YANKEE BUS LINE HEADQUARTERS
34 SCANLON DRIVE
Randolph, MA 02368

STORMWATER REPORT
Pursuant to M.G.L c. 131 §40
& Randolph Ordinances Chapter 195

Submitted to:
Town of Randolph Stormwater Department
Town of Randolph Planning Board

Applicant:
Scanlon Suburban LLC/ 451 High Street LLC
800 Boylston Street
Boston, MA 02116

Architect:
TGAS
146 MT Auburn Street
Cambridge, MA 02138

Surveyor:
CHA
141 Longwater Drive
Suite 104
Norwell, MA 02061

Civil Engineer:
Samiotes Consultants, Inc.
20 A Street
Framingham, MA 01701

20 APRIL 2023

Town of Randolph
Department of Public Works
41 South Main Street
Randolph, MA 02368
781-961-0940

STORM WATER AUTHORITY
APPLICATION FOR STORMWATER MANAGEMENT PERMIT

SUBJECT PROPERTY							
Street Address	34 SCANLON DRIVE						
Map – Block - Parcel	05-A-002.389,001.2,007.01,006.04,006.02,006.A	Residential	☐	Commercial	☑	Industrial	☐

PROPERTY OWNER INFORMATION			
Name	Scanlon Suburban LLC/ 451 High Street LLC	Telephone	908-239-4642
Address	800 BOYLSTON ST		
City, ST, ZIP	BOSTON, MA 02116	Email	acampbell@coreinvestmentinc.com

APPLICANT INFORMATION (if different from owner)			
Name		Telephone	
Address			
City, ST, ZIP		Email	

CONSULTANT/AGENT INFORMATION (if applicable)			
Name	Samiotes Consultants, Inc.	Telephone	508-877-6688
Address	20 A Street		
City, ST, ZIP	Framingham, MA 01778	Email	SGarvin@samiotes.com

PROJECT TYPE (select all that apply)			
☐	Land disturbance 5,000 sq. ft. to 21,799 sq. ft.	☐	Amendment of Permit/Approval
☐	Land disturbance 21,780 sq. ft. to 5 acres	☐	Extension of Permit/Approval
☑	Land disturbance 5 to 10 acres	☐	Resubmittal after denial
☐	Land disturbance > 10 acres	☐	Certificate of Compliance
☐	Detention/Retention/Infiltration System	☐	Other

PROJECT DESCRIPTION (or attach a narrative description)
SEE ATTACHED NARRATIVE

By submitting an application for coverage under the Stormwater Management Permit, the Applicant agrees to the following:

1. **At a minimum, the proposed project complies with the performance standards of the most recent version of the Massachusetts Management Handbook including but not limited to:**

   a) Employing environmentally sensitive site design
   b) Evaluation of Low Impact Development practices
   c) Incorporation of source controls of contaminants and employing BMP's to minimize stormwater pollution
   d) Sizing of water quality of BMP's are based on 1-inch runoff
   e) Methodology for hydrologic analyses (if necessary) is based on TR-55/TR-20 methodology
   f) Designing redevelopment of existing sites must provide a net improvement to stormwater conditions.

2. **The activity shall not increase either the rate or volume of stormwater runoff leaving the site, nor shall it alter stormwater flow to any adjoining properties, public ways or any wetland resource areas, unless otherwise permitted based on improvements over existing conditions.**

   Check all that apply to this project:

   - [x] Roof drains emptying into dry wells/recharge basins
   - [ ] Vegetated swales constructed
   - [ ] Porous pavement installed; _____sq. ft.
   - [ ] Water quality swale
   - [ ] Rain barrels/cistern for irrigation
   - [x] Other methods (please list/describe):

3. **The Applicant shall provide and maintain Erosion and Sedimentation controls, in accordance with the latest edition of the MA DEP Stormwater Handbook, as necessary until the site is permanently stabilized. BMP's selected for erosion controls shall be chosen to minimize site disturbance from erosion control installation. As soon as the site is stabilized, such measures shall be removed.**

   Check all that apply to this project:

   - [x] Compost Sock
   - [x] Silt fencing
   - [x] Construction entrance
   - [x] Temporary vegetative cover – mulch, netting
   - [x] Permanent vegetative cover – hydro seeding, seeding, sodding
   - [x] Slope stabilization
   - [ ] Retaining walls
   - [ ] Slope drains
   - [x] Other methods (please list/describe): silt sacks

4. **The Applicant shall ensure that the site and stormwater management systems are perpetually inspected and maintained to function as designed.**

   Check all that apply to this project:

   - [x] Visual inspections by the contractor
   - [x] Visual inspections by the ~~homeowner~~ Property owner
   - [x] Operation and Maintenance Plan
   - [x] Maintenance contract for stormwater components
   - [ ] Other methods (please list/describe):

I certify that I have reviewed the design standards above and the information contained herein, including all attachments, is true, accurate and complete to the best of my knowledge. Further, I grant the Town of Randolph Stormwater Authority and its authorized agent's permission to enter the property to review this application and make inspections during and after construction.

Authorized Signature	Printed Name	Date
	Michael A. Cahill	04.19.23

SUBMISSION REQUIREMENTS

Materials (6 copies + 1 digital submission of all documents)

- ☒ **Completed application with original signatures of all owners**
- ☒ **Narrative describing the project**
- ☒ **Plans, drawings or specifications for the project**
- ☒ **Soil conditions where infiltration of stormwater is proposed**
- ☒ **Pre and Post development topography at 2-foot contour intervals**
- ☒ **Calculations demonstrating compliance with the design standards of the Ordinance. Calculations will be dependent on the disturbance activity contemplated in the application.**
- ☒ **Other materials as the SWMPC may require to determine whether the project as proposed meets the design standards of the Stormwater Ordinance**
- ☒ **Fee**

OFFICE USE ONLY:

□ Administrative Review □ Land Disturbance Permit

Comments:

_____

_____

_____

_____

Reviewed by: _____ Date: _____

Fee Paid: _____ □Cash □Check #_____

YANKEE LINE HEADQUARTERS
STORMWATER MANAGEMENT NARRATIVE
RANDOLPH, MA

APRIL 2023

Introduction

Project Description:
The new Yankee Bus Headquarters is proposed to be located at 34 Scanlon Drive. The subject site is currently home to multiple businesses. Including amongst these are Equipment Direct Sales, New Life Apostolic Church and Charles Transportation. Previously, the main site at 34 Scanlon, was owned by the neighboring, and now defunct, Lantana's Function and Events Center. Lantana's used the parking area at 34 Scanlon St. as overflow parking to accommodate large gatherings for functions being held at their facility across the street.

Day-to-day operations of the Yankee Line business vary each day due to the nature of Yankee's charter and special projects business. Though their stock is composed of 100+ coach busses and various other vehicles, the site in Randolph will be home to 66. Of these, roughly 40-60 are expected to depart and to arrive on a daily basis. Both the departure and arrival of coach busses will be staggered. Again, this is due to the nature of the operation being based on charter groups and special projects.

As is currently Yankee's practice in South Boston, the on-site activities will be carefully monitored to avoid excess light and noise pollution. Idling and backup beeping will be kept to a minimum, headlights will be dimmed, and horns are prohibited on-site. On-site activities that will occur during evening or early morning hours will be washing and fueling of the motorcoaches using a state-of-the-art wash bay system inside the maintenance garage.

The vast majority maintenance will occur during the daytime hours, but may occasionally run into the early evening. The proposed building plan allows for six maintenance bays to allow for plenty of room to bring buses inside for all required maintenance. Yankee typically performs preventive maintenance and light repair work while all heavy engine or transmission work is sent out to heavy repair shops as needed. Yankee's business model has always dictated maintaining a contemporary model fleet that results in a lack of heavy repair work, with much of the work being performed under warranty.

Soils:
Soils on the site consist of hydrological "A" "B" and "D" soils. The soils resource report, and test pit results, conducted on June 17, 2019 are located in the appendix of this report.

Existing Stormwater Management:
The existing site, consists of a one (1) story building surrounded by paved driveways, parking lots, landscaped areas. The developed area is abutted by a bordering vegetated wetlands to the southeast and areas on the perimeter of the site. The on-site impervious areas consist of the existing building, the driveways, parking lot, and associated sidewalks. In the existing condition, stormwater runoff sheets northwest to southeast where it is captured by a series of linked catch basins in the parking lot before it outlets via existing culverts to the wetlands southeast of the site.

Methodology/ Procedure

Objective:
The objective of the stormwater management for the site is to treat the stormwater runoff prior to discharge to the wetlands. The project is a redevelopment that decreases the amount of impervious which will decrease the peak storm runoff rates due to the construction of the proposed project, in addition to the Stormwater BMP's such as the rain garden and underground infiltrations ystems.

Outlined below are the numerous stormwater best management practices (BMP's) proposed to be used on site.

Proposed Stormwater Control Systems:
The following are the proposed Best Management Practices (BMP's) stormwater control system's to be used on the site to mitigate an increase in peak stormwater runoff and improve water quality:

Subsurface Structures (Infiltration Chambers): Subsurface structures are underground systems that capture runoff, and gradually infiltrate it into the groundwater. There are a number of underground infiltration systems that can be installed to enhance groundwater recharge. Subsurface structures are constructed to temporarily detain stormwater while it percolates into the underlying soil. Underground infiltration structures are feasible only where the soil is adequately permeable and the maximum water table and/or elevation is sufficiently low. They can be used to control the quantity, as well as quality, of stormwater runoff if properly designed and constructed. The structures serve as storage chambers for captured stormwater, while the surrounding soil matrix provides treatment.

Deep Sump Catch Basins: A deep sump catch basin (also known as oil and grease or hooded catch basins) acts as underground retention systems designed to remove trash, debris, and coarse sediment from stormwater runoff, and serve as temporary spill containment devices for floatables such as oil and grease that provides pretreatment. A 25% TSS removal is awarded to the deep sump catch basin when used as pre-treatment.

