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February 17, 2017

Conservation Commission
City of New Bedford
133 William Street, Room 312
New Bedford, MA 02740

RE: Eversource Notice of Intent
50 Duchaine Boulevard – New Bedford, MA

Dear Sarah,

The following letter is being sent to you on behalf of the Applicant formerly asking to continue the Public Hearing process for the above referenced project. We are seeking to be rescheduled to the March 7th Public Hearing.

In closing, we want to thank you for your assistance in this matter. Please feel free to contact us if you should need any further information.

Very truly yours,

FARLAND CORP., INC.

Christian A. Farland

Christian A. Farland, P.E., LEED AP
Principal Engineer and President

February 14, 2017

Mr. Craig P. Dixon, Chairman
New Bedford Conservation Commission
133 William Street – Rm 304
New Bedford, MA 02740

RE: Response Letter
Eversource Project
Duchainne Blvd., New Bedford, Massachusetts

Dear Mr. Dixon,

We have enclosed a response letter, revised Site Plans, SWPPP and stormwater calculations in response to the comment letter prepared by Nitsch Engineering dated January 17, 2017 in regards to their review of the Site Plans.

We trust the attachments noted above and included herewith will provide the necessary documentation to address their comments. If you should have any questions, please feel free to contact us.

Very Truly Yours,

FARLAND CORPORATION, INC.

Christian A. Farland

Christian A. Farland, P.E., LEED AP
Principal Engineer and President

cc: File, Client

Nitsch Engineering Comments

Comment #1:

The existing condition stormwater calculations generally match the final design documents from the Parallel Products project that were previously reviewed by Nitsch Engineering and approved by the Conservation Commission. We agree that this is the appropriate approach and that the existing condition should reflect the undisturbed condition before site clearing in 2016 occurred.

No response needed.

Comment #2:

The proposed project appears to add approximately 5.9 impervious acres to the project site. Since this is more than 5 acres, the project may be subject to Massachusetts Environmental Policy Act (MEPA review and the Environmental Notification Form process. We recommend that the Applicant review the MEPA filing thresholds and confirm if further coordination with MEPA is required.

The project is creating less than 5 acres, therefore an ENF is not required.

Comment #3:

As discussed during the Parallel Products project review, the existing wet area located at the southernmost portion of the site is considered a jurisdictional wetland resource area under the Wetlands Protection Act. Therefore, all proposed stormwater treatment, recharge, and peak flow mitigation must occur prior to discharging into the area. Currently, the peak flow directed towards this wetland (referenced as "Existing Detention Basin" in HydroCAD) is higher in the proposed condition than the existing condition. Therefore, Standard 2 of the MassDEP Stormwater Management Standards is not being met. The onsite stormwater management system should be designed so that there is no increase in peak run-off rate to the wetland.

We provided the Table that demonstrates the peak flow is less in the Post-Development than the Pre-Development (See below).

Table 2 - Comparison of Pre- versus Post-Development Offsite Runoff toward Existing On-site Basin Resource Area

Frequency Storm	2-Year		10-Year		100-Year	
	Rate (cfs)	Volume (af)	Rate (cfs)	Volume (af)	Rate (cfs)	Volume (af)
Pre-Development	0.62	0.678	1.50	1.424	3.46	2.686
Post-Development	0.59	0.647	1.41	1.301	3.42	2.552

Comment #4:

In the proposed conditions HydroCAD model, the time of concentration for subcatchment S-10 (proposed parking lot) is listed as 16 minutes. We recommend that this be revised to 6 minutes, consistent with the MassDEP stormwater handbook and standard engineering practice for paved areas.

Farland Corp. (FC) has revised the Tc as requested.

Comment #5:

The Applicant is using the Dynamic Storage Indication (Dyn-Stor-Ind) pond routing for the proposed conditions. While Nitsch Engineering agrees that the method is appropriate for the proposed conditions, we would request that the model messages and error report be included in the HydroCAD output to confirm that there are no HydroCAD issues created by using the Dyn-Stor-Ind routing setting. The model output appears to indicate that the time step has been increased by three. It is unclear why this is necessary.

FC has included the model messages and error report in the HydroCAD calculations.

Comment #6:

The Applicant indicates that portions of the proposed project are considered a redevelopment under the MassDEP Stormwater Management Standards since the building and site access driveway is existing. Under Standard 7, redevelopment projects are defined as, "Development, rehabilitation, expansion and phased projects on previously developed sites, provided the redevelopment results in no net increase in impervious area." Since the project results in a 5.9-acre increase in impervious area and there are substantial changes proposed to the site and stormwater management system, a vast majority of the site is considered new development and should be designed to meet all of MassDEP Stormwater Management Standards. The existing site driveway that is to remain could be considered a redeveloped area; however, the Applicant should confirm that the same level of treatment is being provided in the proposed condition as the existing condition. The Applicant should indicate whether 1,000 vehicle trips per day will be generated by the proposed project.

FC and the New Bedford Conservation Commission agreed during the last round of permitting that this project would be considered a redevelopment project. The Project will not exceed 1,000 vehicle trips per day.

Comment #7:

Large portions of the proposed project site, including drainage areas S-3, S-4, S-6, S-7, and S-9 discharge to jurisdictional wetland resource areas with minimal treatment or peak flow mitigation. These areas include new impervious roadway and parking areas and should be designed in compliance with the water quality treatment requirements of Standard 4.

If Nitsch and the Commission agree, FC will replace the last drain manholes with Water Quality Inlets to meet Standard 4.

Comment #8:

Portions of the proposed project site may be considered a Land Use with Higher Potential Pollutant Loads. Under the MassDEP Stormwater Management Standards, LUHPPLs include parking lots with exterior fleet storage area or exterior vehicle service maintenance and cleaning areas, and parking lots with high-intensity-uses (1,000 vehicle trips per day or more). The intended use of the site by NStar is unclear and the Applicant should confirm if these uses will occur within the proposed project site.

The proposed use is not considered a Land Use with Higher Potential Pollutant Loads.

Comment #9:

The TSS removal calculations are incomplete for the proposed project. Two calculations should be provided for each treatment train to demonstrate that the treatment train (1) achieves an overall TSS removal of 80% and (2) a pretreatment TSS removal of 44% before discharging to the proposed infiltration basins.

FC has provided TSS removal calculations as requested.

Comment #10:

MassDEP Stormwater Management Standard 8 requires the preparation of a construction period erosion and sediment control plan for project sites greater than 1 acre. Since the project is greater than 1 acre, it also requires a National Pollutant Discharge Elimination System (NPDES) Construction General Permit and the preparation of a Stormwater Pollution Prevention Plan (SWPPP). MassDEP allows the preparation of a single document that fulfills both of these requirements. Nitsch Engineering recommends that the Conservation Commission include a Condition, if the project is approved, that requires the SWPPP be submitted for review prior to the start of construction.

FC agrees with Nitsch Engineering's recommendation.

Comment #11:

The Operation and Maintenance (O&M) Plan should be updated to include catch basins, proprietary water quality structures, sediment forebays, and any other stormwater practices proposed for the project site.

FC has updated the O&M as requested.

Comment #12:

The Exhibits referenced within the Stormwater Report narrative are not consistent with the actual Exhibits provided in this report. The follow documents were not provided with this submittal:

a. Groundwater recharge calculations;
b. Drawdown calculations;
c. Water quality volume calculations;
d. Sediment forebay sizing calculations; and
e. Sizing calculations for the water quality structure to demonstrate that it is sized for the water quality volume flow rate.

FC has included the exhibits noted above.

Comment #13:

Closed drainage calculations should be provided to confirm that the existing infrastructure to remain and the proposed pipes are sized appropriately for the 10-year storm using the Rational Method.

FC has included closed drainage calculations as requested.

Comment #14:

The Grading and Utility Plan provided sufficient detail in some areas determine the major drainage divides on the proposed project site. However, additional spot grades should be provided to indicate critical elevations for the drainage design, such as at high points, low points, curb openings, and berm elevations within the basins.

FC has added additional spot grades as requested.

Comment #15:

The table in the infiltration basin detail should be reviewed for consistency with the HydroCAD model. Some of the elevations for the overflow berm appear to be different. We would also recommend adding these as spot grades to the Grading Plan.

FC has revised the basin detail and added spot grades as requested.

Comment #16:

The crushed stone, gravel, and riprap indicated in the details should include a reference to the Massachusetts Department of Transportation (MassDOT) material specifications.

FC has revised the details as requested.

If you have any questions or require any further information please contact this office at (508) 717-3479.

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TSS Removal Worksheet

Location:	New Bedford, MA
Project:	Eversource
Project No.:	15-500
Prepared by:	***CAF***
Date:	***14-Feb-17***

Detention Basin 1

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining TSS Load
Street Sweeping	10%	1.00	0.10	0.90
		0.90	0.00	0.90
Water Quality Inlet	25%	0.90	0.23	0.68
Infiltration Basin	80%	0.68	0.54	0.14
	0%	0.16	0.00	0.16
	0%	0.16	0.00	0.16
	0%	0.16	0.00	0.16
	0%	0.16	0.00	0.16
	0%	0.16	0.00	0.16
	Total TSS Removal =		87%	

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TSS Removal Worksheet

Location:	New Bedford, MA
Project:	Eversource
Project No.:	15-500
Prepared by:	***CAF***
Date:	***14-Feb-17***

Detention Basin 2

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining TSS Load
Street Sweeping	10%	1.00	0.10	0.90
Deep Sump & Hooded CB's	25%	0.90	0.23	0.68
Water Quality Inlet	25%	0.68	0.17	0.51
Infiltration Basin	80%	0.51	0.41	0.10
	0%	0.16	0.00	0.16
	0%	0.16	0.00	0.16
	0%	0.16	0.00	0.16
	0%	0.16	0.00	0.16
	0%	0.16	0.00	0.16
	Total TSS Removal =		90%	

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TSS Removal Worksheet

Location:	New Bedford, MA
Project:	Eversource
Project No.:	15-500
Prepared by:	***CAF***
Date:	***14-Feb-17***

Detention Basin 3

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining TSS Load
Street Sweeping	10%	1.00	0.10	0.90
Deep Sump & Hooded CB's	25%	0.90	0.23	0.68
Water Quality Inlet	25%	0.68	0.17	0.51
Infiltration Basin	80%	0.51	0.41	0.10
	0%	0.16	0.00	0.16
	0%	0.16	0.00	0.16
	0%	0.16	0.00	0.16
	0%	0.16	0.00	0.16
	0%	0.16	0.00	0.16
	Total TSS Removal =		90%	

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TSS Removal Worksheet

Location:	New Bedford, MA
Project:	Eversource
Project No.:	15-500
Prepared by:	***CAF***
Date:	***14-Feb-17***

Detention Basin 4

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining TSS Load
Street Sweeping	10%	1.00	0.10	0.90
		0.90	0.00	0.90
Water Quality Inlet	25%	0.90	0.23	0.68
Infiltration Basin	80%	0.68	0.54	0.14
	0%	0.16	0.00	0.16
	0%	0.16	0.00	0.16
	0%	0.16	0.00	0.16
	0%	0.16	0.00	0.16
	0%	0.16	0.00	0.16
	Total TSS Removal =		87%	

TSS Design Removal Rates	
Street Sweeping	0-10%
Deep Sump & Hooded Catchbasins	25%
Sediment Forebay (Alone)	25%
Detention Pond	0%
Infiltration Basin	80%
Drainage Channel	0%
Water Quality Swale	70%
Water Quality Inlet	25%
Extended Detention Basin	50%
Vegetated Filter Strip	10% (25') 25% (50')
Bioretention Area	90%
Cionstructed Wetlands	80%
Gravel Wetlands	80%
Wet Basins	80%
Grass Channel	50%
Water Quality Swale	70%
Dry Wells	80%
Subsurface Structure	80%

Note:
Insert "0" in the TSS Removal Rate box for each of the BMP's <u>NOT</u> used.

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Long Term Operation and Maintenance Plan

Proposed "Site Plan"
50 Duchaine Boulevard
New Bedford, MA

February 14, 2017

Prepared For:
Eversource Energy
P.O. Box 1000085 – N2
Duluth, GA 30096

Prepared By:
Christian A. Farland, P.E.
Farland Corporation, Inc.
Project No. 15-500

Street Sweeping

The parking lot will be inspected and maintained by the owner.

It shall be the responsibility of the owner to:

Inspections:

Inspect sediment deposit accumulations on the parking lots quarterly.

Maintenance:

Sweep parking lots at least annually.

Dispose of the accumulated sediment and hydrocarbons in accordance with local, state, and federal guidelines and regulations.

Stone/ Rip Rap Areas

The owner of the rip rap areas shall:

The rip rap areas are to be inspected and maintained by the owner.

It shall be the responsibility of the owner to:

Inspections:

Inspect the rip rapped areas quarterly.

