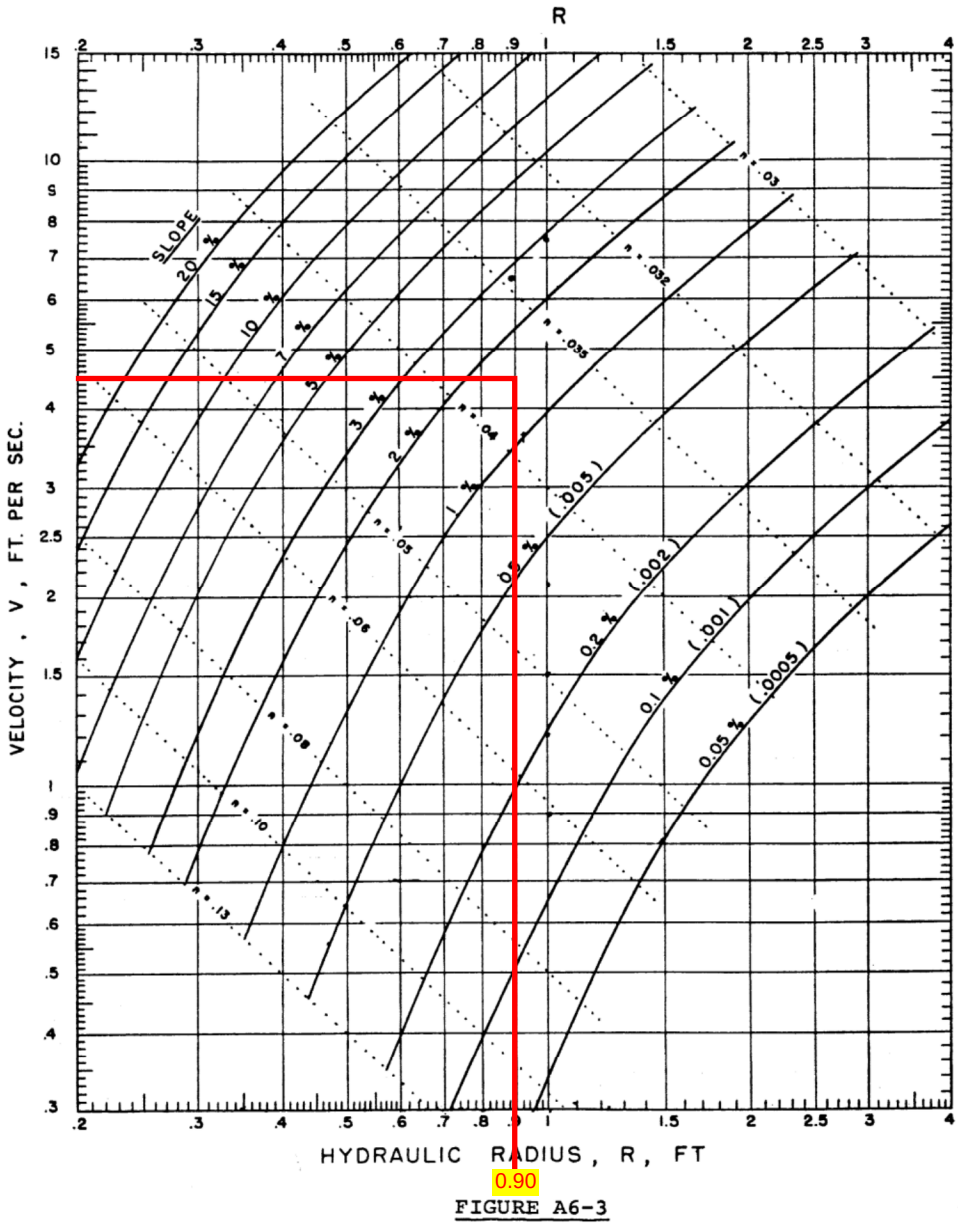


FIGURE A6-3

SOLUTION OF THE MANNING FORMULA FOR RETARDANCE D (LOW VEGETAL RETARDANCE)