Water Quality Units (WQUs): Water Quality Units are a flow-through structure containing a settling or separation unit to remove sediments and other pollutants. These structures typically use the power of swirling or flowing water to separate floatables and coarser sediments, are typically designed and manufactured by private businesses, and come in different sizes to accommodate different design storms and flow conditions. Since proprietary separators can be placed in almost any location on a site, they are particularly useful when either site constraints prevent the use of other stormwater techniques or as part of a larger treatment train. Generally they are placed below ground and contain access ports so that they may be inspected and cleaned.

Rain Garden(s)/ Bioretention: Bioretention is a technique that uses soils, plants, and microbes to treat stormwater before it is infiltrated and/or discharged. Bioretention cells (also called rain gardens in residential applications) are shallow depressions filled with sandy soil topped with a thick layer of mulch and planted with dense native vegetation. Stormwater runoff is directed into the cell via piped or sheet flow. The runoff percolates through the soil media that acts as a filter. There are two types of bioretention cells: those that are designed solely as an organic filter. Filtering bioretention areas and those configured to recharge groundwater in addition to acting as a filter exfiltrating bioretention areas. Bioretention areas remove pollutants through filtration, microbe activity, and uptake by plants; contact with soil and roots provides water quality treatment better than conventional infiltration structures. Studies indicate that bioretention areas can remove from 80% to 90% of TSS. If properly designed and installed, bioretention areas remove phosphorus, nitrogen, metals, organics, and bacteria to varying degrees. Bioretention areas help reduce stress in watersheds that experience severe low flows due to excessive impervious cover.

Proposed Stormwater Management System:
The proposed stormwater management system consists of catch basins located throughout the sites impervious areas. The catch basins route the stormwater into water quality unts prior to discharging. Majority of the site discharges either to the underground infiltration systems or the rain garden. The overflow from the infiltration systems and rain garden outlet towards the wetlands via an existing 12-inch and 18-inch drain line. Portion of the parking lot runoff (due to high groundwater) is treated via catch basins and outlets. The building's roof runoff is routed to the rain garden.

Watershed Routing

Below is a summary of the various existing and proposed watersheds with a brief narrative describing the routing. The descriptions of the watersheds are depicted in sketches Ex-HYD and P-HYD located in the Appendix.

Existing Watersheds:

Existing Watershed-1: This watershed consists of majority of the site consisting of pervious areas (landscaped areas, and surrounding woods) as well as impervious areas (the building & parking lot). Stormwater runoff sheets directly towards the wetlands, and intermittent stream. Portions of the paved area sheets into catch basins that outlet directly into the resource area via a 12-inch drain line at a culvert located between wetland flags WF-S-22 and WF-S-21.

Proposed Watersheds:

P-Watershed-1: This watershed consists of the northeastern portion of the site. The watershed consists of paved parking lot and surrounding landscaped areas. Stormwater runoff from this watershed sheets into catch basins, and then routed through a water quality units prior to outletting into an underground infiltration system. Stormwater that doesn't infiltrate, overflows into the existing 12" culvert that crosses through the site.

P-Watershed-2: This watershed consists of the western portion of the site. The watershed consists of paved parking lot and surrounding landscaped areas. Stormwater runoff from this watershed sheets into catch basins, and then routed through a water quality units prior to outletting into an underground infiltration system. Stormwater that doesn't infiltrate, overflows into the existing 12" culvert that crosses through the site.

P-Watershed-3: This watershed consists of the southern portion of the site. The watershed consists of paved parking lot and surrounding landscaped areas. Stormwater runoff from this watershed sheets into catch basins, and then routed through a water quality units prior to outletting to the rain garden. Stormwater that doesn't infiltrate, overflows into the drainage ditch/ wetlands.

P-Watershed-4: This watershed consists of the eastern portion of the site. The watershed consists of paved parking lot and surrounding landscaped areas. Stormwater runoff from this watershed sheets into water quality units prior to outletting into the existing 12" culvert that crosses through the site.

P-Watershed-5: This watershed consists of the surrounding landscaped areas, existing woods, portions of the walkways on the perimeter of the site. Stormwater runoff from this watershed sheets off site.

Proposed Building (P-BLDG): The proposed building's roof runoff is routed towards the rain garden. Stormwater that doesn't infiltrate, overflows into the surrounding wetlands/ drainage ditch that is hydrologically connected via a 12" and 18" culvert to the intermittent stream.

Analysis:
The analysis was based on the pre and post development peak discharge rates at the point of analysis. The proposed construction of the Yankee Bus Headquarters facility will result in a **decrease** in impervious area, therefore the proposed stormwater management system has been designed to mitigate and improve stormwater quality, and retain volume per the Randolph by-laws.

Results/ Summary

Results of Analysis:
Through the use of the HydroCAD Software, the curve numbers, times of concentrations, and peak discharge rates were determined for both the existing conditions and the proposed conditions. The results of the study shows that both the post-development peak rates of runoff are equal or less than the existing rates.

As shown in Table A, the post development peak rates of runoff from the site will be mitigated.

	Table A – POA Peak Rates of Runoff (cfs)			
	2-year storm	**10-year storm**	**25-year storm**	**100-year storm**
Existing	13.30	20.71	25.84	34.88
Proposed	2.91	7.80	16.85	27.72

Stormwater Management Standards

The Department of Environmental Protection has implemented the Stormwater Management Standards as of November 18, 1996 and updated them in April 2008. The standards met are described below and in the Stormwater Management Form as provided by DEP.

Standard #1: Untreated Stormwater

The project is designed so that stormwater conveyances (outfalls/discharges) do not discharge untreated stormwater into, or cause erosion to, wetlands or waters.

Therefore Standard #1 is met.

Standard #2: Post-development peak discharge rates

The proposed project will result in a decrease in impervious area. The proposed stormwater management system has been designed so that there is no increase in post construction discharge rates from the site. See Table 1: Analysis Point Peak Rate of Runoff (cubic feet per second, cfs)

Therefore Standard #2 is met.

Standard #3: Recharge to groundwater

Loss of annual recharge to groundwater shall be eliminated or minimized through the use of environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post- development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

Soil types have been identified based on the information contained in the Soil Report. We have determined that the soils are consistent with Hydrologic soil type "A" "B" and "D" which requires runoff to be infiltrated (as listed in the table below) for new impervious areas.

Hydrologic Group Volume to Recharge (x Total Impervious Area)	
Hydrologic Group	Volume to Recharge x Total Impervious Area
A	0.60 inches of runoff
B	0.35 inches of runoff
C	0.25 inches of runoff
D	0.10 inches of runoff

The proposed development will result in a decrease in impervious area. therefore additional recharge is not required. However, the project is providing recharge per the Town of Randolph by-laws:

Infiltration System-1 (volume under outlet elev 142): 2,863 cf
Infiltration System-2: (volume under outlet elev 141.80): 2,385 cf
Rain Garden (volume under overflow weir elev 141.50): 6,159 cf
Total recharge volume: 11,407 cf

Total Impervious on site: 170,313 sf
Retain 0.80 inches (per by-law)
170,313 sf x 0.80 in. x (1ft/12in) =11,354 cf required
Provided: 11,407 cf

Therefore Standard #3 is met.

Standard #4: TSS removal

The BMP's selected to remove TSS from impervious areas for this include: water Quality Units (WQU), catch basins, underground infiltration chambers, rain gardens

Parking Lot (P-WS-1)
Catch Basin: (1.00)(1.00-0.25)= 0.75 TSS
WQU: (0.75)(1.00-0.80)=0.15 TSS
INF Syst: (0.15)(1.00-0.80)=0.03 TSS
Total TSS Removal= 97%

Parking Lot (P-WS-2)
Catch Basin: (1.00)(1.00-0.25)= 0.75 TSS
WQU: (0.75)(1.00-0.80)=0.15 TSS
INF Syst: (0.15)(1.00-0.80)=0.03 TSS
Total TSS Removal= 97%

Parking Lot (P-WS-3)
WQU: (1.00)(1.00-0.80)=0.20 TSS
Rain Garden: (0.20)(1.00-0.80)=0.04 TSS
Total TSS Removal= 96%

Parking Lot (P-WS-4)
WQU: (1.00)(1.00-0.80)=0.20 TSS
Total TSS Removal= 80%

*MASTEP and NJCAT Rating

Therefore Standard #4 is met.

Standard #5: Higher potential pollutant loads

The project site does contains Land Uses with Higher Potential Pollutant Loads.

The project has been designed to provide source control and pollution prevention implementation in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from land uses to the maximum extent practicable. The stormwater management system has been sized to treat for the 1" water quality volume and the 44% pre-treatment.

Therefore Standard #5 is met.

Standard #6: Protection of critical areas

The site is located within critical areas as defined by Critical areas are Outstanding Resource Waters (ORW) as designated in 314 CMR 4.00, Special Resource Waters as designated in 314 CMR 4.00, recharge areas for public water supplies as defined in 310 CMR 22.02 (Zone Is, Zone IIs and Interim Wellhead Protection Areas for groundwater sources and Zone As for surface water sources), bathing beaches as defined in 105 CMR 445.000, cold-water fisheries as defined in 314 CMR 9.02 and 310 CMR 10.04, and shellfish growing areas as defined in 314 CMR 9.02 and 310 CMR 10.04.

The stormwater management system has been sized to treat for the 1" water quality volume and the 44% pre-treatment.

Therefore Standard #6 is met.

Standard #7: Redevelopment projects

The project is a redevelopment.

Standard #8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

Soil Erosion and Sediment Control Plan:
The objectives of the Soil Erosion and Sediment Control Plan are to control erosion at its source with temporary control structures, minimize the runoff from areas of disturbance, and de-concentrate and distribute stormwater runoff through natural vegetation before discharge to critical zones such as streams or wetlands. Soil erosion control does not begin with the perimeter sediment trap. It begins at the source of the sediment, the disturbed land areas, and extends down to the control structure.