Maintenance:

Remove accumulated sediment, trash, leaves and debris at least annually. Check for signs of erosion and repair as need. Replace any damaged areas with new rip rap of the same size.

Dispose of the accumulated sediment and hydrocarbons in accordance with local, state, and federal guidelines and regulations.

Infiltration Basin

The owner of the basins shall:

The basins are to be inspected and maintained by the owner.

It shall be the responsibility of the owner to:

Inspections:

Inspect to basins quarterly and after major storms (>3.2” of rain in 24 hours)

Inspect fore-bay quarterly.

Inspect basins for settlement, subsidence, erosion, cracking or tree growth on the embankment, condition of stone; sediment accumulation around the outlet or within the basin; and erosion within the basin and banks.

Inspect outlet structures and/ or outlet pipes for evidence of clogging, sediment deposits or signs of erosion around the structure/ pipe.

Ensure that the basins are operating as designed. If inspection shows that a basin fails to fully drain within 72 hours following a storm event, then the responsible party shall retain a Registered Professional Civil Engineer licensed in the state of Massachusetts to assess the reason for infiltration/ detention failure and recommend corrective action for restoring the intended functions. For a wet pond, fully drained means that the ponding level in the basin is at or below the lowest elevation of the outlet structure. For an infiltration basin, fully drained means that there is no ponding occurring in the infiltration basin.

Inspect emergency spillways for signs of erosion.

Maintenance:

When mowing the basin and forebay, mow the buffer area, side slopes, and basin bottom. Remove grass clippings and accumulated debris. Mow three times per year in May, July and September.

Remove accumulated trash, leaves, debris in basin and forebay every month between April and November of each year. Inspect areas in February of each year, if possible, to determine whether the aforementioned services are required.

If the infiltration basin is ponding in areas or not infiltrating as designed, use deep tilling to break up clogged surfaces, and re-vegetate immediately.

Replace stone in forebay and at all pipe ends once every five (5) years or when sediment depth is excessive.

Do not store snow in basin area.

Remove sediment from the basin and forebay as necessary and at least once every 5 years but wait until the floor of the basin is thoroughly dry. After removing sediment, replace any vegetation damaged during clean-out by either re-seeding or re-sodding.

Dispose of the accumulated sediment and hydrocarbons in accordance with local, state, and federal guidelines and regulations.

Drain Lines

After construction, the drain lines shall be inspected after every major storm for the first few months to ensure proper functions. Presence of accumulated sand and silt would indicate more frequent maintenance of the pre-treatment devices is required. Thereafter, the drain lines shall be inspected at least once per year. Accumulated silt shall be removed by a vactor truck or other method preferred.

Deep Sump Catch Basins

The owner of the catch basins and manholes shall:

The catch basins and manholes are to be inspected and maintained by the owner.
It shall be the responsibility of the owner to:

Inspections:

Inspect the catch basins and manholes quarterly.

Maintenance:

Remove accumulated sediment, trash, leaves and debris when the depth of deposits is greater than or equal to one half the depth from the bottom invert of the lowest pipe in the basin and/or manhole to the bottom elevation of the basin or manhole.

Dispose of the accumulated sediment and hydrocarbons in accordance with local, state, and federal guidelines and regulations.

Water Quality Units

The owner of the units shall:

The units are to be inspected and maintained by the owner.

It shall be the responsibility of the owner to:

Inspections:

Inspect the units quarterly.

Prepare inspection reports as part of each inspection and include the following information:

1. Date of inspection
2. Maintenance personnel
3. Location of unit (GPS coordinates if possible)
4. Time since last rainfall
5. Installation deficiencies (missing parts, incorrect installation of parts)
6. Structural Deficiencies (concrete cracks, broken parts)
7. Operational deficiencies (leaks, blockages)
8. Presence of oil sheen of depth of oil layer
9. Estimate of depth/ volume of floatables (trash, leaves) captured
10. Sediment depth measured
11. Recommendations for any repairs and/ or maintenance for the units
12. Estimation of time before maintenance is required if not required at time of inspection.

Maintenance:

Typically, the unit is maintained using a vaccuum truck or clam shell bucket.

The Stormceptor Unit shall be cleaned once the sediment depth reaches 15% of the storage capacity.

To remove oil and other hydrocarbons that accumulate, it may be preferable to use adsorbent pads.

Dispose of the accumulated sediment and hydrocarbons in accordance with local, state, and federal guidelines and regulations.

RECHARGE CALCULATIONS

REQUIRED:

Recharge Volume Required ("A" Soils) = [Impervious Area x (Recharge Depth/12)]

= [439,093 sf x (0.60"/12)]
= 21,398 cf (Required Volume)

Total Required Recharge Volume = 21,955 cf

STATIC METHOD:

- Assume the entire Required Recharge Volume is discharged to the infiltration device before infiltration begins.

PROVIDED:

Detention Basin #1:

- Cumulative Volume below the lowest outlet (elev=77.50) = 15,309 c.f.

Detention Basin #2:

- Cumulative Volume below the lowest outlet (elev=78.25) = 56,269 c.f.

Detention Basin #3:

- Cumulative Volume below the lowest outlet (elev=77.75) = 6,807 c.f.

Detention Basin #4:

- Cumulative Volume below the lowest outlet (elev=78.20) = 16,503 c.f.

Subsurface Recharge System:

- Cumulative Volume below the lowest outlet (elev=76.50) = 3,301 c.f.

Total Recharge Volume Provided = 98,189 cf

$$Time_{drawdown} = \frac{Rv}{(K)(Bottom\ \ Area)}$$

Where:

Rv = Required Storage Volume = (F)(impervious area)

K = Saturated Hydraulic Conductivity For "Static" and "Simple Dynamic" Methods, use Rawls Rate (see Table 2.3.3).

For "Dynamic Field" Method, use 50% of the in-situ saturated hydraulic conductivity.

$$Time_{drawdown} = \frac{Rv}{(K)(Bottom\ \ Area)} \quad = \quad 0.80 \text{ hours}$$

Rv =	*21,955*	*C.F.*
K =	*8.27*	*inch/hr.*
BA =	*39,820*	*S.F.*

A	sand	**0.6-inch**
B	loam	**0.35-inch**
C	silty loam	**0.25-inch**
D	clay	**0.1-inch**

Texture Class	NRCS Hydrologic Soil Group (HSG)	Infiltration Rate Inches/Hour
Sand	A	8.27
Loamy Sand	A	2.41
Sandy Loam	B	1.02
Loam	B	0.52
Silt Loam	C	0.27
Sandy Clay Loam	C	0.17
Clay Loam	D	0.09
Silty Clay Loam	D	0.06
Sandy Clay	D	0.05
Silty Clay	D	0.04
Clay	D	0.02

WATER QUALITY VOLUME CALCULATIONS:

REQUIRED VOLUME:
*Water Quality Volume Required = (1.0”/12) x (Total Impervious Area)
*Water Quality Volume Required = (1.0”/12) x (439,093 sf) = 36,591 cf

PROVIDED:

Detention Basin #1:
- Cumulative Volume below the lowest outlet (elev=77.50) = 15,309 c.f.

Detention Basin #2:
- Cumulative Volume below the lowest outlet (elev=78.25) = 56,269 c.f.

Detention Basin #3:
- Cumulative Volume below the lowest outlet (elev=77.75) = 6,807 c.f.

Detention Basin #4:
- Cumulative Volume below the lowest outlet (elev=78.20) = 16,503 c.f.

Subsurface Recharge System:
- Cumulative Volume below the lowest outlet (elev=76.50) = 3,301 c.f.

Total Recharge Volume Provided = 98,189 cf

98,189 cf (Provided) >>> 36,591 cf (Required)

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SEDIMENT FOREBAY SIZING CALCULATIONS

CONTRIBUTING AREA TO FOREBAY #1 AT DETENTION BASIN #1

Impervious Area = 65,796 s.f.

REQUIRED VOLUME OF SEDIMENT FOREBAY = VOLUME PRODUCED BY 0.25" RUNOFF/IMPERVIOUS ACRE

= 0.25 "/ACRE x (1 ACRE / 43,560 S.F.) X 65,796 S.F.

= 0.378 INCHES OF RUNOFF

TOTAL VOLUME PRODUCED = 0.378 INCHES X (1 FT / 12 IN) X 65,796 S.F.

= 2,070 C.F.

PROVIDED VOLUME OF SEDIMENT FOREBAY

BOTTOM FOREBAY EL. =	76.00	AREA =	2,448 S.F.
FOREBAY BERM EL. =	77.00	AREA =	3,527 S.F.

VOLUME PROVIDED = 2,988 C.F.

CONTRIBUTING AREA TO FOREBAY #3 AT DETENTION BASIN #3

Impervious Area = 43,521 s.f.

REQUIRED VOLUME OF SEDIMENT FOREBAY = VOLUME PRODUCED BY 0.25" RUNOFF/IMPERVIOUS ACRE

= 0.25 "/ACRE x (1 ACRE / 43,560 S.F.) X 43,521 S.F.

= 0.250 INCHES OF RUNOFF

TOTAL VOLUME PRODUCED = 0.250 INCHES X (1 FT / 12 IN) X 43,521 S.F.

= 906 C.F.

PROVIDED VOLUME OF SEDIMENT FOREBAY

BOTTOM FOREBAY EL. =	76.00	AREA =	658 S.F.
FOREBAY BERM EL. =	77.00	AREA =	1,211 S.F.

VOLUME PROVIDED = 935 C.F.

CONTRIBUTING AREA TO FOREBAY #1 AT DETENTION BASIN #4

Impervious Area = 18,385 s.f.

REQUIRED VOLUME OF SEDIMENT FOREBAY = VOLUME PRODUCED BY 0.25" RUNOFF/IMPERVIOUS ACRE

= 0.25 "/ACRE x (1 ACRE / 43,560 S.F.) X 18,385 S.F.

= 0.106 INCHES OF RUNOFF

TOTAL VOLUME PRODUCED = 0.106 INCHES X (1 FT / 12 IN) X 18,385 S.F.

= 162 C.F.

PROVIDED VOLUME OF SEDIMENT FOREBAY

BOTTOM FOREBAY EL. =	77.00	AREA =	836 S.F.
FOREBAY BERM EL. =	78.00	AREA =	1,264 S.F.

VOLUME PROVIDED = 1,050 C.F.

CONTRIBUTING AREA TO FOREBAY #2 AT DETENTION BASIN #4

Impervious Area = 18,385 s.f.

REQUIRED VOLUME OF SEDIMENT FOREBAY = VOLUME PRODUCED BY 0.25" RUNOFF/IMPERVIOUS ACRE

= 0.25 "/ACRE x (1 ACRE / 43,560 S.F.) X 18,385 S.F.

= 0.106 INCHES OF RUNOFF

TOTAL VOLUME PRODUCED = 0.106 INCHES X (1 FT / 12 IN) X 18,385 S.F.

= 162 C.F.

PROVIDED VOLUME OF SEDIMENT FOREBAY

BOTTOM FOREBAY EL. =	77.00	AREA =	247 S.F.
FOREBAY BERM EL. =	78.00	AREA =	452 S.F.

VOLUME PROVIDED = 350 C.F.