Return to TOC

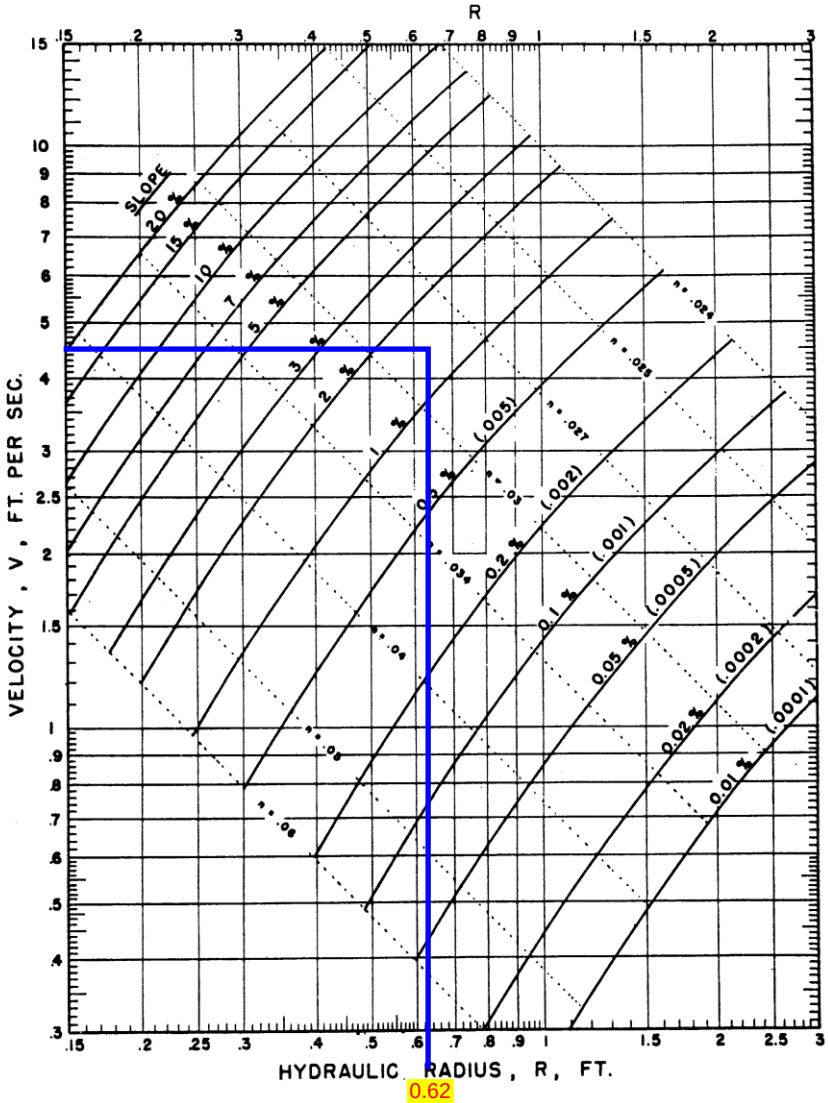


FIGURE A6-4

SOLUTION OF THE MANNING FORMULA FOR RETARDANCE E (VERY