The Soil Erosion and Sediment Control Plan will be enacted in order to protect the resource areas during construction. The erosion control devices will remain in place until all exposed areas have been stabilized with vegetation or impervious surfaces.

The objective of the Soil erosion & Sediment Control Plan that will be enacted on site is to control the vulnerability of the soil to the erosion process or the capability of moving water to detach soil particles during the construction phase(s).

The erosion and sediment control plan to be in place during the construction phase is detailed within the NOI narrative (under separate cover).

Therefore Standard #8 is met.

Standard #9: Operation/maintenance plan

An operation and maintenance plan for both construction and post-development stormwater controls has been developed. The plan includes owner(s); parties responsible for operation and maintenance; schedule for inspection and maintenance; routine and non-routine maintenance tasks. A copy of the O&M is included in the Appendix.

Therefore Standard #9 is met.

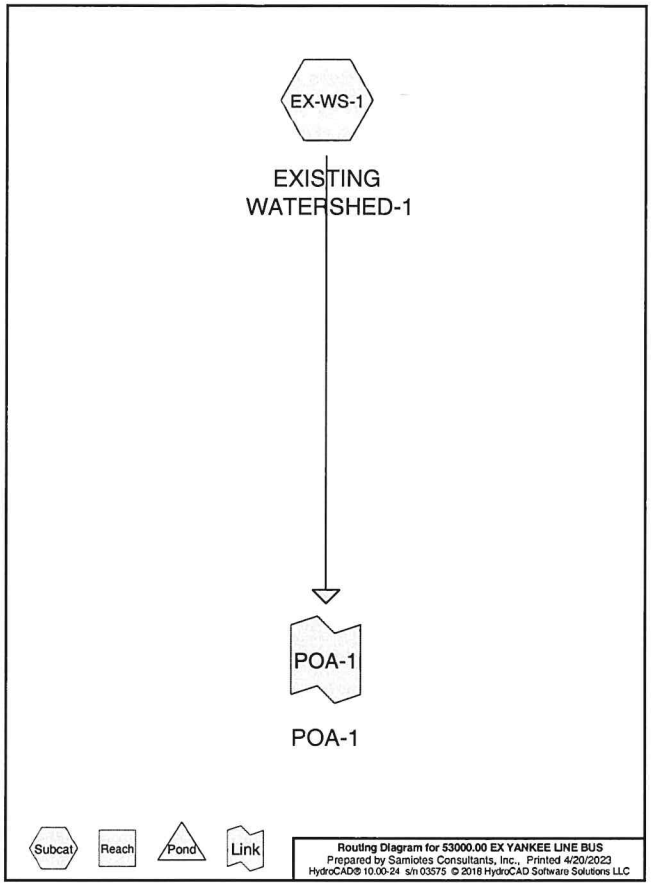
Standard #10: All illicit discharges to the stormwater management system are prohibited

It is not anticipated that there will be any Illicit discharges for the project.

Therefore Standard #10 is met.

TABLE OF CONTENTS FOR APPENDIX

APPENDIX 1:
EXISTING HYDROLOGY REPORT



Project Notes

Rainfall events imported from "HydroCAD ALMA PROPOSED - CA.hcp"

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
11,053	39	>75% Grass cover, Good (EX-WS-1)
185,582	98	Paved parking, (EX-WS-1)
702	98	Wetlands (EX-WS-1)
32,591	55	Woods, Good, HSG B (EX-WS-1)
9,045	98	roof (EX-WS-1)
238,973	**89**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
32,591	HSG B	EX-WS-1
0	HSG C	
0	HSG D	
206,382	Other	EX-WS-1
238,973		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	0	0	0	11,053	11,053	>75% Grass cover, Good
0	0	0	0	185,582	185,582	Paved parking,
0	0	0	0	702	702	Wetlands
0	32,591	0	0	0	32,591	Woods, Good
0	0	0	0	9,045	9,045	roof
0	**32,591**	**0**	**0**	**206,382**	**238,973**	**TOTAL AREA**

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-WS-1: EXISTING Runoff Area=238,973 sf 81.74% Impervious Runoff Depth=2.08"
Tc=6.0 min CN=89 Runoff=13.30 cfs 41,453 cf

Link POA-1: POA-1 Inflow=13.30 cfs 41,453 cf
Primary=13.30 cfs 41,453 cf

Total Runoff Area = 238,973 sf Runoff Volume = 41,453 cf Average Runoff Depth = 2.08"
18.26% Pervious = 43,644 sf 81.74% Impervious = 195,329 sf

Summary for Subcatchment EX-WS-1: EXISTING WATERSHED-1

Runoff = 13.30 cfs @ 12.09 hrs, Volume= 41,453 cf, Depth= 2.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	185,582	98	Paved parking,
	32,591	55	Woods, Good, HSG B
*	11,053	39	>75% Grass cover, Good
*	702	98	Wetlands
*	9,045	98	roof
	238,973	89	Weighted Average
	43,644		18.26% Pervious Area
	195,329		81.74% Impervious Area

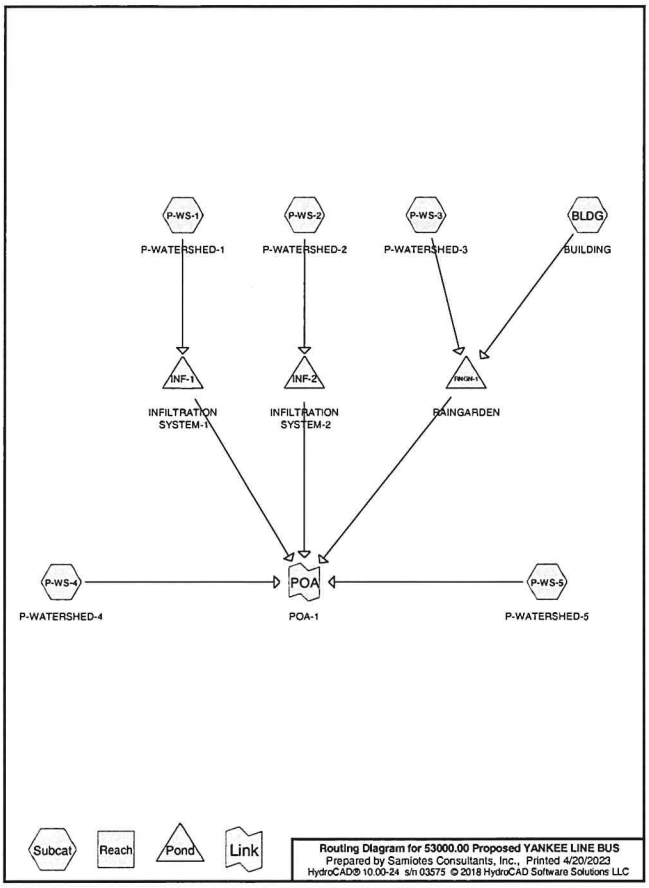
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Link POA-1: POA-1

Inflow Area = 238,973 sf, 81.74% Impervious, Inflow Depth = 2.08" for 2 yr event
Inflow = 13.30 cfs @ 12.09 hrs, Volume= 41,453 cf
Primary = 13.30 cfs @ 12.09 hrs, Volume= 41,453 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

APPENDIX 2:
PROPOSED HYDROLOGY REPORT



Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
2,413	39	>75% Grass cover, Good, HSG A (P-WS-2)
10,900	61	>75% Grass cover, Good, HSG B (P-WS-4)
310	80	>75% Grass cover, Good, HSG D (P-WS-4)
17,854	30	Brush, Good, HSG A (P-WS-3)
8,213	48	Brush, Good, HSG B (P-WS-5)
7,363	98	Paved (P-WS-5)
132,345	98	Paved parking (P-WS-1, P-WS-2, P-WS-3, P-WS-4)
37,873	98	ROOF (BLDG)
21,000	55	Woods, Good, HSG B (P-WS-5)
702	98	wetlands (P-WS-5)
238,973	**85**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
20,267	HSG A	P-WS-2, P-WS-3
40,113	HSG B	P-WS-4, P-WS-5
0	HSG C	
310	HSG D	P-WS-4
178,283	Other	BLDG, P-WS-1, P-WS-2, P-WS-3, P-WS-4, P-WS-5
238,973		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
2,413	10,900	0	310	0	13,623	>75% Grass cover, Good
17,854	8,213	0	0	0	26,067	Brush, Good
0	0	0	0	7,363	7,363	Paved
0	0	0	0	132,345	132,345	Paved parking
0	0	0	0	37,873	37,873	ROOF
0	21,000	0	0	0	21,000	Woods, Good
0	0	0	0	702	702	wetlands
20,267	**40,113**	**0**	**310**	**178,283**	**238,973**	**TOTAL AREA**

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	INF-1	142.00	136.30	100.0	0.0570	0.011	12.0	0.0	0.0
2	INF-2	141.80	136.30	150.0	0.0367	0.011	12.0	0.0	0.0

Summary for Subcatchment BLDG: BUILDING

Runoff = 2.70 cfs @ 12.08 hrs, Volume= 9,366 cf, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	37,873	98	ROOF
	37,873		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment P-WS-1: P-WATERSHED-1

Runoff = 1.67 cfs @ 12.08 hrs, Volume= 5,783 cf, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	23,385	98	Paved parking
	23,385		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment P-WS-2: P-WATERSHED-2

Runoff = 2.62 cfs @ 12.08 hrs, Volume= 8,465 cf, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	37,520	98	Paved parking
	2,413	39	>75% Grass cover, Good, HSG A
	39,933	94	Weighted Average
	2,413		6.04% Pervious Area
	37,520		93.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment P-WS-3: P-WATERSHED-3

Runoff = 1.63 cfs @ 12.09 hrs, Volume= 5,232 cf, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	36,650	98	Paved parking
	17,854	30	Brush, Good, HSG A
	54,504	76	Weighted Average
	17,854		32.76% Pervious Area
	36,650		67.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-WS-4: P-WATERSHED-4