Stormceptor® Rinker MATERIALS™

Detailed Stormceptor Sizing Report – 50 Duchaine Boulevard

Project Information & Location			
Project Name	50 Duchaine Boulevard	**Project Number**	15-500
City	New Bedford	**State/ Province**	Massachusetts
Country	United States of America	**Date**	2/15/2017
Designer Information		**EOR Information (optional)**	
Name	John Marchand	**Name**	
Company	Farland Corp	**Company**	
Phone #	508-717-3479	**Phone #**	
Email	jmarchand@farlandcorp.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	50 Duchaine Boulevard
Recommended Stormceptor Model	STC 450i
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	83
PSD	Fine Distribution
Rainfall Station	PROVIDENCE WSO AIRPORT

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	83
STC 900	89
STC 1200	89
STC 1800	89
STC 2400	92
STC 3600	92
STC 4800	94
STC 6000	94
STC 7200	95
STC 11000	97
STC 13000	97
STC 16000	97
StormceptorMAX	Custom

Stormceptor

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.
Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour).
Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

State/Province	Rhode Island	**Total Number of Rainfall Events**	9696
Rainfall Station Name	PROVIDENCE WSO AIRPORT	**Total Rainfall (in)**	2585.3
Station ID #	6698	**Average Annual Rainfall (in)**	44.6
Coordinates	41°43'19"N, 71°25'57"W	**Total Evaporation (in)**	190.7
Elevation (ft)	51	**Total Infiltration (in)**	378.8
Years of Rainfall Data	58	**Total Rainfall that is Runoff (in)**	2015.8

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Stormceptor® | Rinker MATERIALS™

Drainage Area	
Total Area (acres)	0.64
Imperviousness %	85.0

Up Stream Storage	
Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cfs)	

Design Details	
Stormceptor Inlet Invert Elev (ft)	
Stormceptor Outlet Invert Elev (ft)	75.00
Stormceptor Rim Elev (ft)	78.50
Normal Water Level Elevation (ft)	
Pipe Diameter (in)	12
Pipe Material	
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	Yes

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	50 Duchaine Boulevard

Site Details

Drainage Area

Total Area (acres)	0.64
Imperviousness %	85.0

Surface Characteristics

Width (ft)	334.00
Slope %	2
Impervious Depression Storage (in)	0.02
Pervious Depression Storage (in)	0.2
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency

Maintenance Frequency (months) >	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (in/hr)	2.44
Min. Infiltration Rate (in/hr)	0.4
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation

Daily Evaporation Rate (in/day)	0.1

Dry Weather Flow

Dry Weather Flow (cfs)	0

Winter Months

Winter Infiltration	0

TSS Loading Parameters

TSS Loading Function	

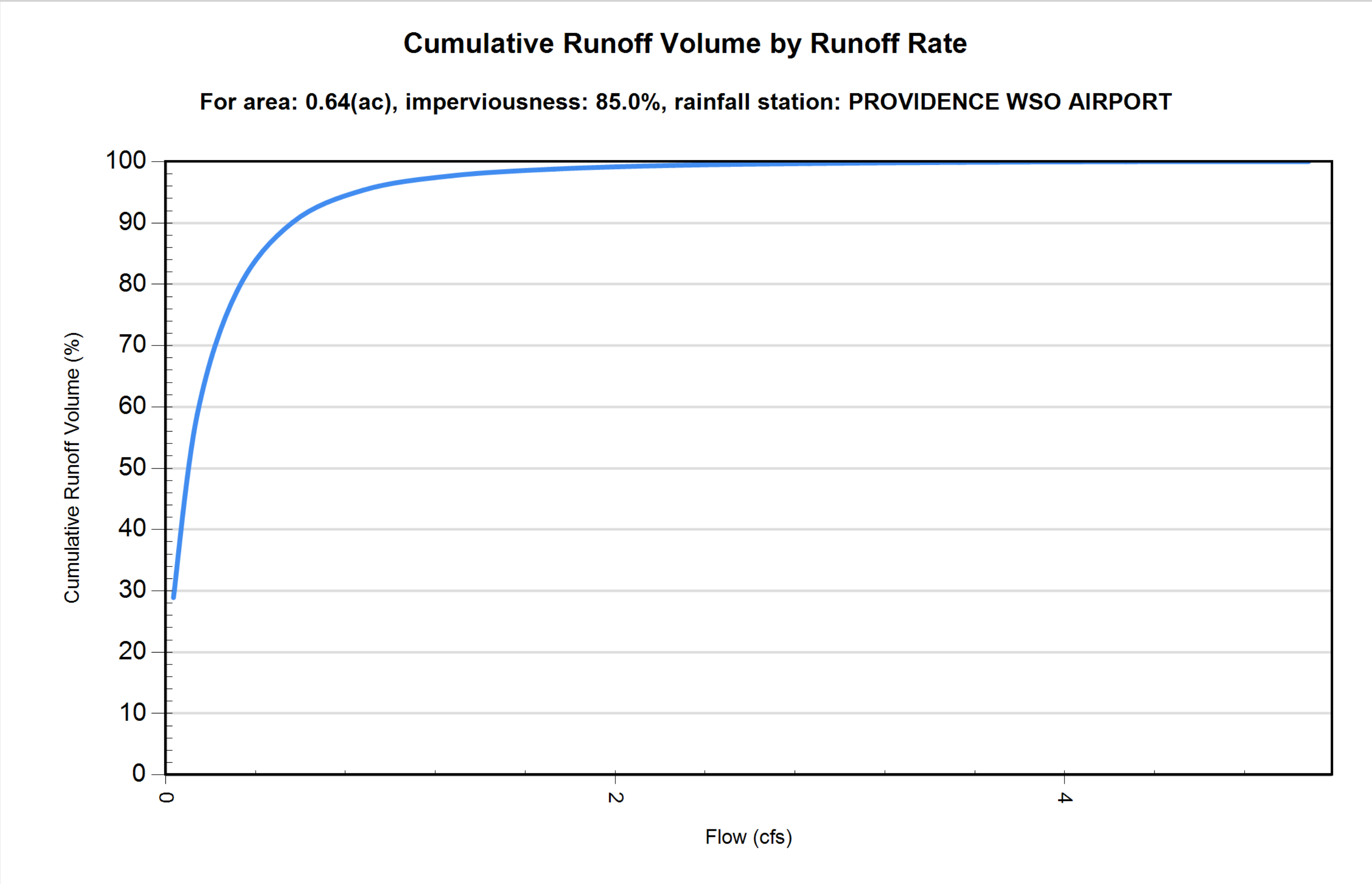
Buildup/Wash-off Parameters

Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

TSS Availability Parameters

Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (cfs)	Runoff Volume (ft³)	Volume Over (ft³)	Cumulative Runoff Volume (%)
0.035	1404759	3451695	28.9
0.141	2854002	2001567	58.8
0.318	3831851	1023656	78.9
0.565	4376032	478952	90.1
0.883	4629521	225466	95.4
1.271	4742666	112221	97.7
1.730	4797914	56957	98.8
2.260	4826834	28009	99.4
2.860	4840493	14317	99.7
3.531	4848419	6366	99.9
4.273	4852495	2283	100.0
5.085	4854614	162	100.0



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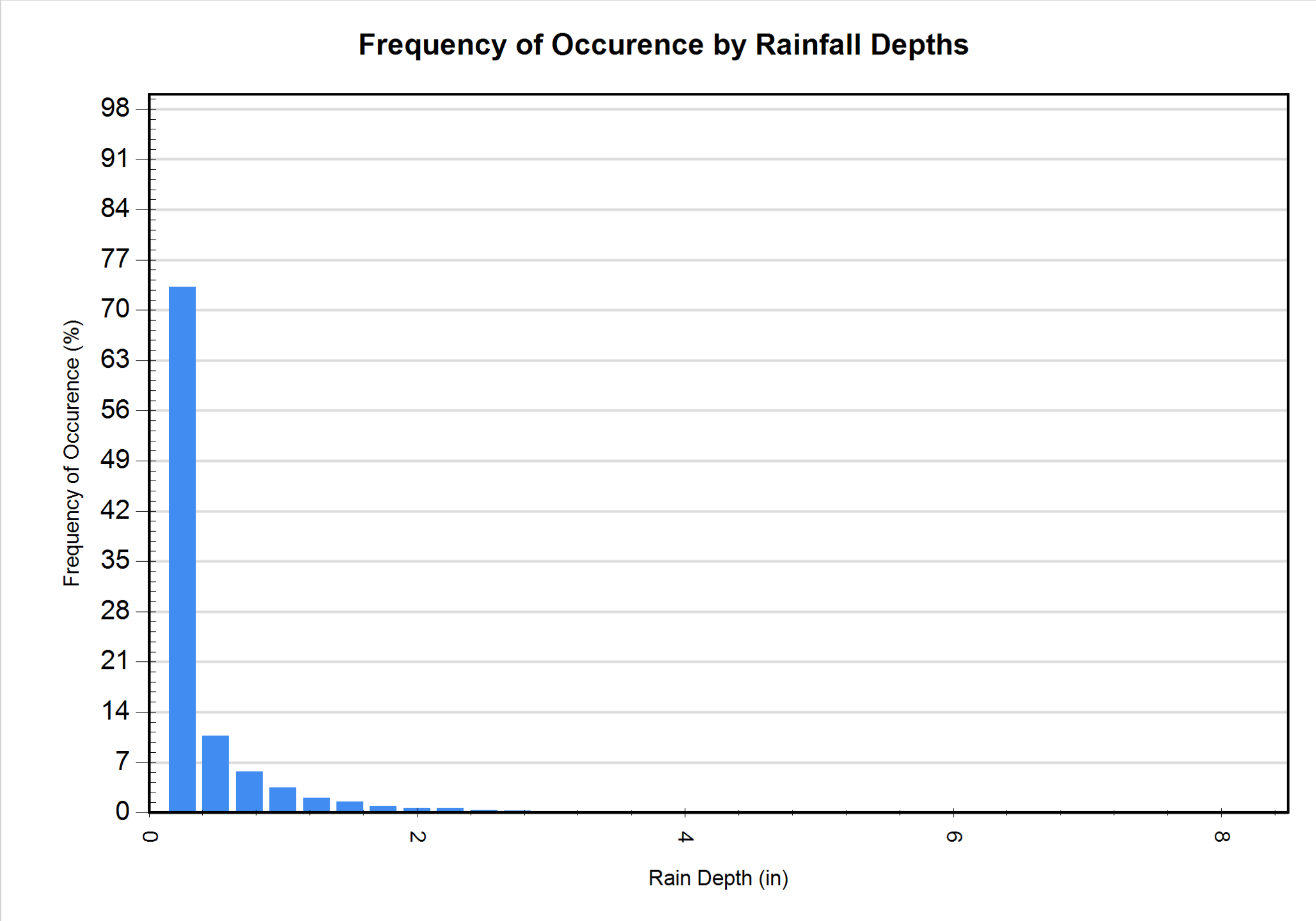
Rinker MATERIALS™

Rainfall Event Analysis

Rainfall Depth (in)	No. of Events	Percentage of Total Events (%)	Total Volume (in)	Percentage of Annual Volume (%)
0.25	7102	73.2	430	16.6
0.50	1033	10.7	373	14.4
0.75	557	5.7	344	13.3
1.00	340	3.5	298	11.5
1.25	202	2.1	226	8.8
1.50	146	1.5	200	7.8
1.75	87	0.9	141	5.4
2.00	63	0.6	119	4.6
2.25	54	0.6	115	4.4
2.50	34	0.4	81	3.1
2.75	29	0.3	76	2.9
3.00	11	0.1	32	1.2
3.25	12	0.1	37	1.4
3.50	8	0.1	27	1.0
3.75	4	0.0	14	0.6
4.00	1	0.0	4	0.2
4.25	3	0.0	12	0.5
4.50	3	0.0	13	0.5
4.75	0	0.0	0	0.0
5.00	3	0.0	15	0.6
5.25	1	0.0	5	0.2
5.50	0	0.0	0	0.0
5.75	0	0.0	0	0.0
6.00	0	0.0	0	0.0
6.25	0	0.0	0	0.0
6.50	0	0.0	0	0.0
6.75	1	0.0	7	0.3
7.00	0	0.0	0	0.0
7.25	0	0.0	0	0.0
7.50	1	0.0	7	0.3
7.75	0	0.0	0	0.0
8.00	0	0.0	0	0.0
8.25	1	0.0	8	0.3
8.25	0	0.0	0	0.0