LOW VEGETAL RETARDANCE

Return to TOC

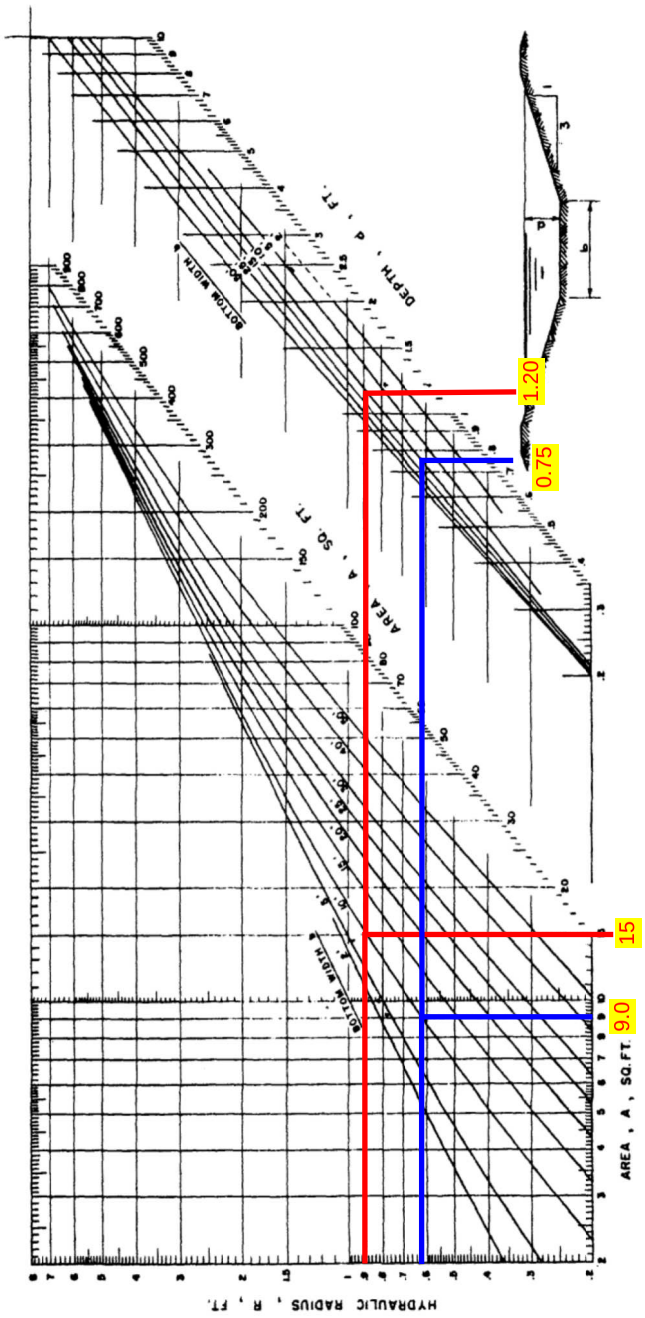
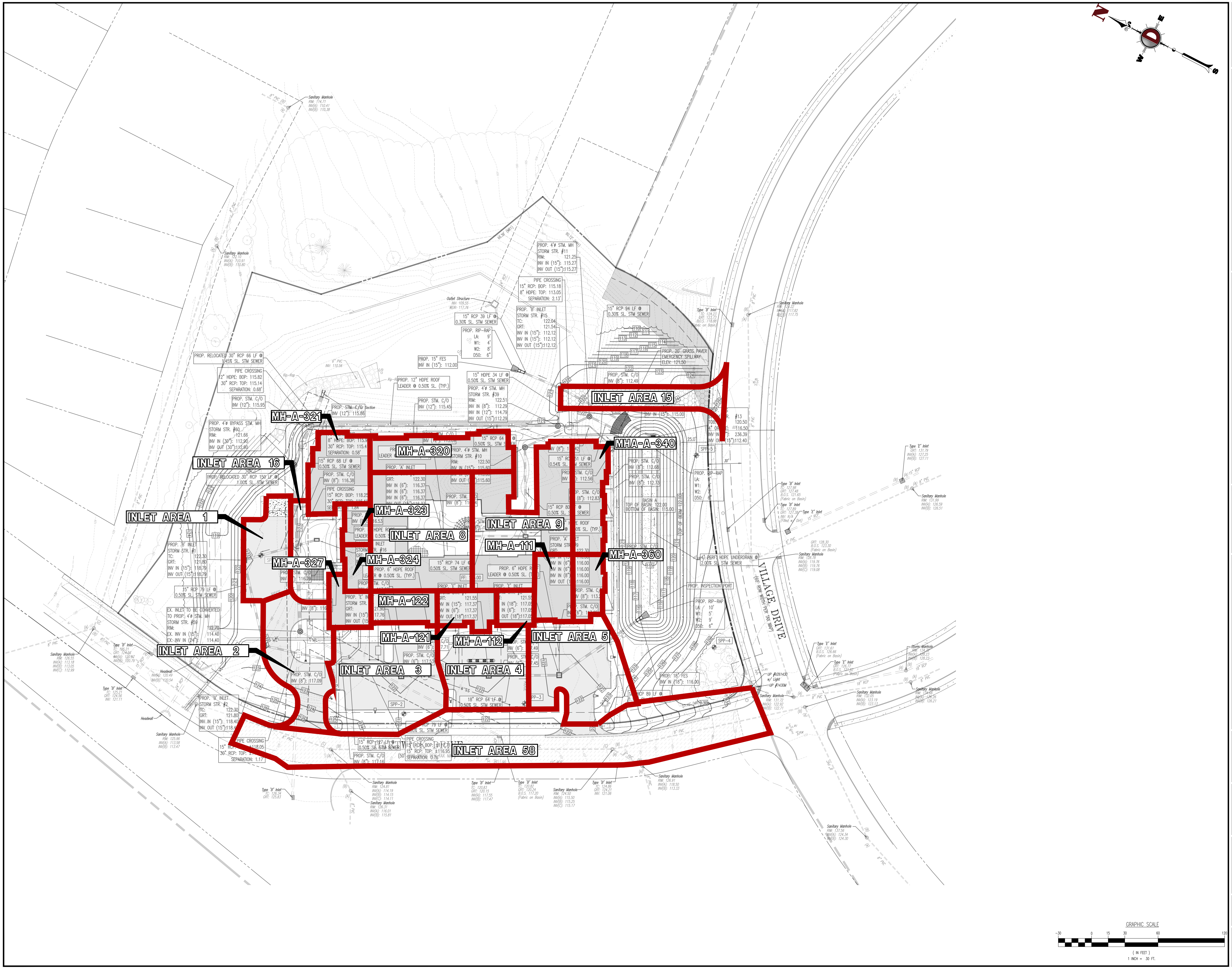