Runoff = 2.56 cfs @ 12.09 hrs, Volume= 7,979 cf, Depth= 2.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	10,900	61	>75% Grass cover, Good, HSG B
	310	80	>75% Grass cover, Good, HSG D
*	34,790	98	Paved parking
	46,000	89	Weighted Average
	11,210		24.37% Pervious Area
	34,790		75.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-WS-5: P-WATERSHED-5

Runoff = 0.37 cfs @ 12.11 hrs, Volume= 1,613 cf, Depth= 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	21,000	55	Woods, Good, HSG B
	8,213	48	Brush, Good, HSG B
*	702	98	wetlands
*	7,363	98	Paved
	37,278	63	Weighted Average
	29,213		78.37% Pervious Area
	8,065		21.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Pond INF-1: INFILTRATION SYSTEM-1

Inflow Area = 23,385 sf,100.00% Impervious, Inflow Depth = 2.97" for 2 yr event
Inflow = 1.67 cfs @ 12.08 hrs, Volume= 5,783 cf
Outflow = 0.11 cfs @ 13.53 hrs, Volume= 5,783 cf, Atten= 94%, Lag= 86.6 min
Discarded = 0.06 cfs @ 9.57 hrs, Volume= 5,662 cf
Primary = 0.04 cfs @ 13.53 hrs, Volume= 121 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 142.11' @ 13.53 hrs Surf.Area= 1,144 sf Storage= 2,869 cf

Plug-Flow detention time= 381.2 min calculated for 5,782 cf (100% of inflow)
Center-of-Mass det. time= 381.2 min (1,137.6 - 756.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	139.00'	657 cf	**26.00'W x 44.00'L x 4.67'H Field A** 5,342 cf Overall - 3,699 cf Embedded = 1,643 cf x 40.0% Voids
#2A	139.00'	2,700 cf	**Shea Leaching Chamber 8x14x3.7** x 9 Inside #1 Inside= 84.0"W x 36.0"H => 23.08 sf x 13.00'L = 300.0 cf Outside= 96.0"W x 44.0"H => 29.36 sf x 14.00'L = 411.0 cf 9 Chambers in 3 Rows
		3,357 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	139.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	142.00'	**12.0" Round Culvert** L= 100.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 142.00' / 136.30' S= 0.0570 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Discarded OutFlow Max=0.06 cfs @ 9.57 hrs HW=139.05' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.04 cfs @ 13.53 hrs HW=142.11' (Free Discharge)
└**2=Culvert** (Inlet Controls 0.04 cfs @ 0.89 fps)

Pond INF-1: INFILTRATION SYSTEM-1 - Chamber Wizard Field A

Chamber Model = Shea Leaching Chamber 8x14x3.7 (Shea Galley)
Inside= 84.0"W x 36.0"H => 23.08 sf x 13.00'L = 300.0 cf
Outside= 96.0"W x 44.0"H => 29.36 sf x 14.00'L = 411.0 cf

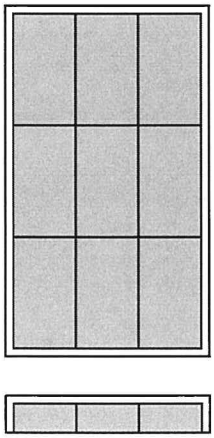
3 Chambers/Row x 14.00' Long = 42.00' Row Length +12.0" End Stone x 2 = 44.00' Base Length
3 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 26.00' Base Width
44.0" Chamber Height + 12.0" Cover = 4.67' Field Height

9 Chambers x 300.0 cf = 2,700.0 cf Chamber Storage
9 Chambers x 411.0 cf = 3,699.4 cf Displacement

5,342.5 cf Field - 3,699.4 cf Chambers = 1,643.1 cf Stone x 40.0% Voids = 657.2 cf Stone Storage

Chamber Storage + Stone Storage = 3,357.2 cf = 0.077 af
Overall Storage Efficiency = 62.8%
Overall System Size = 44.00' x 26.00' x 4.67'

9 Chambers
197.9 cy Field
60.9 cy Stone



Summary for Pond INF-2: INFILTRATION SYSTEM-2

Inflow Area = 39,933 sf, 93.96% Impervious, Inflow Depth = 2.54" for 2 yr event
Inflow = 2.62 cfs @ 12.08 hrs, Volume= 8,465 cf
Outflow = 0.89 cfs @ 12.36 hrs, Volume= 8,465 cf, Atten= 66%, Lag= 16.7 min
Discarded = 0.09 cfs @ 10.13 hrs, Volume= 6,219 cf
Primary = 0.80 cfs @ 12.36 hrs, Volume= 2,246 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 142.32' @ 12.36 hrs Surf.Area= 1,656 sf Storage= 3,074 cf

Plug-Flow detention time= 191.5 min calculated for 8,464 cf (100% of inflow)
Center-of-Mass det. time= 191.5 min (978.6 - 787.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	140.00'	1,120 cf	**36.00'W x 46.00'L x 4.67'H Field A** 7,734 cf Overall - 4,932 cf Embedded = 2,801 cf x 40.0% Voids
#2A	140.00'	3,600 cf	**Shea Leaching Chamber 8x14x3.7** x 12 Inside #1 Inside= 84.0"W x 36.0"H => 23.08 sf x 13.00'L = 300.0 cf Outside= 96.0"W x 44.0"H => 29.36 sf x 14.00'L = 411.0 cf 12 Chambers in 4 Rows
		4,720 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	141.80'	**12.0" Round Culvert** L= 150.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 141.80' / 136.30' S= 0.0367 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Discarded	140.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.09 cfs @ 10.13 hrs HW=140.05' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.80 cfs @ 12.36 hrs HW=142.32' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.80 cfs @ 1.94 fps)

Pond INF-2: INFILTRATION SYSTEM-2 - Chamber Wizard Field A

Chamber Model = Shea Leaching Chamber 8x14x3.7 (Shea Galley)
Inside= 84.0"W x 36.0"H => 23.08 sf x 13.00'L = 300.0 cf
Outside= 96.0"W x 44.0"H => 29.36 sf x 14.00'L = 411.0 cf

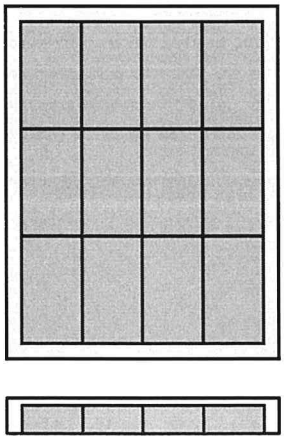
3 Chambers/Row x 14.00' Long = 42.00' Row Length +24.0" End Stone x 2 = 46.00' Base Length
4 Rows x 96.0" Wide + 24.0" Side Stone x 2 = 36.00' Base Width
44.0" Chamber Height + 12.0" Cover = 4.67' Field Height

12 Chambers x 300.0 cf = 3,600.0 cf Chamber Storage
12 Chambers x 411.0 cf = 4,932.5 cf Displacement

7,733.5 cf Field - 4,932.5 cf Chambers = 2,801.0 cf Stone x 40.0% Voids = 1,120.4 cf Stone Storage

Chamber Storage + Stone Storage = 4,720.4 cf = 0.108 af
Overall Storage Efficiency = 61.0%
Overall System Size = 46.00' x 36.00' x 4.67'

12 Chambers
286.4 cy Field
103.7 cy Stone



Summary for Pond RNGN-1: RAINGARDEN

[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area = 92,377 sf, 80.67% Impervious, Inflow Depth = 1.90" for 2 yr event
Inflow = 4.32 cfs @ 12.09 hrs, Volume= 14,598 cf
Outflow = 0.36 cfs @ 13.27 hrs, Volume= 14,598 cf, Atten= 92%, Lag= 71.1 min
Discarded = 0.36 cfs @ 13.27 hrs, Volume= 14,598 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 141.39' @ 13.27 hrs Surf.Area= 6,392 sf Storage= 6,082 cf

Plug-Flow detention time= 176.6 min calculated for 14,596 cf (100% of inflow)
Center-of-Mass det. time= 176.8 min (968.7 - 791.9)

Volume	Invert	Avail.Storage	Storage Description
#1	140.00'	21,056 cf	**RAIN GARDEN (Prismatic)** Listed below (Recalc)
#2	135.40'	8 cf	**1.50'D x 4.60'H AREA DRAIN**
		21,064 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
140.00	2,572	0	0
141.00	5,100	3,836	3,836
142.00	8,414	6,757	10,593
143.00	12,512	10,463	21,056

Device	Routing	Invert	Outlet Devices
#1	Primary	141.60'	**50.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Discarded	135.40'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.36 cfs @ 13.27 hrs HW=141.39' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.36 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=135.40' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link POA: POA-1

Inflow Area = 238,973 sf, 74.60% Impervious, Inflow Depth = 0.60" for 2 yr event
Inflow = 2.91 cfs @ 12.09 hrs, Volume= 11,960 cf
Primary = 2.91 cfs @ 12.09 hrs, Volume= 11,960 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Subcatchment BLDG: BUILDING

Runoff = 3.82 cfs @ 12.08 hrs, Volume= 13,458 cf, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	37,873	98	ROOF
	37,873		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment P-WS-1: P-WATERSHED-1

Runoff = 2.36 cfs @ 12.08 hrs, Volume= 8,310 cf, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	23,385	98	Paved parking
	23,385		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment P-WS-2: P-WATERSHED-2

Runoff = 3.84 cfs @ 12.08 hrs, Volume= 12,697 cf, Depth= 3.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	37,520	98	Paved parking
	2,413	39	>75% Grass cover, Good, HSG A
	39,933	94	Weighted Average
	2,413		6.04% Pervious Area
	37,520		93.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment P-WS-3: P-WATERSHED-3

Runoff = 3.11 cfs @ 12.09 hrs, Volume= 9,674 cf, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	36,650	98	Paved parking
	17,854	30	Brush, Good, HSG A
	54,504	76	Weighted Average
	17,854		32.76% Pervious Area
	36,650		67.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-WS-4: P-WATERSHED-4