For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

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PIPE CAPACITY CALCULATIONS

10 YEAR STORM EVENT

Pipe Description				Draiange Area (Acres)			Comp. C-Value	CA	Time of Concentration (min)			I (in./hr)	Qc=CIA (cfs)	
Length #	DA #	From	To	Total	Imperv. C=0.90	Pervious C=0.30			Inlet	Drain	Total			
DRAINAGE PIPES														
1		CB-2	CB-1	0.195	0.185	0.010	0.87	0.170	10	0.09	10.09	4.3	0.73	
2		CB-1	FE-1	1.140	1.005	0.135	0.83	0.945	10	0.04	10.04	4.3	4.06	
3		CB-3	DMH-1	0.117	0.108	0.009	0.85	0.100	10	0.05	10.05	4.3	0.43	
4		CB-4	DMH-1	0.188	0.150	0.038	0.78	0.146	10	0.05	10.05	4.3	0.63	
5		DMH-1	DMH-2	0.305	0.258	0.047	0.81	0.246	10	1.04	11.04	4.3	1.06	
6		BASIN-4	DMH-2										0.97	(HYDROCAD)
7		DMH-2	DMH-3	0.305	0.258	0.047	0.81	0.246	10	0.35	10.35	4.3	2.03	
8		DMH-3	DMH-4	0.305	0.258	0.047	0.81	0.246	10	0.00	10.00	4.3	2.03	
9		CB-5	DMH-4	0.349	0.349	0.000	0.90	0.314	10	0.01	10.01	4.3	2.32	
10		DMH-4	FE-7	0.654	0.607	0.047	0.86	0.560	10	0.20	10.20	4.3	3.38	
11		CB-6	DMH-7	1.193	1.193	0.000	0.90	1.074	10	0.01	10.01	4.3	4.62	
12		CB-7	DMH-7	0.088	0.088	0.000	0.90	0.079	10	0.01	10.01	4.3	0.34	
13		DMH-7	DMH-6	1.281	1.281	0.000	0.90	1.153	10	0.00	10.00	4.3	4.96	
14		DMH-6	DMH-5	1.281	1.281	0.000	0.90	1.153	10	0.00	10.00	4.3	4.96	
15		DMH-23	DMH-24	0.280	0.280	0.000	0.90	0.252	10	0.25	10.25	4.3	1.08	
16		DMH-24	DMH-25	0.280	0.280	0.000	0.90	0.252	10	0.21	10.21	4.3	1.08	
17		TR. GR.-2	DMH-25	0.123	0.123	0.000	0.90	0.111	10	0.04	10.04	4.3	0.48	
18		DMH-25	DMH	0.403	0.403	0.000	0.90	0.363	10	0.23	10.23	4.3	1.56	
19		DMH	DMH	0.403	0.403	0.000	0.90	0.363	10	0.18	10.18	4.3	1.56	
20		DMH	DMH-5	0.403	0.403	0.000	0.90	0.363	10	0.10	10.10	4.3	1.56	
21		DMH-5	FE-10	1.684	1.684	0.000	0.90	1.516	10	0.33	10.33	4.3	6.52	
22		DMH-11	DMH-12	0.111	0.111	0.000	0.90	0.100	10	0.37	10.37	4.3	0.43	
23		DMH-12	DMH-13	0.111	0.111	0.000	0.90	0.100	10	0.45	10.45	4.3	0.43	
24		DMH-13	DMH-14	0.111	0.111	0.000	0.90	0.100	10	0.66	10.66	4.3	0.43	
25		DMH-14	DMH-15	0.111	0.111	0.000	0.90	0.100	10	0.95	10.95	4.3	0.43	
26		DMH-15	FE-8	0.111	0.111	0.000	0.90	0.100	10	0.47	10.47	4.3	0.43	
27		TR. GR.-1	DMH-16	0.831	0.736	0.095	0.83	0.691	10	0.00	10.00	4.3	2.97	
28		DMH-16	DMH-17	0.831	0.736	0.095	0.83	0.691	10	0.01	10.01	4.3	2.97	
29		DMH-17	DMH-18	2.134	2.039	0.095	0.87	1.864	10	0.21	10.21	4.3	8.01	
30		DMH-18	DMH-19	2.134	2.039	0.095	0.87	1.864	10	0.23	10.23	4.3	8.01	
31		DMH-22	DMH-21	1.333	1.333	0.000	0.90	1.200	10	0.14	10.14	4.3	5.16	
32		DMH-21	DMH-20	1.791	1.791	0.000	0.90	1.612	10	0.48	10.48	4.3	6.93	
33		SRC	DMH-20							0.24			0.00	(HYDROCAD)
34		DMH-20	DMH-19	1.791	1.791	0.000	0.90	1.612	10	0.46	10.46	4.3	6.93	
35		DMH-19	FE-9	3.925	3.830	0.095	0.89	3.476	10	0.28	10.28	4.3	14.94	

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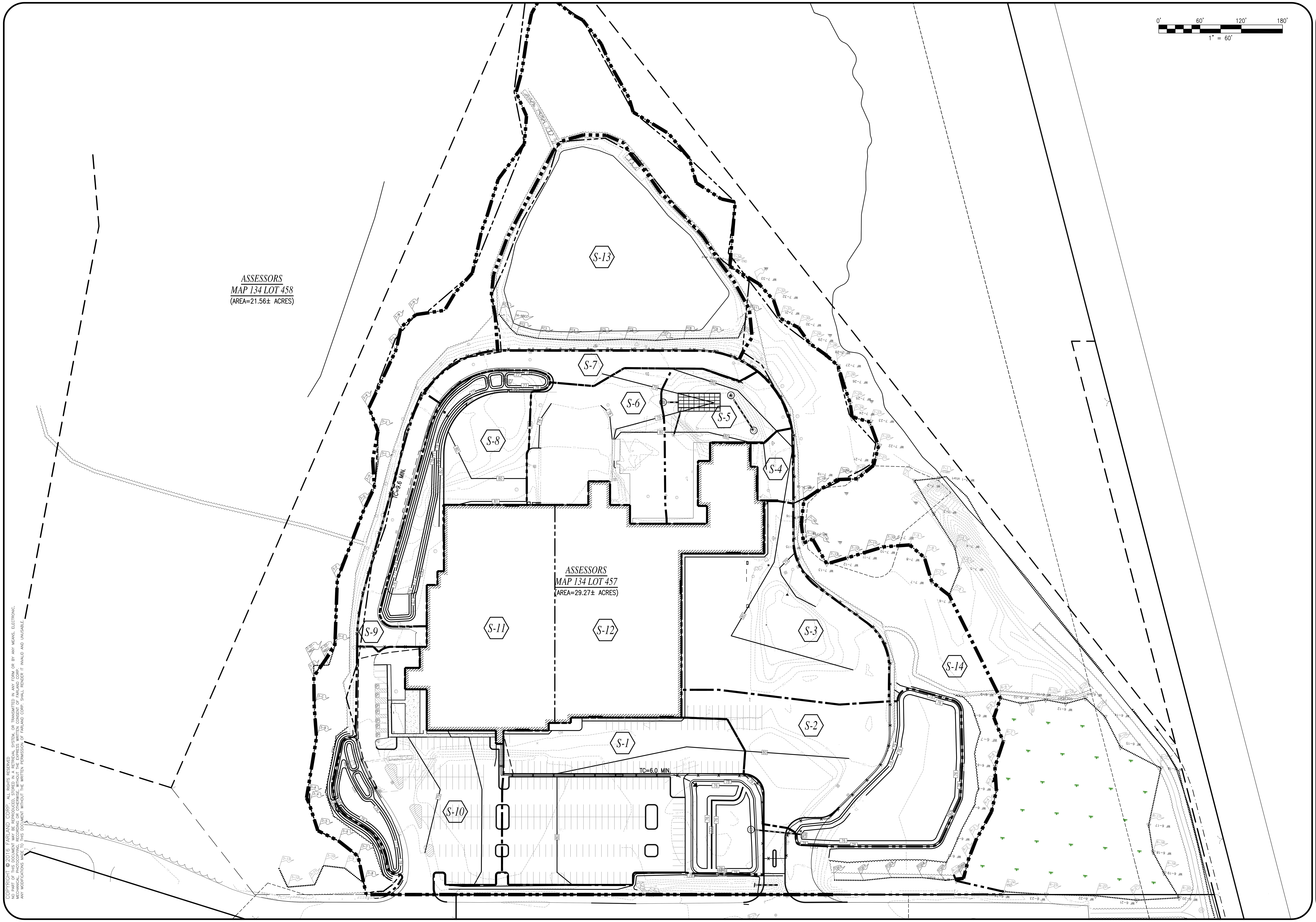
PIPE CAPACITY CALCULATIONS

10 YEAR STORM EVENT

Length #	Pipe Diameter (in)	Pipe Material (n-value)	Slope (ft./ft.)	Length (ft)	Full Flow			Current Flow				Pipe capacity
					Vf (ft/sec)	Qf (cfs)	Vc (ft/sec)	Qc (cfs)	Qc/Qf	d/D (in.)	Flow Depth in pipe (in)	Flow capacity check
DRAINAGE PIPES												
1	12	0.013	0.0059	17	3.48	2.74	3.02	0.73	0.27	0.3	4.2	**OK!**
2	12	0.013	0.0190	16	6.25	4.91	7.13	4.06	0.83	0.7	8.1	**OK!**
3	12	0.013	0.0300	14	7.86	6.17	4.55	0.43	0.07	0.2	2.1	**OK!**
4	12	0.013	0.0330	15	8.24	6.47	5.35	0.63	0.10	0.2	2.5	**OK!**
5	12	0.013	0.0046	190	3.08	2.42	3.04	1.06	0.44	0.5	5.4	**OK!**
6	12	0.013	0.0100	36	4.54	3.56	3.96	0.97	0.27	0.4	4.2	**OK!**
7	12	0.013	0.0044	72	3.01	2.36	3.45	2.03	0.86	0.7	8.3	**OK!**
8	12	0.013	0.0016	79	1.81	1.43	-12896.82	2.03	1.42	3.1	37.7	**FLOW TOO HIGH**
9	12	0.013	0.1170	7	15.52	12.19	12.34	2.32	0.19	0.3	3.6	**OK!**
10	12	0.013	0.0103	64	4.60	3.62	5.36	3.38	0.93	0.7	8.9	**OK!**
11	12	0.013	0.0900	7	13.61	10.69	13.39	4.62	0.43	0.4	5.4	**OK!**
12	12	0.013	0.1340	5	16.61	13.04	6.83	0.34	0.03	0.1	1.2	**OK!**
13	12	0.013	0.0029	218	2.44	1.92	########	4.96	2.58	181.4	2177.3	**FLOW TOO HIGH**
14	12	0.013	0.0057	103	3.42	2.69	########	4.96	1.84	18.8	225.1	**FLOW TOO HIGH**
15	12	0.013	0.0047	47	3.11	2.44	3.08	1.08	0.44	0.5	5.4	**OK!**
16	12	0.013	0.0042	38	2.94	2.31	2.96	1.08	0.47	0.5	5.6	**OK!**
17	6	0.013	0.0688	16	7.50	1.47	6.83	0.48	0.32	0.4	2.3	**OK!**
18	12	0.013	0.0053	49	3.30	2.59	3.54	1.56	0.60	0.6	6.6	**OK!**
19	12	0.013	0.0118	51	4.93	3.87	4.76	1.56	0.40	0.4	5.2	**OK!**
20	12	0.013	0.0273	40	7.50	5.89	6.49	1.56	0.26	0.3	4.2	**OK!**
											0.0	
21	18	0.013	0.0085	120	5.48	9.68	6.03	6.52	0.67	0.6	10.7	**OK!**
22	18	0.013	0.0103	64	6.03	10.66	2.87	0.43	0.04	0.1	2.3	**OK!**
23	18	0.013	0.0103	77	6.03	10.66	2.87	0.43	0.04	0.1	2.3	**OK!**
24	18	0.013	0.0103	113	6.03	10.66	2.87	0.43	0.04	0.1	2.3	**OK!**
25	18	0.013	0.0103	163	6.03	10.66	2.87	0.43	0.04	0.1	2.3	**OK!**
26	18	0.013	0.0103	81	6.03	10.66	2.87	0.43	0.04	0.1	2.3	**OK!**
27	6	0.013	0.0410	11	5.79	1.14	########	2.97	2.61	195.8	1174.9	**FLOW TOO HIGH**
28	12	0.013	0.0540	5	10.54	8.28	9.87	2.97	0.36	0.4	4.8	**OK!**
29	18	0.013	0.0103	85	6.03	10.66	6.77	8.01	0.75	0.6	11.5	**OK!**
30	18	0.013	0.0103	94	6.03	10.66	6.77	8.01	0.75	0.6	11.5	**OK!**
31	18	0.013	0.0047	38	4.08	7.20	4.54	5.16	0.72	0.6	11.1	**OK!**
32	24	0.013	0.0013	86	2.60	8.16	2.97	6.93	0.85	0.7	16.5	**OK!**
33	8	0.013	0.0833	35	9.99	3.49	2.45	0.00	0.00	0.0	0.4	**OK!**
34	24	0.013	0.0021	101	3.30	10.37	3.62	6.93	0.67	0.6	14.2	**OK!**
35	30	0.013	0.0044	99	5.54	27.21	5.82	14.94	0.55	0.5	15.6	**OK!**



REVISIONS

CHRISTIAN ALBERT FARLAND No. 47544 CIVIL

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NEW BEDFORD, MA 02740
P.508.717.3479
OFFICES IN:
- TAUNTON
- MARLBOROUGH
- WARWICK, RI