FIGURE A6-8

DIMENSIONS OF TRAPEZOIDAL CHANNELS WITH 3 TO 1 SIDE SLOPES

Return to TOC

INLET AREA MAPS



DYNAMIC
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REV.	DATE	COMMENTS	BY
1	02/28/23	REV. PER TOWNSHIP COMMENTS	DMC

THIS PLAN SET IS FOR PERMITTING PURPOSES ONLY AND MAY NOT BE USED FOR CONSTRUCTION

DRAWN BY: MFD
DESIGNED BY: JH
CHECKED BY: JDS

PROJECT:
BPS DEVELOPMENT COMPANY, LLC
PROPOSED ASSISTED LIVING & MEMORY CARE FACILITY
BLOCK 28003, LOT 211
HARTWICK DRIVE & VILLAGE DRIVE
MONTGOMERY TOWNSHIP, SOMERSET COUNTY, NEW JERSEY

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PROFESSIONAL ENGINEER
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JEFFREY HABERMAN
PROFESSIONAL ENGINEER
NEW JERSEY LICENSE No. 53560

TITLE:
INLET AREA MAP

SCALE: (H) 1"=30' (V)
DATE: 12/15/2022
PROJECT No: 4496-22-01857
SHEET No: 3 OF 3
Rev. #: 1

Plotted: 03/01/23 – 5:23 PM, By: gcowdrick
File: \\dwapc.local\dwcfolders\Data\DEDPC PROJECTS\4496 Broemor Partners\22-01857 Montgomery\Dwg\DA Maps\D449622018S7D1.dwg, ---> INLET AREA MAP