Runoff = 3.99 cfs @ 12.09 hrs, Volume= 12,631 cf, Depth= 3.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
	10,900	61	>75% Grass cover, Good, HSG B
	310	80	>75% Grass cover, Good, HSG D
*	34,790	98	Paved parking
	46,000	89	Weighted Average
	11,210		24.37% Pervious Area
	34,790		75.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-WS-5: P-WATERSHED-5

Runoff = 1.09 cfs @ 12.10 hrs, Volume= 3,735 cf, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
	21,000	55	Woods, Good, HSG B
	8,213	48	Brush, Good, HSG B
*	702	98	wetlands
*	7,363	98	Paved
	37,278	63	Weighted Average
	29,213		78.37% Pervious Area
	8,065		21.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Pond INF-1: INFILTRATION SYSTEM-1

Inflow Area = 23,385 sf,100.00% Impervious, Inflow Depth = 4.26" for 10 yr event
Inflow = 2.36 cfs @ 12.08 hrs, Volume= 8,310 cf
Outflow = 1.41 cfs @ 12.19 hrs, Volume= 8,310 cf, Atten= 40%, Lag= 6.2 min
Discarded = 0.06 cfs @ 8.50 hrs, Volume= 6,296 cf
Primary = 1.35 cfs @ 12.19 hrs, Volume= 2,013 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 142.71' @ 12.19 hrs Surf.Area= 1,144 sf Storage= 2,917 cf

Plug-Flow detention time= 305.0 min calculated for 8,308 cf (100% of inflow)
Center-of-Mass det. time= 305.0 min (1,054.8 - 749.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	139.00'	657 cf	**26.00'W x 44.00'L x 4.67'H Field A** 5,342 cf Overall - 3,699 cf Embedded = 1,643 cf x 40.0% Voids
#2A	139.00'	2,700 cf	**Shea Leaching Chamber 8x14x3.7** x 9 Inside #1 Inside= 84.0"W x 36.0"H => 23.08 sf x 13.00'L = 300.0 cf Outside= 96.0"W x 44.0"H => 29.36 sf x 14.00'L = 411.0 cf 9 Chambers in 3 Rows
		3,357 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	139.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	142.00'	**12.0" Round Culvert** L= 100.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 142.00' / 136.30' S= 0.0570 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Discarded OutFlow Max=0.06 cfs @ 8.50 hrs HW=139.05' (Free Discharge)
↳**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=1.34 cfs @ 12.19 hrs HW=142.71' (Free Discharge)
↳**2=Culvert** (Inlet Controls 1.34 cfs @ 2.26 fps)

Pond INF-1: INFILTRATION SYSTEM-1 - Chamber Wizard Field A

Chamber Model = Shea Leaching Chamber 8x14x3.7 (Shea Galley)
Inside= 84.0"W x 36.0"H => 23.08 sf x 13.00'L = 300.0 cf
Outside= 96.0"W x 44.0"H => 29.36 sf x 14.00'L = 411.0 cf

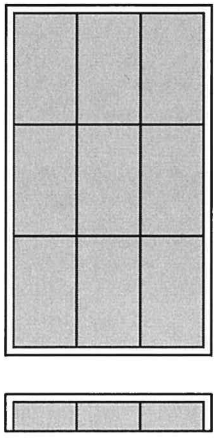
3 Chambers/Row x 14.00' Long = 42.00' Row Length +12.0" End Stone x 2 = 44.00' Base Length
3 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 26.00' Base Width
44.0" Chamber Height + 12.0" Cover = 4.67' Field Height

9 Chambers x 300.0 cf = 2,700.0 cf Chamber Storage
9 Chambers x 411.0 cf = 3,699.4 cf Displacement

5,342.5 cf Field - 3,699.4 cf Chambers = 1,643.1 cf Stone x 40.0% Voids = 657.2 cf Stone Storage

Chamber Storage + Stone Storage = 3,357.2 cf = 0.077 af
Overall Storage Efficiency = 62.8%
Overall System Size = 44.00' x 26.00' x 4.67'

9 Chambers
197.9 cy Field
60.9 cy Stone



Summary for Pond INF-2: INFILTRATION SYSTEM-2

Inflow Area = 39,933 sf, 93.96% Impervious, Inflow Depth = 3.82" for 10 yr event
Inflow = 3.84 cfs @ 12.08 hrs, Volume= 12,697 cf
Outflow = 2.32 cfs @ 12.19 hrs, Volume= 12,697 cf, Atten= 40%, Lag= 6.1 min
Discarded = 0.09 cfs @ 8.91 hrs, Volume= 7,156 cf
Primary = 2.23 cfs @ 12.19 hrs, Volume= 5,541 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 142.86' @ 12.19 hrs Surf.Area= 1,656 sf Storage= 3,784 cf

Plug-Flow detention time= 155.6 min calculated for 12,697 cf (100% of inflow)
Center-of-Mass det. time= 155.6 min (932.1 - 776.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	140.00'	1,120 cf	**36.00'W x 46.00'L x 4.67'H Field A** 7,734 cf Overall - 4,932 cf Embedded = 2,801 cf x 40.0% Voids
#2A	140.00'	3,600 cf	**Shea Leaching Chamber 8x14x3.7** x 12 Inside #1 Inside= 84.0"W x 36.0"H => 23.08 sf x 13.00'L = 300.0 cf Outside= 96.0"W x 44.0"H => 29.36 sf x 14.00'L = 411.0 cf 12 Chambers in 4 Rows
		4,720 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	141.80'	**12.0" Round Culvert** L= 150.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 141.80' / 136.30' S= 0.0367 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Discarded	140.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.09 cfs @ 8.91 hrs HW=140.05' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=2.23 cfs @ 12.19 hrs HW=142.86' (Free Discharge)
└**1=Culvert** (Inlet Controls 2.23 cfs @ 2.83 fps)

Pond INF-2: INFILTRATION SYSTEM-2 - Chamber Wizard Field A

Chamber Model = Shea Leaching Chamber 8x14x3.7 (Shea Galley)
Inside= 84.0"W x 36.0"H => 23.08 sf x 13.00'L = 300.0 cf
Outside= 96.0"W x 44.0"H => 29.36 sf x 14.00'L = 411.0 cf

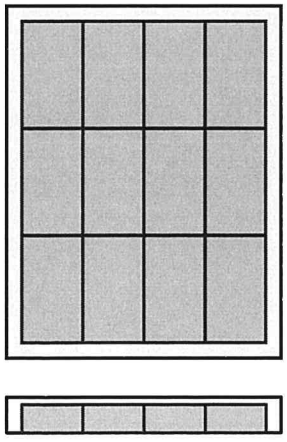
3 Chambers/Row x 14.00' Long = 42.00' Row Length +24.0" End Stone x 2 = 46.00' Base Length
4 Rows x 96.0" Wide + 24.0" Side Stone x 2 = 36.00' Base Width
44.0" Chamber Height + 12.0" Cover = 4.67' Field Height

12 Chambers x 300.0 cf = 3,600.0 cf Chamber Storage
12 Chambers x 411.0 cf = 4,932.5 cf Displacement

7,733.5 cf Field - 4,932.5 cf Chambers = 2,801.0 cf Stone x 40.0% Voids = 1,120.4 cf Stone Storage

Chamber Storage + Stone Storage = 4,720.4 cf = 0.108 af
Overall Storage Efficiency = 61.0%
Overall System Size = 46.00' x 36.00' x 4.67'

12 Chambers
286.4 cy Field
103.7 cy Stone



Summary for Pond RNGN-1: RAINGARDEN

Inflow Area = 92,377 sf, 80.67% Impervious, Inflow Depth = 3.00" for 10 yr event
Inflow = 6.93 cfs @ 12.09 hrs, Volume= 23,131 cf
Outflow = 2.89 cfs @ 12.30 hrs, Volume= 23,131 cf, Atten= 58%, Lag= 13.0 min
Discarded = 0.41 cfs @ 12.30 hrs, Volume= 19,353 cf
Primary = 2.48 cfs @ 12.30 hrs, Volume= 3,778 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 141.67' @ 12.30 hrs Surf.Area= 7,325 sf Storage= 8,012 cf

Plug-Flow detention time= 176.5 min calculated for 23,128 cf (100% of inflow)
Center-of-Mass det. time= 176.6 min (963.1 - 786.4)

Volume	Invert	Avail.Storage	Storage Description
#1	140.00'	21,056 cf	**RAIN GARDEN (Prismatic)** Listed below (Recalc)
#2	135.40'	8 cf	**1.50'D x 4.60'H AREA DRAIN**
		21,064 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
140.00	2,572	0	0
141.00	5,100	3,836	3,836
142.00	8,414	6,757	10,593
143.00	12,512	10,463	21,056

Device	Routing	Invert	Outlet Devices
#1	Primary	141.60'	**50.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Discarded	135.40'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.41 cfs @ 12.30 hrs HW=141.67' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.41 cfs)

Primary OutFlow Max=2.24 cfs @ 12.30 hrs HW=141.67' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 2.24 cfs @ 0.63 fps)

Summary for Link POA: POA-1

Inflow Area = 238,973 sf, 74.60% Impervious, Inflow Depth = 1.39" for 10 yr event
Inflow = 7.80 cfs @ 12.26 hrs, Volume= 27,698 cf
Primary = 7.80 cfs @ 12.26 hrs, Volume= 27,698 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Subcatchment BLDG: BUILDING

Runoff = 4.60 cfs @ 12.08 hrs, Volume= 16,294 cf, Depth= 5.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

	Area (sf)	CN	Description
*	37,873	98	ROOF
	37,873		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-WS-1: P-WATERSHED-1

Runoff = 2.84 cfs @ 12.08 hrs, Volume= 10,061 cf, Depth= 5.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

	Area (sf)	CN	Description
*	23,385	98	Paved parking
	23,385		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-WS-2: P-WATERSHED-2