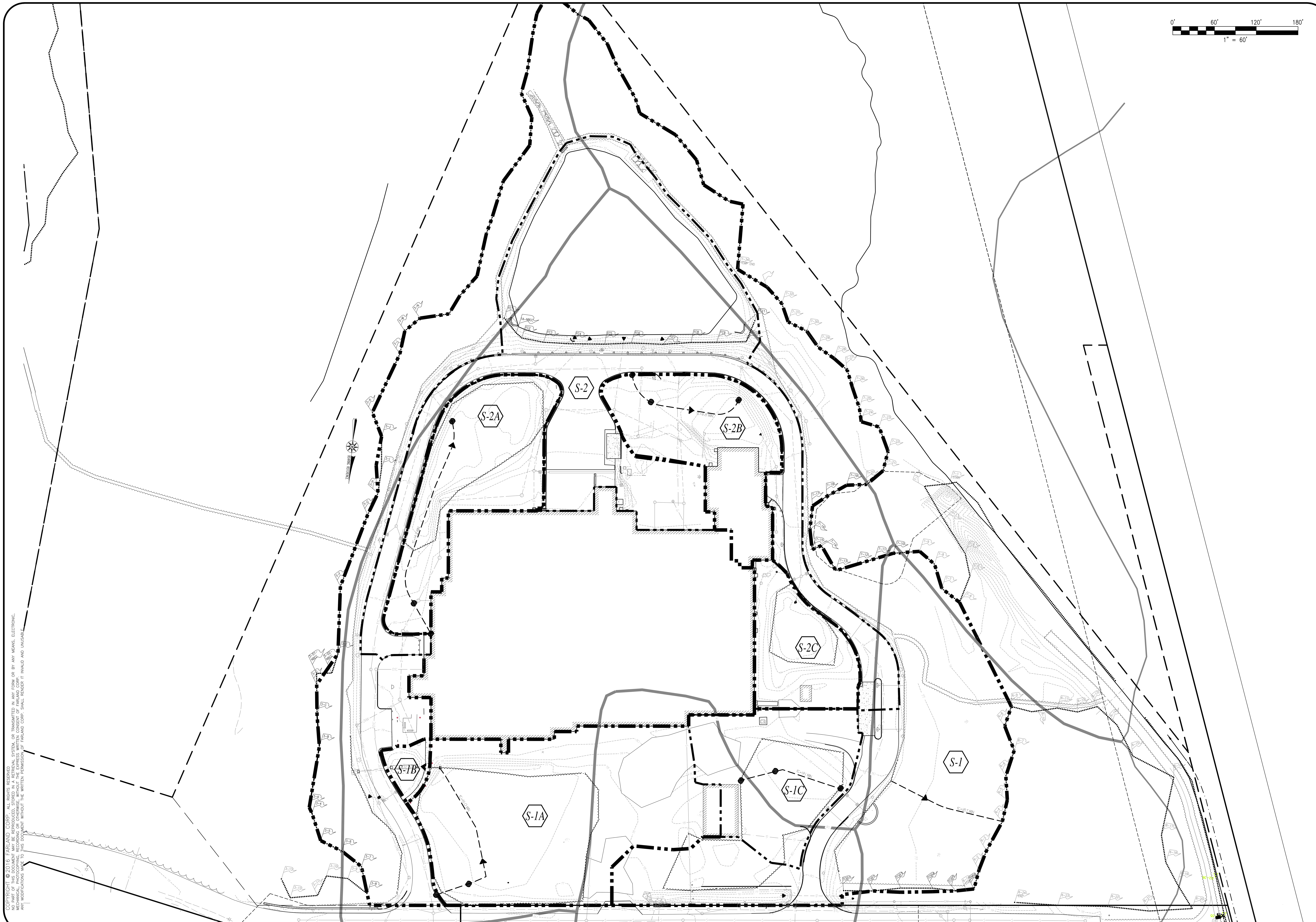
DRAWN BY: JKM/MJW
DESIGNED BY: CAF
CHECKED BY: CAF

SITE PLAN
50 DUCHAINE BLVD
ASSESSORS MAP 134 LOTS 456, 457, 458 & 459
NEW BEDFORD, MASSACHUSETTS

PREPARED FOR: EVERSOURCE ENERGY
PO BOX 100085 – N2
DULUTH, GA 30096

NOVEMBER 18, 2016
SCALE: 1"=60'
JOB NO. 15–500
LATEST REVISION:

POST–DEVELOPMENT DRAIANGE MAP
SHEET 5A OF 9



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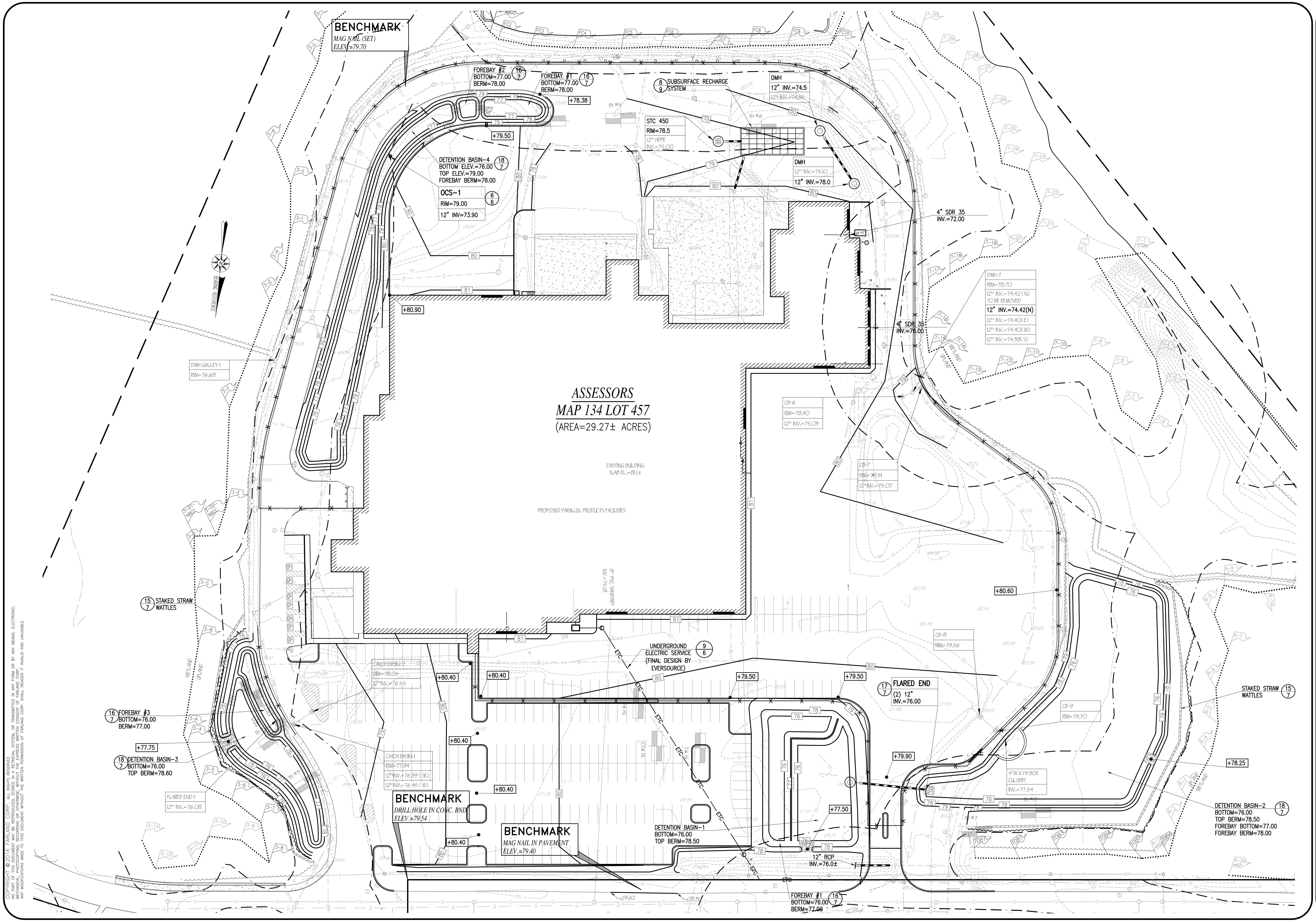
PO BOX 100085 – N2
DULUTH, GA 30096

NOVEMBER 18, 2016
SCALE: 1"=60'
JOB NO. 15-500
LATEST REVISION:

PRE-DEVELOPMENT DRAINAGE MAP
SHEET 3a OF 9



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- WARWICK, RI

DRAWN BY: JKM/MJW
DESIGNED BY: CAF
CHECKED BY: CAF

SITE PLAN

50 DUCHAINE BLVD

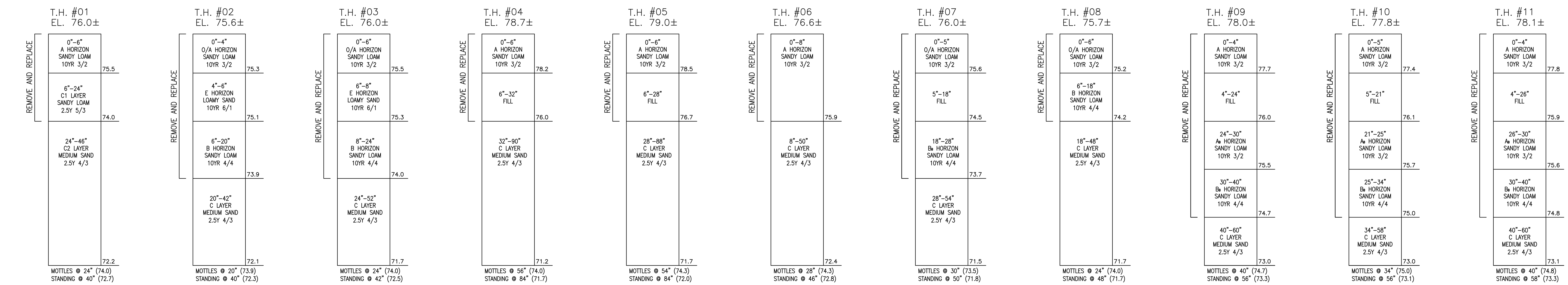
ASSESSORS MAP 134 LOTS 456, 457, 458 & 459
NEW BEDFORD, MASSACHUSETTS

PREPARED FOR:
EVERSOURCE ENERGY
PO BOX 100085 – N2
DULUTH, GA 30096

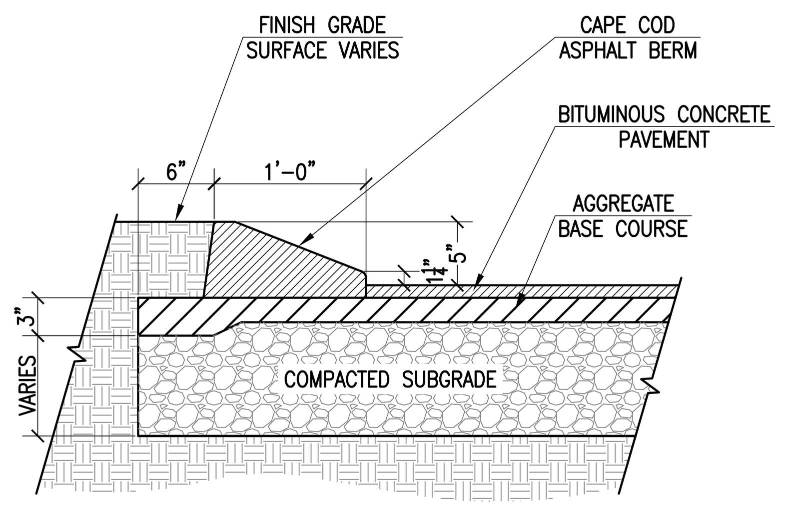
FEBRUARY 17, 2016
SCALE: 1"=40'
JOB NO. 15-500
LATEST REVISION:

GRADING & UTILITY
SHEET 5 OF 9

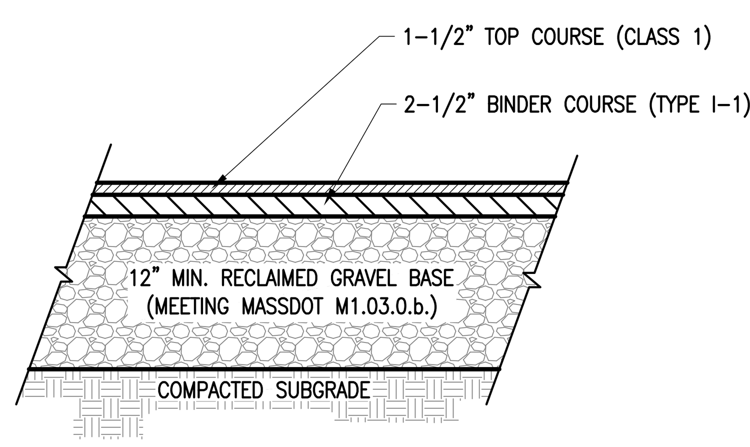
REVISIONS



1/6 SOIL PROFILES
NOT TO SCALE

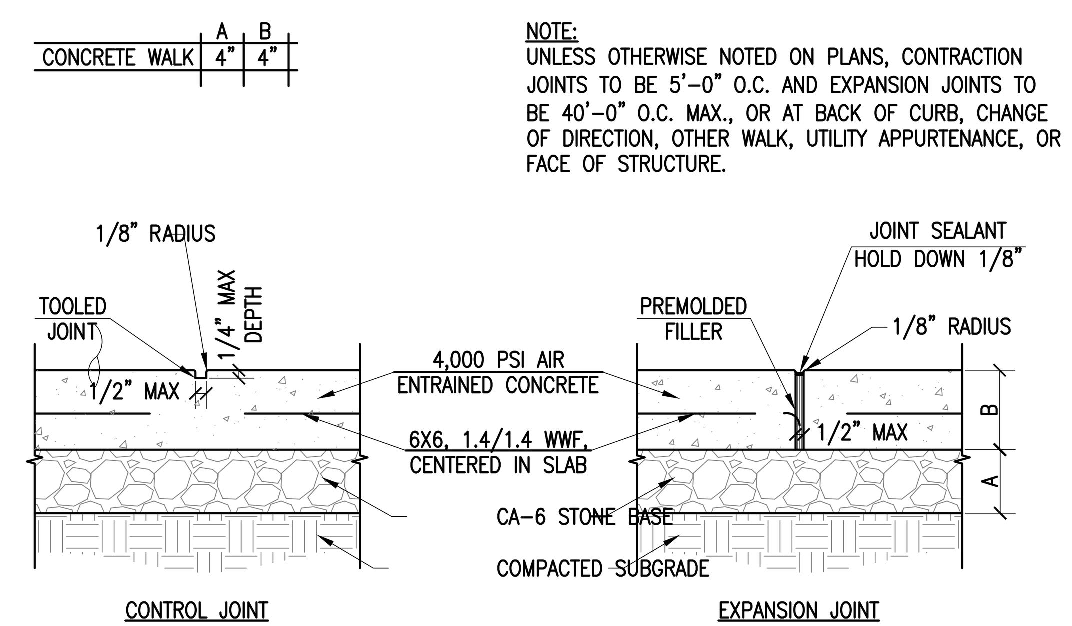


2/6 BITUMINIOUS CONCRETE CAPE COD BERM
NOT TO SCALE

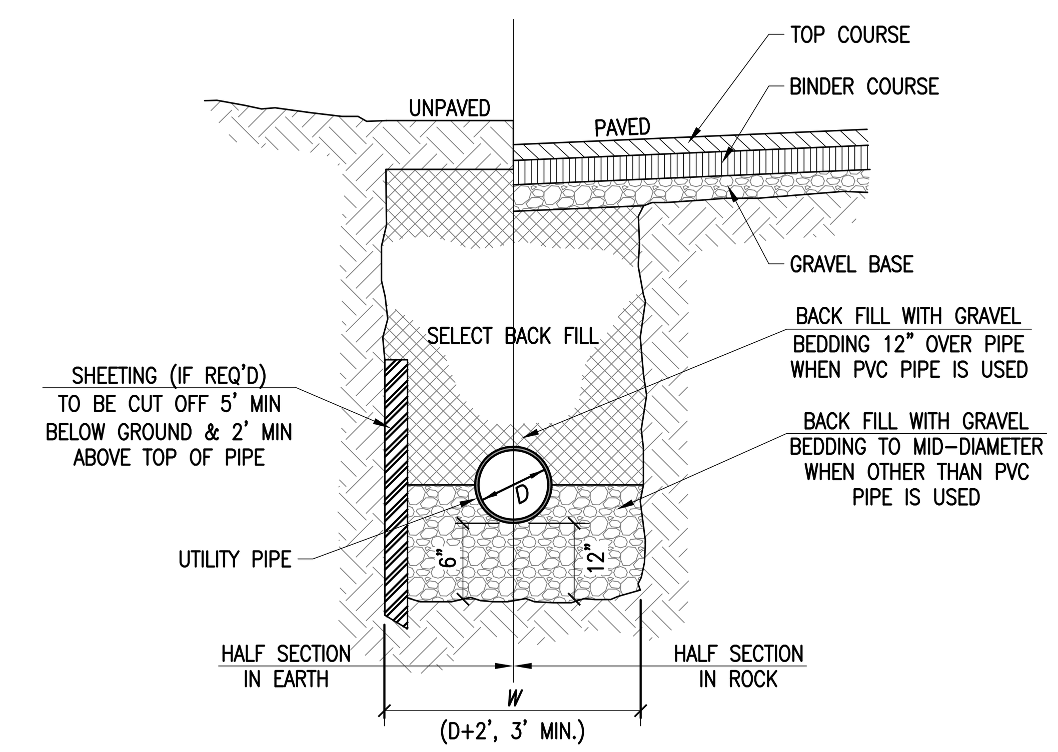


3/6 BITUMINOUS CONCRETE PAVEMENT
NOT TO SCALE

NOTE:
UNLESS OTHERWISE NOTED ON PLANS, CONTRACTION JOINTS TO BE 5'-0" O.C. AND EXPANSION JOINTS TO BE 40'-0" O.C. MAX., OR AT BACK OF CURB, CHANGE OF DIRECTION, OTHER WALK, UTILITY APPURTENANCE, OR FACE OF STRUCTURE.

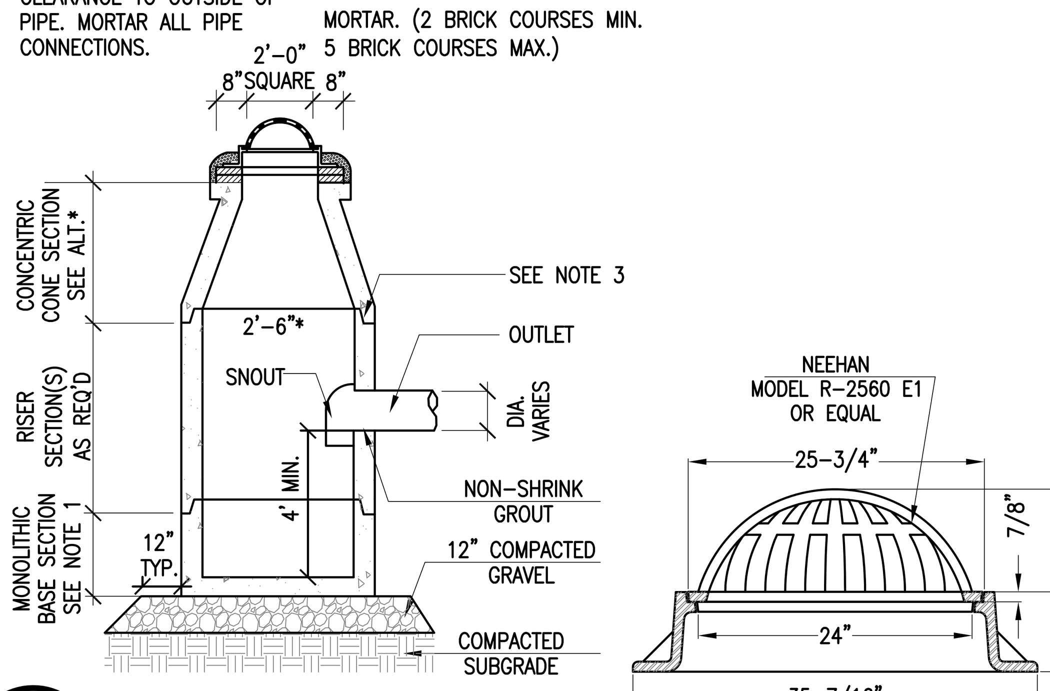


4/6 CONCRETE PAVEMENT SIDEWALK
NOT TO SCALE



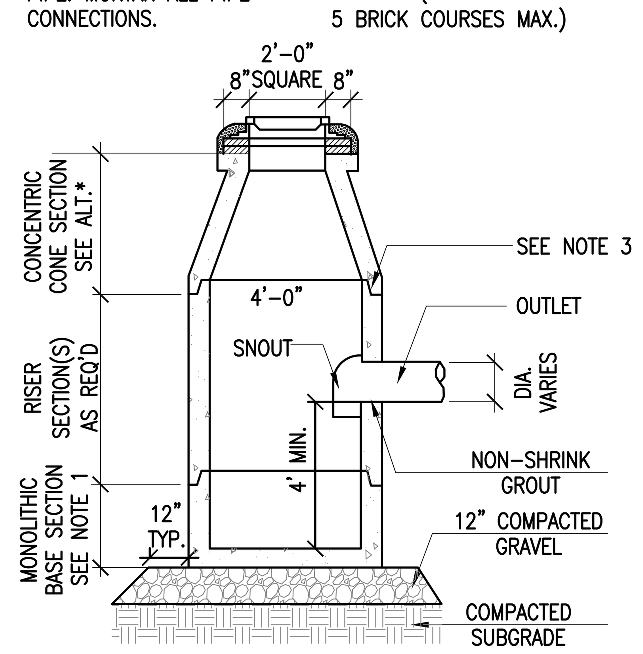
5/6 UTILITY TRENCH
NOT TO SCALE

NOTES:
1. ALL SECTIONS SHALL BE DESIGNED FOR HS-20 LOADING.
2. PROVIDE "V" KNOCKOUTS FOR PIPES WITH 1" MAX. CLEARANCE TO OUTSIDE OF PIPE. MORTAR ALL PIPE CONNECTIONS.
3. JOINT SEALANT BETWEEN PRECAST SECTIONS SHALL BE PREFORMED BUTYL RUBBER.
4. CATCH BASIN FRAME SHALL BE SET IN FULL MORTAR BED. ADJUST TO GRADE WITH CLAY BRICK AND MORTAR. (2 BRICK COURSES MIN. 5 BRICK COURSES MAX.)
5. FRAME AND GRATE TO BE EQUAL TO NEENAH R-2560 E-1 BEEHIVE STYLE.

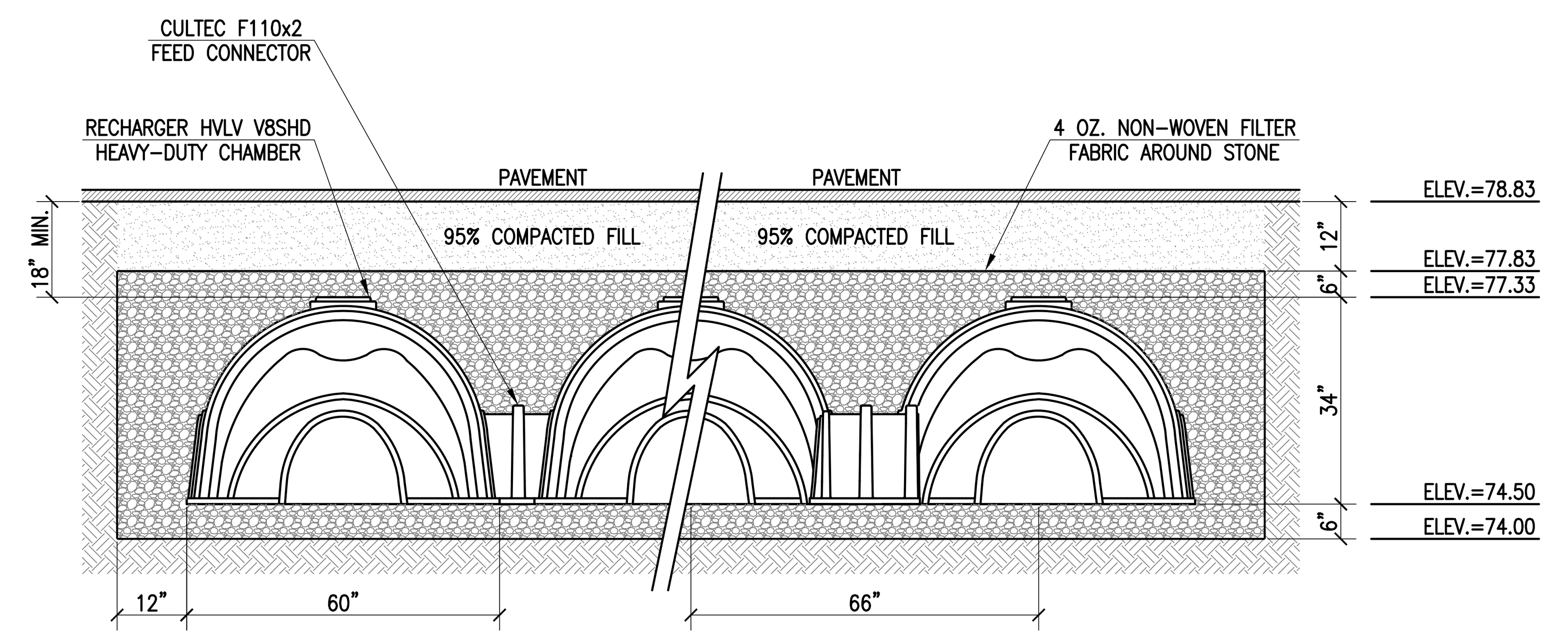


6/6 BEEHIVE CATCH BASIN
NOT TO SCALE

NOTES:
1. ALL SECTIONS SHALL BE DESIGNED FOR HS-20 LOADING.
2. PROVIDE "V" KNOCKOUTS FOR PIPES WITH 1" MAX. CLEARANCE TO OUTSIDE OF PIPE. MORTAR ALL PIPE CONNECTIONS.
3. JOINT SEALANT BETWEEN PRECAST SECTIONS SHALL BE PREFORMED BUTYL RUBBER.
4. MANHOLE FRAME SHALL BE SET IN FULL MORTAR BED. ADJUST TO GRADE WITH CLAY BRICK AND MORTAR. (2 BRICK COURSES MIN. 5 BRICK COURSES MAX.)