Runoff = 4.68 cfs @ 12.08 hrs, Volume= 15,650 cf, Depth= 4.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

	Area (sf)	CN	Description
*	37,520	98	Paved parking
	2,413	39	>75% Grass cover, Good, HSG A
	39,933	94	Weighted Average
	2,413		6.04% Pervious Area
	37,520		93.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-WS-3: P-WATERSHED-3

Runoff = 4.21 cfs @ 12.09 hrs, Volume= 13,029 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

	Area (sf)	CN	Description
*	36,650	98	Paved parking
	17,854	30	Brush, Good, HSG A
	54,504	76	Weighted Average
	17,854		32.76% Pervious Area
	36,650		67.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-WS-4: P-WATERSHED-4

Runoff = 4.97 cfs @ 12.09 hrs, Volume= 15,931 cf, Depth= 4.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

	Area (sf)	CN	Description
	10,900	61	>75% Grass cover, Good, HSG B
	310	80	>75% Grass cover, Good, HSG D
*	34,790	98	Paved parking
	46,000	89	Weighted Average
	11,210		24.37% Pervious Area
	34,790		75.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-WS-5: P-WATERSHED-5

Runoff = 1.68 cfs @ 12.10 hrs, Volume= 5,492 cf, Depth= 1.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

	Area (sf)	CN	Description
	21,000	55	Woods, Good, HSG B
	8,213	48	Brush, Good, HSG B
*	702	98	wetlands
*	7,363	98	Paved
	37,278	63	Weighted Average
	29,213		78.37% Pervious Area
	8,065		21.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Pond INF-1: INFILTRATION SYSTEM-1

Inflow Area = 23,385 sf,100.00% Impervious, Inflow Depth = 5.16" for 25 yr event
Inflow = 2.84 cfs @ 12.08 hrs, Volume= 10,061 cf
Outflow = 2.27 cfs @ 12.14 hrs, Volume= 10,061 cf, Atten= 20%, Lag= 3.5 min
Discarded = 0.06 cfs @ 7.84 hrs, Volume= 6,659 cf
Primary = 2.21 cfs @ 12.14 hrs, Volume= 3,402 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 143.05' @ 12.14 hrs Surf.Area= 1,144 sf Storage= 3,073 cf

Plug-Flow detention time= 271.2 min calculated for 10,059 cf (100% of inflow)
Center-of-Mass det. time= 271.3 min (1,018.1 - 746.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	139.00'	657 cf	**26.00'W x 44.00'L x 4.67'H Field A** 5,342 cf Overall - 3,699 cf Embedded = 1,643 cf x 40.0% Voids
#2A	139.00'	2,700 cf	**Shea Leaching Chamber 8x14x3.7** x 9 Inside #1 Inside= 84.0"W x 36.0"H => 23.08 sf x 13.00'L = 300.0 cf Outside= 96.0"W x 44.0"H => 29.36 sf x 14.00'L = 411.0 cf 9 Chambers in 3 Rows
		3,357 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	139.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	142.00'	**12.0" Round Culvert** L= 100.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 142.00' / 136.30' S= 0.0570 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Discarded OutFlow Max=0.06 cfs @ 7.84 hrs HW=139.05' (Free Discharge)
↳**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=2.21 cfs @ 12.14 hrs HW=143.05' (Free Discharge)
↳**2=Culvert** (Inlet Controls 2.21 cfs @ 2.81 fps)

Pond INF-1: INFILTRATION SYSTEM-1 - Chamber Wizard Field A

Chamber Model = Shea Leaching Chamber 8x14x3.7 (Shea Galley)
Inside= 84.0"W x 36.0"H => 23.08 sf x 13.00'L = 300.0 cf
Outside= 96.0"W x 44.0"H => 29.36 sf x 14.00'L = 411.0 cf

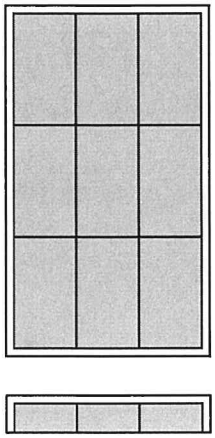
3 Chambers/Row x 14.00' Long = 42.00' Row Length +12.0" End Stone x 2 = 44.00' Base Length
3 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 26.00' Base Width
44.0" Chamber Height + 12.0" Cover = 4.67' Field Height

9 Chambers x 300.0 cf = 2,700.0 cf Chamber Storage
9 Chambers x 411.0 cf = 3,699.4 cf Displacement

5,342.5 cf Field - 3,699.4 cf Chambers = 1,643.1 cf Stone x 40.0% Voids = 657.2 cf Stone Storage

Chamber Storage + Stone Storage = 3,357.2 cf = 0.077 af
Overall Storage Efficiency = 62.8%
Overall System Size = 44.00' x 26.00' x 4.67'

9 Chambers
197.9 cy Field
60.9 cy Stone



Summary for Pond INF-2: INFILTRATION SYSTEM-2

Inflow Area = 39,933 sf, 93.96% Impervious, Inflow Depth = 4.70" for 25 yr event
Inflow = 4.68 cfs @ 12.08 hrs, Volume= 15,650 cf
Outflow = 3.69 cfs @ 12.15 hrs, Volume= 15,650 cf, Atten= 21%, Lag= 3.7 min
Discarded = 0.09 cfs @ 8.35 hrs, Volume= 7,676 cf
Primary = 3.60 cfs @ 12.15 hrs, Volume= 7,974 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 143.75' @ 12.15 hrs Surf.Area= 1,656 sf Storage= 4,112 cf

Plug-Flow detention time= 140.5 min calculated for 15,648 cf (100% of inflow)
Center-of-Mass det. time= 140.5 min (911.8 - 771.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	140.00'	1,120 cf	**36.00'W x 46.00'L x 4.67'H Field A** 7,734 cf Overall - 4,932 cf Embedded = 2,801 cf x 40.0% Voids
#2A	140.00'	3,600 cf	**Shea Leaching Chamber 8x14x3.7** x 12 Inside #1 Inside= 84.0"W x 36.0"H => 23.08 sf x 13.00'L = 300.0 cf Outside= 96.0"W x 44.0"H => 29.36 sf x 14.00'L = 411.0 cf 12 Chambers in 4 Rows
		4,720 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	141.80'	**12.0" Round Culvert** L= 150.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 141.80' / 136.30' S= 0.0367 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Discarded	140.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.09 cfs @ 8.35 hrs HW=140.05' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=3.59 cfs @ 12.15 hrs HW=143.75' (Free Discharge)
└**1=Culvert** (Inlet Controls 3.59 cfs @ 4.58 fps)

Pond INF-2: INFILTRATION SYSTEM-2 - Chamber Wizard Field A

Chamber Model = Shea Leaching Chamber 8x14x3.7 (Shea Galley)
Inside= 84.0"W x 36.0"H => 23.08 sf x 13.00'L = 300.0 cf
Outside= 96.0"W x 44.0"H => 29.36 sf x 14.00'L = 411.0 cf

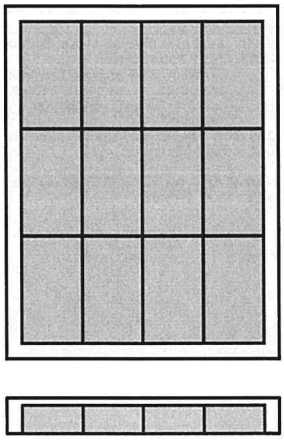
3 Chambers/Row x 14.00' Long = 42.00' Row Length +24.0" End Stone x 2 = 46.00' Base Length
4 Rows x 96.0" Wide + 24.0" Side Stone x 2 = 36.00' Base Width
44.0" Chamber Height + 12.0" Cover = 4.67' Field Height

12 Chambers x 300.0 cf = 3,600.0 cf Chamber Storage
12 Chambers x 411.0 cf = 4,932.5 cf Displacement

7,733.5 cf Field - 4,932.5 cf Chambers = 2,801.0 cf Stone x 40.0% Voids = 1,120.4 cf Stone Storage

Chamber Storage + Stone Storage = 4,720.4 cf = 0.108 af
Overall Storage Efficiency = 61.0%
Overall System Size = 46.00' x 36.00' x 4.67'

12 Chambers
286.4 cy Field
103.7 cy Stone



Summary for Pond RNGN-1: RAINGARDEN

Inflow Area = 92,377 sf, 80.67% Impervious, Inflow Depth = 3.81" for 25 yr event
Inflow = 8.80 cfs @ 12.09 hrs, Volume= 29,323 cf
Outflow = 6.31 cfs @ 12.16 hrs, Volume= 29,323 cf, Atten= 28%, Lag= 4.6 min
Discarded = 0.42 cfs @ 12.16 hrs, Volume= 21,158 cf
Primary = 5.89 cfs @ 12.16 hrs, Volume= 8,165 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 141.73' @ 12.16 hrs Surf.Area= 7,531 sf Storage= 8,472 cf

Plug-Flow detention time= 156.4 min calculated for 29,319 cf (100% of inflow)
Center-of-Mass det. time= 156.5 min (939.7 - 783.2)

Volume	Invert	Avail.Storage	Storage Description
#1	140.00'	21,056 cf	**RAIN GARDEN (Prismatic)** Listed below (Recalc)
#2	135.40'	8 cf	**1.50'D x 4.60'H AREA DRAIN**
		21,064 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
140.00	2,572	0	0
141.00	5,100	3,836	3,836
142.00	8,414	6,757	10,593
143.00	12,512	10,463	21,056

Device	Routing	Invert	Outlet Devices
#1	Primary	141.60'	**50.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Discarded	135.40'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.42 cfs @ 12.16 hrs HW=141.73' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.42 cfs)

Primary OutFlow Max=5.73 cfs @ 12.16 hrs HW=141.73' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 5.73 cfs @ 0.86 fps)