7/6 DEEP SUMP MANHOLE
NOT TO SCALE



8/6 CULTEC RECHARGER V8HD HEAVY DUTY CROSS SECTION
NOT TO SCALE

COMMONWEALTH OF MASSACHUSETTS
CHRISTIAN ALBERT FARLAND
No. 47544
CIVIL
REGISTERED PROFESSIONAL ENGINEER

FARLAND CORP.
www.FarlandCorp.com
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OFFICES IN:
●TAUNTON
●MARLBOROUGH
●WARWICK, RI

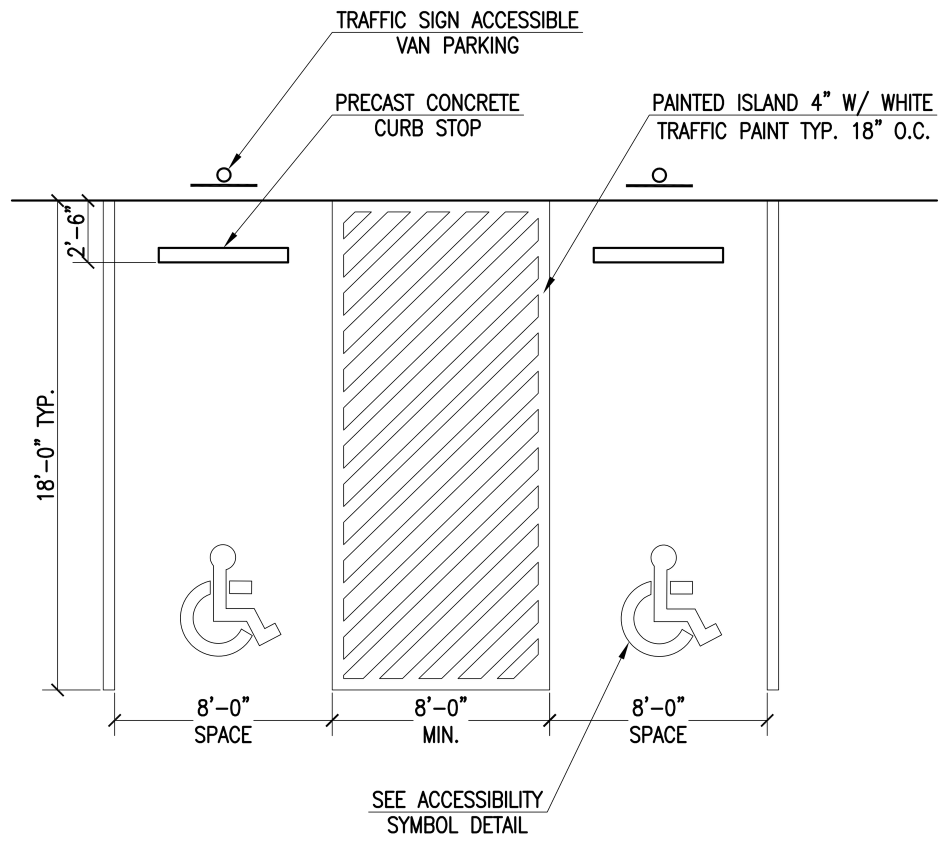
DRAWN BY: JKM/MJW
DESIGNED BY: CAF
CHECKED BY: CAF

SITE PLAN
50 DUCHAINE BLVD
ASSESSORS MAP 134 LOTS 456, 457, 458 & 459
NEW BEDFORD, MASSACHUSETTS

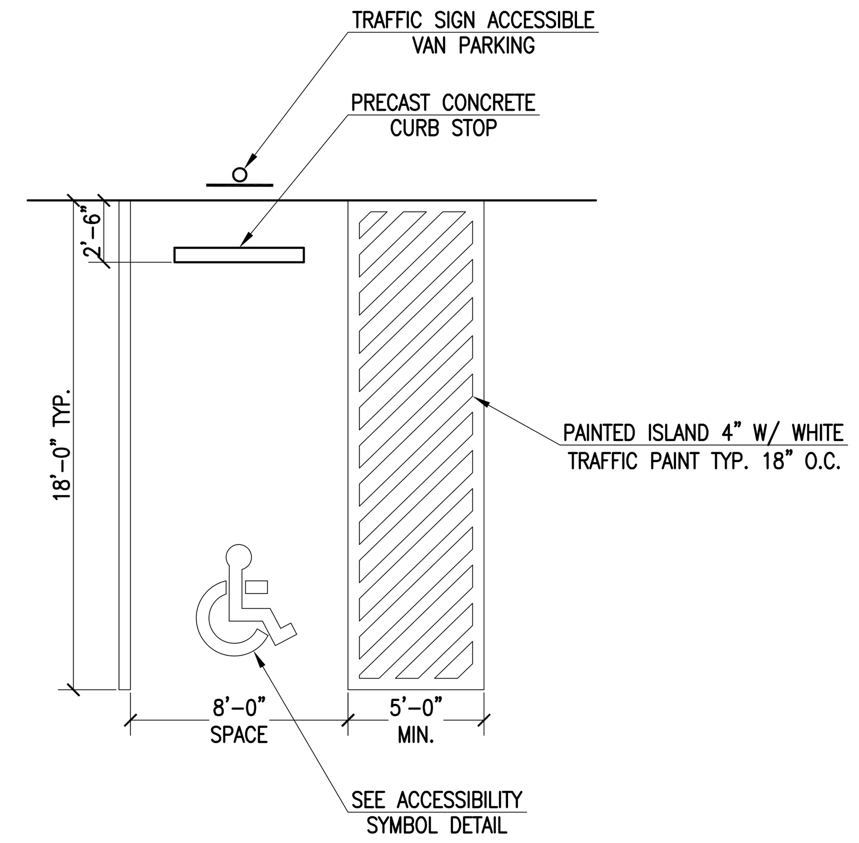
PREPARED FOR:
EVERSOURCE ENERGY
PO BOX 100085 – N2
DULUTH, GA 30096

FEBRUARY 17, 2016
SCALE: N.T.S.
JOB NO. 15-500
LATEST REVISION:

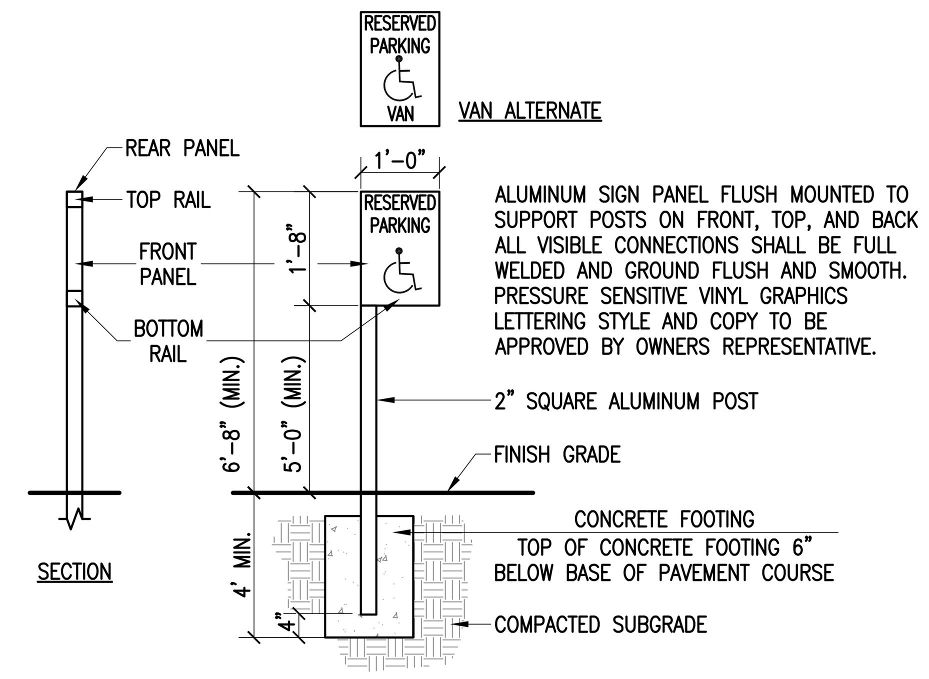
DETAIL



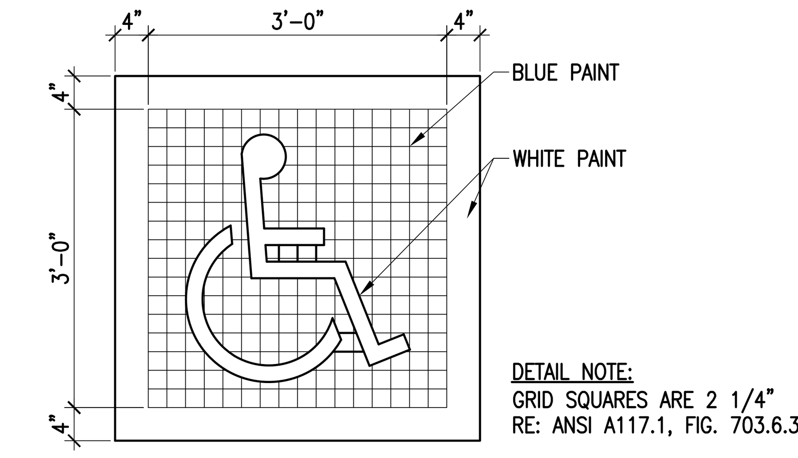
10/7 ACCESSIBLE PARKING LAYOUT
NOT TO SCALE



11/7 ACCESSIBLE PARKING LAYOUT
NOT TO SCALE

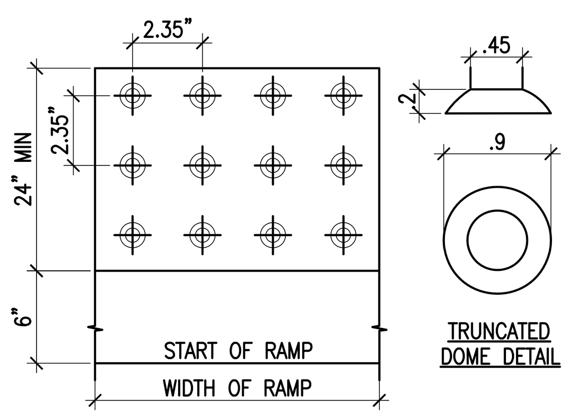


12/7 ACCESSIBLE PARKING SIGN
NOT TO SCALE

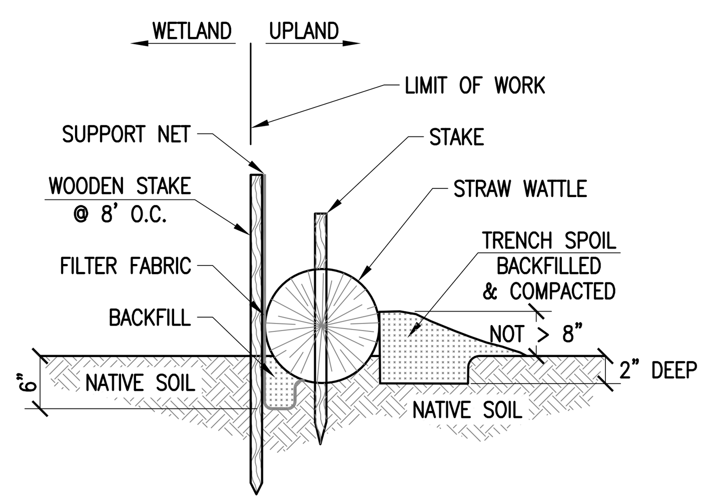


13/7 ACCESSIBLE PARKING SYMBOL
NOT TO SCALE

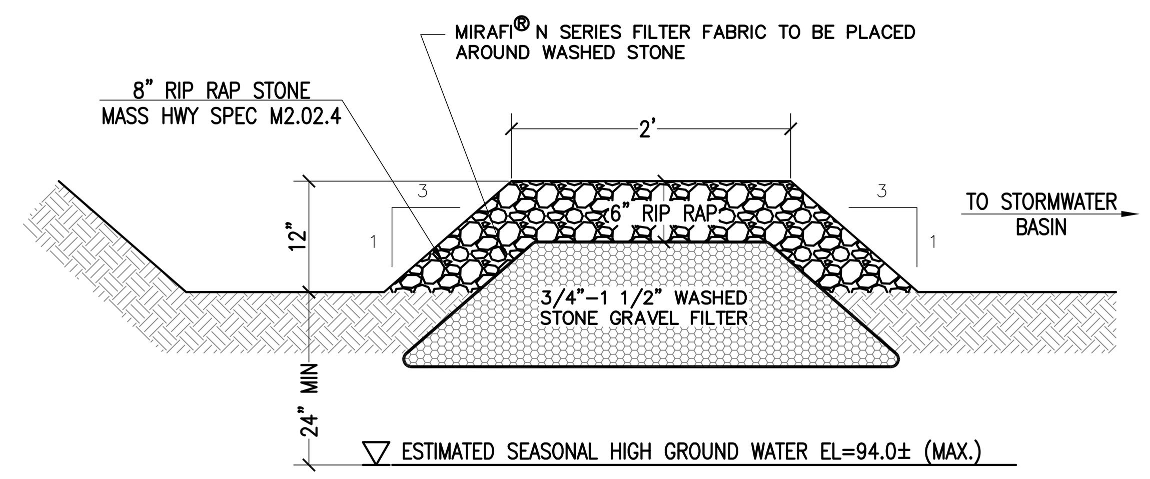
NOTES:
1. COLOR OF TACTILE DETECTABLE WARNINGS SHALL BE YELLOW.
2. CONTRACTOR SHALL INSTALL TILE PER MANUFACTURER'S SPECIFICATIONS
3. PREFERRED PRODUCT SHALL BE REPLACEABLE (WET-SET) COMPOSITE TACTILE BY ADA SOLUTIONS, INC. FOR PRICING QUOTATIONS, PLACING ORDERS, AND FURTHER INFORMATION, CALL JON MEHLMAN, EAST REGIONAL ACCOUNT DIRECTOR FOR ADA SOLUTIONS, INC. AT (800) 372-0519 or (978) 262-9900. DETAILED INFORMATION IS AVAILABLE AT www.adatile.com.