Summary for Link POA: POA-1

Inflow Area = 238,973 sf, 74.60% Impervious, Inflow Depth = 2.06" for 25 yr event
Inflow = 16.85 cfs @ 12.14 hrs, Volume= 40,964 cf
Primary = 16.85 cfs @ 12.14 hrs, Volume= 40,964 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Subcatchment BLDG: BUILDING

Runoff = 5.97 cfs @ 12.08 hrs, Volume= 21,338 cf, Depth= 6.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

	Area (sf)	CN	Description
*	37,873	98	ROOF
	37,873		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment P-WS-1: P-WATERSHED-1

Runoff = 3.69 cfs @ 12.08 hrs, Volume= 13,175 cf, Depth= 6.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

	Area (sf)	CN	Description
*	23,385	98	Paved parking
	23,385		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment P-WS-2: P-WATERSHED-2

Runoff = 6.15 cfs @ 12.08 hrs, Volume= 20,926 cf, Depth= 6.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

	Area (sf)	CN	Description
*	37,520	98	Paved parking
	2,413	39	>75% Grass cover, Good, HSG A
	39,933	94	Weighted Average
	2,413		6.04% Pervious Area
	37,520		93.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment P-WS-3: P-WATERSHED-3

Runoff = 6.23 cfs @ 12.09 hrs, Volume= 19,337 cf, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

	Area (sf)	CN	Description
*	36,650	98	Paved parking
	17,854	30	Brush, Good, HSG A
	54,504	76	Weighted Average
	17,854		32.76% Pervious Area
	36,650		67.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-WS-4: P-WATERSHED-4

Runoff = 6.71 cfs @ 12.08 hrs, Volume= 21,881 cf, Depth= 5.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

	Area (sf)	CN	Description
	10,900	61	>75% Grass cover, Good, HSG B
	310	80	>75% Grass cover, Good, HSG D
*	34,790	98	Paved parking
	46,000	89	Weighted Average
	11,210		24.37% Pervious Area
	34,790		75.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-WS-5: P-WATERSHED-5

Runoff = 2.87 cfs @ 12.09 hrs, Volume= 9,011 cf, Depth= 2.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

	Area (sf)	CN	Description
	21,000	55	Woods, Good, HSG B
	8,213	48	Brush, Good, HSG B
*	702	98	wetlands
*	7,363	98	Paved
	37,278	63	Weighted Average
	29,213		78.37% Pervious Area
	8,065		21.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Pond INF-1: INFILTRATION SYSTEM-1

Inflow Area = 23,385 sf,100.00% Impervious, Inflow Depth = 6.76" for 100 yr event
Inflow = 3.69 cfs @ 12.08 hrs, Volume= 13,175 cf
Outflow = 3.12 cfs @ 12.13 hrs, Volume= 13,175 cf, Atten= 15%, Lag= 3.0 min
Discarded = 0.06 cfs @ 6.75 hrs, Volume= 7,177 cf
Primary = 3.06 cfs @ 12.13 hrs, Volume= 5,998 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 143.55' @ 12.13 hrs Surf.Area= 1,144 sf Storage= 3,303 cf

Plug-Flow detention time= 230.7 min calculated for 13,174 cf (100% of inflow)
Center-of-Mass det. time= 230.7 min (973.7 - 743.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	139.00'	657 cf	**26.00'W x 44.00'L x 4.67'H Field A** 5,342 cf Overall - 3,699 cf Embedded = 1,643 cf x 40.0% Voids
#2A	139.00'	2,700 cf	**Shea Leaching Chamber 8x14x3.7** x 9 Inside #1 Inside= 84.0"W x 36.0"H => 23.08 sf x 13.00'L = 300.0 cf Outside= 96.0"W x 44.0"H => 29.36 sf x 14.00'L = 411.0 cf 9 Chambers in 3 Rows
		3,357 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	139.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	142.00'	**12.0" Round Culvert** L= 100.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 142.00' / 136.30' S= 0.0570 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Discarded OutFlow Max=0.06 cfs @ 6.75 hrs HW=139.05' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=3.06 cfs @ 12.13 hrs HW=143.55' (Free Discharge)
└**2=Culvert** (Inlet Controls 3.06 cfs @ 3.89 fps)

Pond INF-1: INFILTRATION SYSTEM-1 - Chamber Wizard Field A

Chamber Model = Shea Leaching Chamber 8x14x3.7 (Shea Galley)
Inside= 84.0"W x 36.0"H => 23.08 sf x 13.00'L = 300.0 cf
Outside= 96.0"W x 44.0"H => 29.36 sf x 14.00'L = 411.0 cf

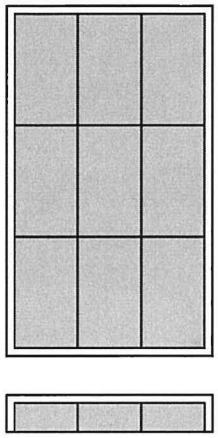
3 Chambers/Row x 14.00' Long = 42.00' Row Length +12.0" End Stone x 2 = 44.00' Base Length
3 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 26.00' Base Width
44.0" Chamber Height + 12.0" Cover = 4.67' Field Height

9 Chambers x 300.0 cf = 2,700.0 cf Chamber Storage
9 Chambers x 411.0 cf = 3,699.4 cf Displacement

5,342.5 cf Field - 3,699.4 cf Chambers = 1,643.1 cf Stone x 40.0% Voids = 657.2 cf Stone Storage

Chamber Storage + Stone Storage = 3,357.2 cf = 0.077 af
Overall Storage Efficiency = 62.8%
Overall System Size = 44.00' x 26.00' x 4.67'

9 Chambers
197.9 cy Field
60.9 cy Stone



Summary for Pond INF-2: INFILTRATION SYSTEM-2

Inflow Area = 39,933 sf, 93.96% Impervious, Inflow Depth = 6.29" for 100 yr event
Inflow = 6.15 cfs @ 12.08 hrs, Volume= 20,926 cf
Outflow = 4.58 cfs @ 12.15 hrs, Volume= 20,926 cf, Atten= 26%, Lag= 4.2 min
Discarded = 0.09 cfs @ 7.24 hrs, Volume= 8,415 cf
Primary = 4.49 cfs @ 12.15 hrs, Volume= 12,511 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 144.56' @ 12.15 hrs Surf.Area= 1,656 sf Storage= 4,647 cf

Plug-Flow detention time= 122.0 min calculated for 20,923 cf (100% of inflow)
Center-of-Mass det. time= 122.0 min (886.6 - 764.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	140.00'	1,120 cf	**36.00'W x 46.00'L x 4.67'H Field A** 7,734 cf Overall - 4,932 cf Embedded = 2,801 cf x 40.0% Voids
#2A	140.00'	3,600 cf	**Shea Leaching Chamber 8x14x3.7** x 12 Inside #1 Inside= 84.0"W x 36.0"H => 23.08 sf x 13.00'L = 300.0 cf Outside= 96.0"W x 44.0"H => 29.36 sf x 14.00'L = 411.0 cf 12 Chambers in 4 Rows
		4,720 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	141.80'	**12.0" Round Culvert** L= 150.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 141.80' / 136.30' S= 0.0367 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Discarded	140.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.09 cfs @ 7.24 hrs HW=140.05' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=4.49 cfs @ 12.15 hrs HW=144.56' (Free Discharge)
└**1=Culvert** (Inlet Controls 4.49 cfs @ 5.71 fps)

Pond INF-2: INFILTRATION SYSTEM-2 - Chamber Wizard Field A

Chamber Model = Shea Leaching Chamber 8x14x3.7 (Shea Galley)
Inside= 84.0"W x 36.0"H => 23.08 sf x 13.00'L = 300.0 cf
Outside= 96.0"W x 44.0"H => 29.36 sf x 14.00'L = 411.0 cf

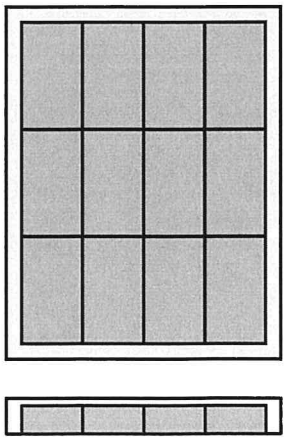
3 Chambers/Row x 14.00' Long = 42.00' Row Length +24.0" End Stone x 2 = 46.00' Base Length
4 Rows x 96.0" Wide + 24.0" Side Stone x 2 = 36.00' Base Width
44.0" Chamber Height + 12.0" Cover = 4.67' Field Height

12 Chambers x 300.0 cf = 3,600.0 cf Chamber Storage
12 Chambers x 411.0 cf = 4,932.5 cf Displacement

7,733.5 cf Field - 4,932.5 cf Chambers = 2,801.0 cf Stone x 40.0% Voids = 1,120.4 cf Stone Storage

Chamber Storage + Stone Storage = 4,720.4 cf = 0.108 af
Overall Storage Efficiency = 61.0%
Overall System Size = 46.00' x 36.00' x 4.67'

12 Chambers
286.4 cy Field
103.7 cy Stone



Summary for Pond RNGN-1: RAINGARDEN

Inflow Area = 92,377 sf, 80.67% Impervious, Inflow Depth = 5.28" for 100 yr event
Inflow = 12.20 cfs @ 12.09 hrs, Volume= 40,675 cf
Outflow = 11.61 cfs @ 12.11 hrs, Volume= 40,675 cf, Atten= 5%, Lag= 1.6 min
Discarded = 0.43 cfs @ 12.11 hrs, Volume= 23,883 cf
Primary = 11.18 cfs @ 12.11 hrs, Volume= 16,792 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 141.80' @ 12.11 hrs Surf.Area= 7,769 sf Storage= 9,022 cf

Plug-Flow detention time= 132.1 min calculated for 40,675 cf (100% of inflow)
Center-of-Mass det. time= 132.1 min (910.4 - 778.4)