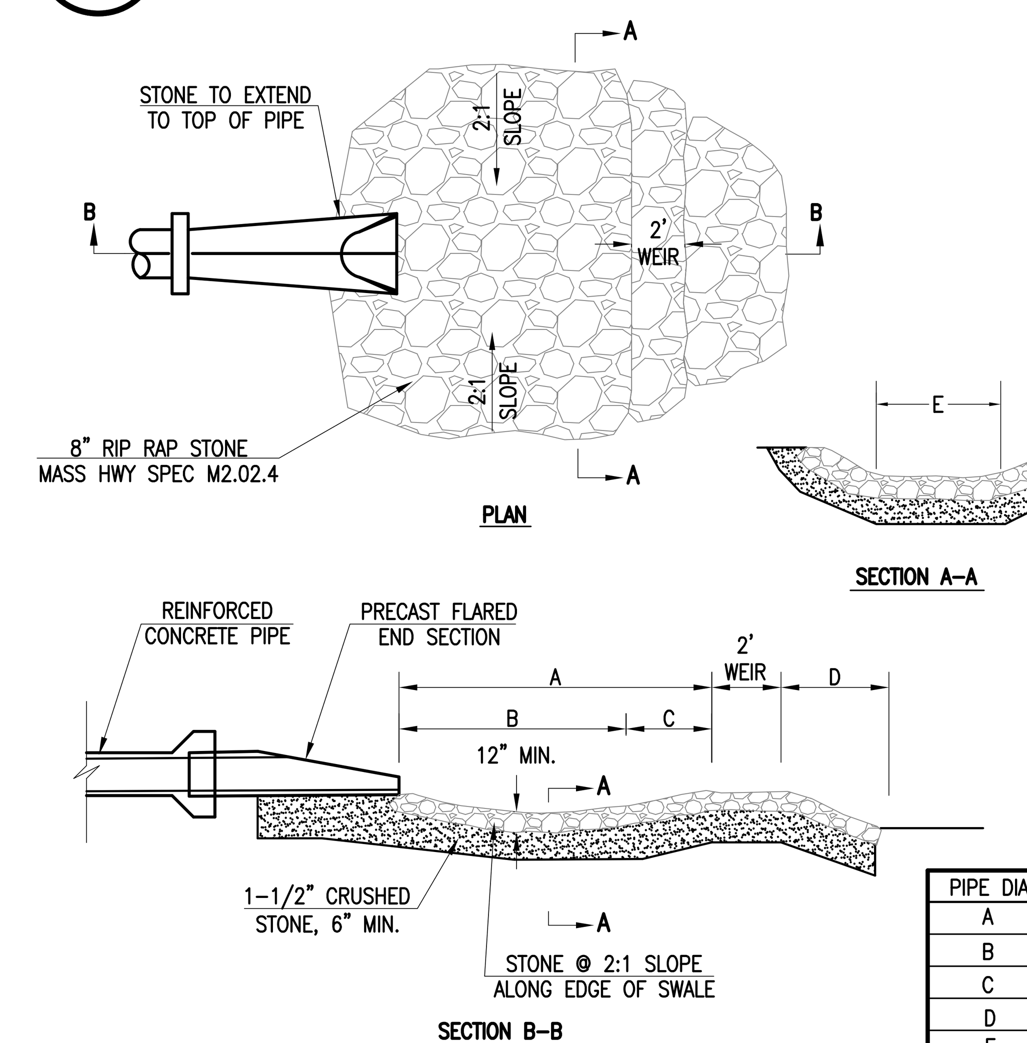
14/7 DETECTABLE WARNING DETAIL
NOT TO SCALE



15/7 STAKED STRAW WATTLE WITH SILT FENCE
NOT TO SCALE



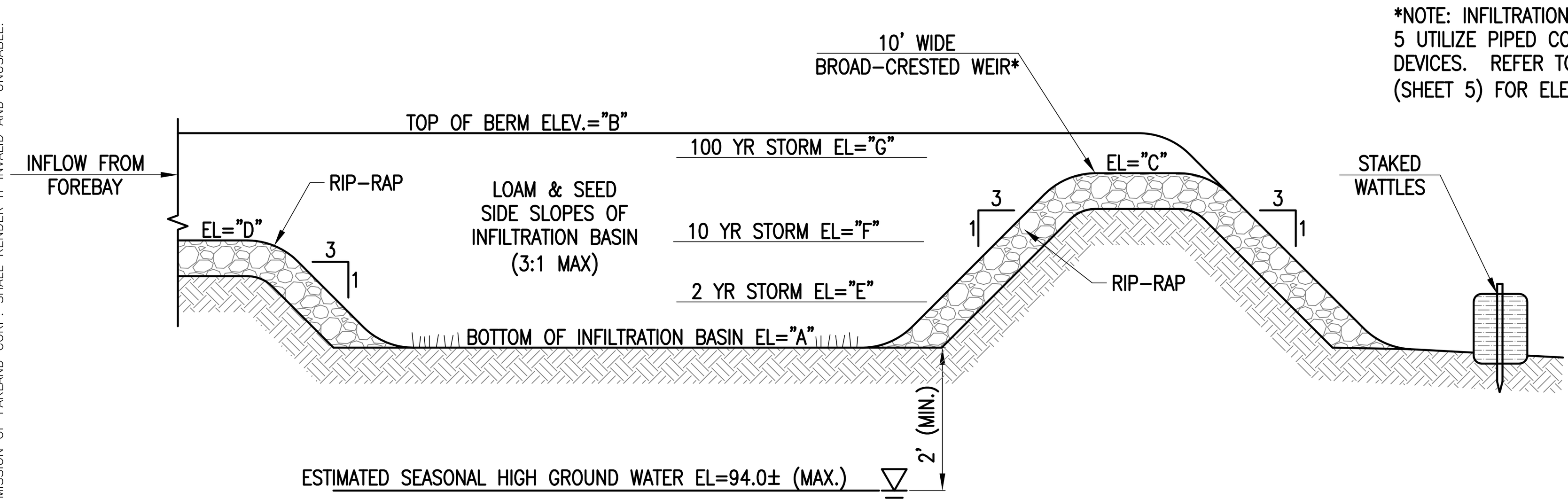
16/7 SEDIMENT FOREBAY W/ GRAVEL FILTER
NOT TO SCALE



PIPE DIA.	12"
A	10'-0"
B	7'-6"
C	2'-6"
D	3'-0"
E	4'-0"

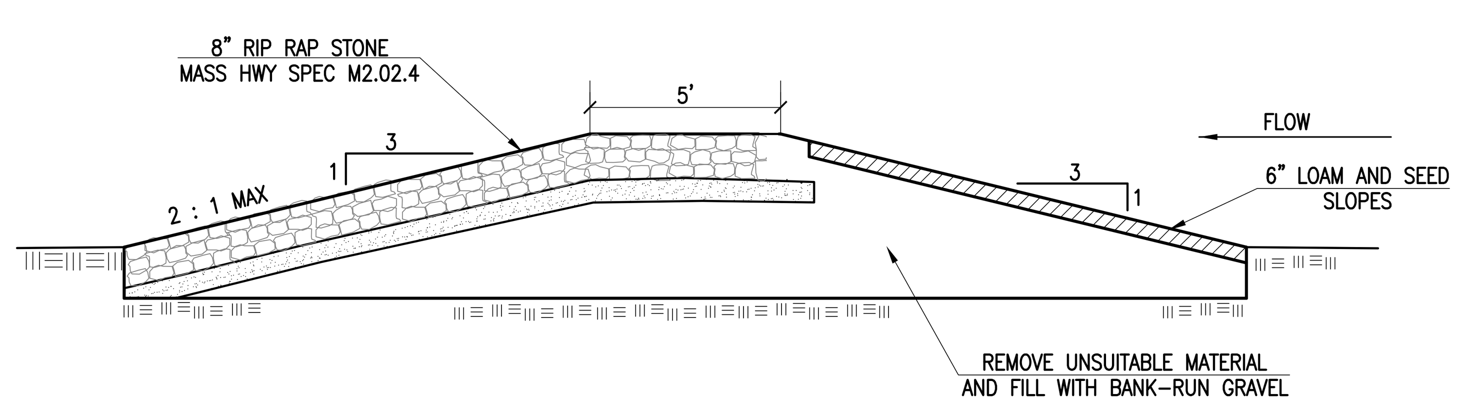
17/7 FLARED END OUTLET
NOT TO SCALE

*NOTE: INFILTRATION BASINS 1B, 1D, 3, 4, AND 5 UTILIZE PIPED CONDUIT OUTLET CONTROL DEVICES. REFER TO GRADING & UTILITY PLAN (SHEET 5) FOR ELEVATION DETAILS.



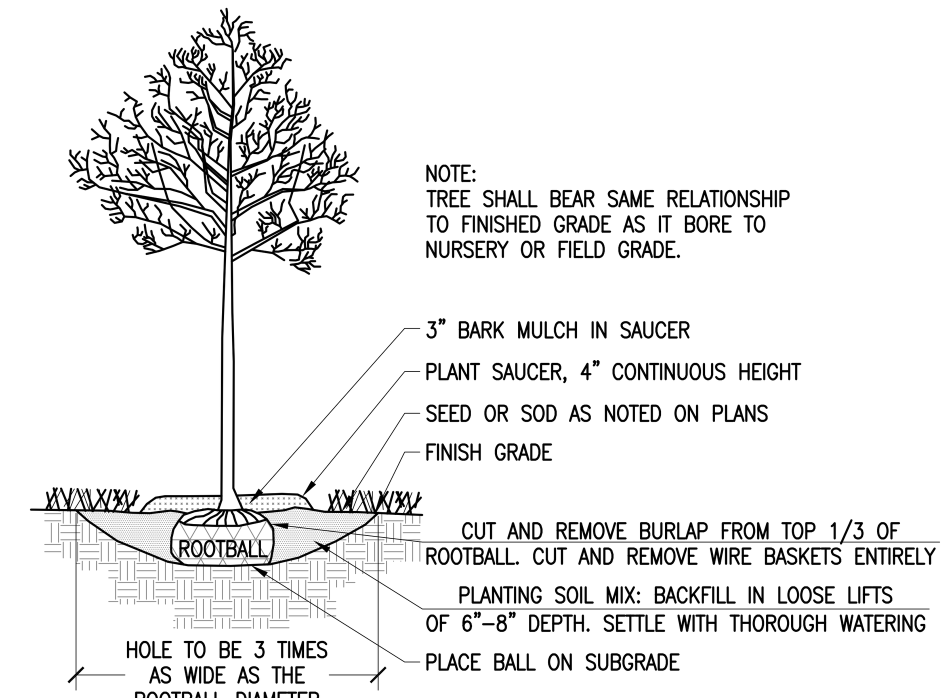
DETENTION BASIN	"A"	"B"	"C"	"D"	"E"	"F"	"G"
1	76.00	78.60	77.50	79.50	77.23	77.66	78.10
2	76.00	78.50	78.25	N/A	76.48	76.81	77.51
3	76.00	78.60	77.75	N/A	77.59	77.91	78.12
4	76.00	79.00	*	79.50	77.95	78.41	78.78

18/7 INFILTRATION BASIN
NOT TO SCALE



19/7 OVERFLOW SPILLWAY DETAIL
NOT TO SCALE

NOTE:
TREE SHALL BEAR SAME RELATIONSHIP TO FINISHED GRADE AS IT BORE TO NURSERY OR FIELD GRADE.



20/7 TREE PLANTING
NOT TO SCALE

REVISIONS

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SHEET 8 OF 9