Volume	Invert	Avail.Storage	Storage Description
#1	140.00'	21,056 cf	**RAIN GARDEN (Prismatic)** Listed below (Recalc)
#2	135.40'	8 cf	**1.50'D x 4.60'H AREA DRAIN**
		21,064 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
140.00	2,572	0	0
141.00	5,100	3,836	3,836
142.00	8,414	6,757	10,593
143.00	12,512	10,463	21,056

Device	Routing	Invert	Outlet Devices
#1	Primary	141.60'	**50.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Discarded	135.40'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.43 cfs @ 12.11 hrs HW=141.80' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.43 cfs)

Primary OutFlow Max=10.99 cfs @ 12.11 hrs HW=141.80' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 10.99 cfs @ 1.07 fps)

Summary for Link POA: POA-1

Inflow Area = 238,973 sf, 74.60% Impervious, Inflow Depth = 3.32" for 100 yr event
Inflow = 27.72 cfs @ 12.11 hrs, Volume= 66,194 cf
Primary = 27.72 cfs @ 12.11 hrs, Volume= 66,194 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

APPENDIX 3:
SOILS REPORT

Commonwealth of Massachusetts
City/Town of RANDOLPH

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

34 SCANLON DRIVE - JACK OLEARY SE - 17835 - JUNE 17, 2019

C. On-Site Review (continued)

Deep Observation Hole Number: 17-1

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-3"	FILL										ASPHALT
3"-72"	FILL	2.5Y6/4		LOAMY SAND		LOAMY SAND,	20	5	SINGLE	LOOSE	
						SILT LOAM INCLUSIONS			GRAIN		

Additional Notes:

WATER WEEPING @ 56" ± ESHGW

NO REDOXIMORPHIC FEATURES

BASE COURSE INCLUDED IN FILL 3"-12"±

Commonwealth of Massachusetts
City/Town of RANDOLPH

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

34 SCANLON DRIVE - JACK O'LEARY SE 1785 - JUNE 17, 2019

C. On-Site Review (continued)

Deep Observation Hole Number: 17-2

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-3"	FILL										ASPHALT
3"-46"	FILL	2.5Y 6/4				LOAMY SAND	5		SINGLE GRAIN	LOOSE	
46"-64"	FILL	2.5Y 5/3				LOAMY SAND	20		SINGE GRAIN	LOOSE	

Additional Notes:

GROUNDWATER WEEPING @ 56" ← ESHGW

NO REDOXIMORPHIC FEATURES

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

34 SCANLON DRIVE — JACK OLEARY / SE 1785 — JUNE 17, 2019

C. On-Site Review (continued)

Deep Observation Hole Number: 17-3

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-3"	FILL										ASPHALT
3"-59"	FILL	2.5Y 6/4				LOAMY SAND	20	5	SINGLE GRAIN	LOOSE	SILT INCLUSIONS
59"-60"	^C1	10Y 3/1	59"	GLEY COLOR		CLAY LOAM			MASSIVE	FIRM	TOPSOIL LENS *

Additional Notes:

GROUNDWATER WEEPING AT 56" ← ESHGW

REDOXIMORPHIC FEATURES AT 59" (GLEY COLOR)

*^C1 HORIZON INDICATIVE OF BORDER WETLAND

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

34 SCANLON DRIVE – JACK OVERN / SE 1785 - JUNE 17, 2019

C. On-Site Review (continued)

Deep Observation Hole Number: 17-4

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-3"	FILL										ASPHALT
3"-55"	FILL	2.5Y6/4				SANDY LOAM	20	5	SINGLE GRAIN	LOOSE	SAND INCLUSIONS
55"-67"	^A	2.5YR3/3				SAPRIC			MASSIVE	FIRM	*
67"-84"	^C1	10Y3/1	67"	GLEY COLOR		CLAY LOAM			MASSIVE	FIRM	*

Additional Notes:

GROUNDWATER WELLING AT 56" ← ESHGW

REDOXIMORPHIC FEATURES AT 67"

* ^A AND ^C1 HORIZONS INDICATIVE OF BURIED WETLAND

Commonwealth of Massachusetts
City/Town of RANDOLPH

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

34 SCANLON DRIVE - JACK OLSON/SE 1785 - JUNE 17, 2019

C. On-Site Review (continued)

Deep Observation Hole Number: 17-5

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-3"	FILL										ASPHALT
3"-84"	FILL	2.5Y 4/4				SAND	20	5	SINGLE GRAIN	LOOSE	

Additional Notes:

NO GROUNDWATER OBSERVED

NO REDOXIMORPHIC FEATURES NOTED

EXCAVATION STOPPED DUE TO HOLE COLLAPSE

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

34 SCHOOL DRIVE – JACK O'LEARY SE 1785 – JUNE 17, 2019

C. On-Site Review (continued)

Deep Observation Hole Number: 17-6

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-3"	FILL										ASPHALT
3"-38"	FILL	2.5Y 6/4				SANDY LOAM	20	20	SINGLE GRAIN	LOOSE	
38"-50"	A	2.5Y 3/3	38"	HYDRIC		SAPRIC			MASSIVE	FIRM	*
50"-64"	C1	10Y 3/1				CLAY LOAM			MASSIVE	FIRM	*
64"-120"	C2	10YR 4/4				SANDY LOAM	30	10	SINGLE GRAIN	LOOSE	*

Additional Notes:

BURIED HYDRIC SOIL = ESHGL = 38"

* BURIED SOIL HORIZONS INDICATIVE OF WETLANDS

Commonwealth of Massachusetts
City/Town of RANDOLPH

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

34 SCANLON DRIVE - JACK O'LEARY/SE 1785 - JUNE 17, 2019

C. On-Site Review (continued)

Deep Observation Hole Number: 17-7

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-3"	FILL										ASPHALT
3"-108"	FILL	2.5Y 6/4				LOAMY SAND	30	10	MASSIVE	FIRM	*

Additional Notes:

* SILTY LENSES, 10% COBBLES IN UPPER 3'

GROUNDWATER SEEPING @ 72"

NO REDOXIMORPHIC FEATURES NOTED

Commonwealth of Massachusetts
City/Town of RANDOLPH

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

34 SCANLON DRIVE – JACK O'LEARY SE 1785 – JUNE 17, 2019

C. On-Site Review (continued)

Deep Observation Hole Number: 17-8

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-3"	FILL										ASPHALT
3"-14"	FILL										BASE COURSE
14"-20"	^A										BURIED TOPSOIL
20"-29"	^B										BURIED SUBSOIL
29"-84"	^C	2.5Y 6/4				SANDY LOAM	30	20	MASSIVE	FIRM	

Additional Notes:

NO GROUNDWATER ENCOUNTERED
NO REDOXIMORPHIC FEATURES NOTED
EXCAVATION STOPPED DUE TO HOLE COLLAPSE

811 Know what's below. Call before you dig.

VERTEX®
400 Libbey Parkway | Weymouth, MA 02189
Main: 781-952-6000 | VERTEXENG.COM

HIGH STREET (PUBLIC – 66' WIDE)

SCANLON DRIVE (PUBLIC – 50' WIDE)

TEMPORARY BENCHMARK #3
XCUT IN BONNETT BOLT
ELEV. 145.25 (NAVD 88)

TEMPORARY BENCHMARK #2
NAIL SET IN UP #93
ELEV. 151.50 (NAVD 88)

TEMPORARY BENCHMARK #4
NAIL SET IN UP #7
ELEV. 147.74 (NAVD 88)

TEMPORARY BENCHMARK #5
NAIL SET IN UP #5
ELEV. 142.31 (NAVD 88)

TEMPORARY BENCHMARK #6
NAIL SET IN UP #90-2
ELEV. 142.60 (NAVD 88)

TEST HOLE # 17-1
TEST HOLE # 17-2
TEST HOLE # 17-3
TEST HOLE # 17-4
TEST HOLE # 17-5
TEST HOLE # 17-6
TEST HOLE # 17-7
TEST HOLE # 17-8

05-A-001.2 — N/F MINOT, INC. DEED BOOK 11425, PAGE 406 LOT AREA=207,550± SQ. FT. 4.765 ACRES

05-A-007.01 — N/F SAMUEL E ABELL DEED BOOK 10890, PAGE 85 PARCEL ID: 05-A-007.404

05-A-007.02 — N/F BE BOULDER LLC DEED BOOK 32995, PAGE 169 PARCEL ID: 05-A-006.03

05-A-006.02 — N/F SIMAO BARBOSA DEED BOOK 28222, PAGE 336 PARCEL ID: 05-A-029.4&12

05-A-006.04 — N/F ELYSEE M NJONTU DEED BOOK 33482, PAGE 332 PARCEL ID: 05-A-030.C

05-A-006.A — N/F LOUIS C GAY DEED BOOK 19937, PAGE 476 PARCEL ID: 05-A-031.290

N/F ROBERT R HARDESTY DEED BOOK 8423, PAGE 168 PARCEL ID: 05-A-032.A

N/F STEPHEN MAGEE DEED BOOK 32354, PAGE 148 PARCEL ID: 05-A-033.296

N/F SUZANNE BAKER DEED BOOK 20387, PAGE 321 PARCEL ID: 05-A-034.A

N/F 20 SCANLON DRIVE LLC DEED BOOK 23751, PAGE 16 PARCEL ID: 05-A-006.01

N/F HART FAMILY LIMITED PARTNERSHIP DEED BOOK 17103, PAGE 192 PARCEL ID: 05-A-45.422

EXISTING BUILDING 34 SCANLON DRIVE

N/F MINOT, INC. DEED BOOK 11425, PAGE 406 PARCEL ID: 02-C-1.438

"THE LANTANA"

MASSASOIT COMMUNITY COLLEGE

DISABLED AMERICAN VETS CHAPTER 38

GENERAL NOTES:

1. THE EXISTING CONDITIONS INFORMATION SHOWN HEREON IS THE RESULT OF AN ON-THE-GROUND SURVEY PERFORMED BY CHA CONSULTING, INC. IN JUNE OF 2019.

2. ALL DEED REFERENCES ARE TO NORFOLK COUNTY REGISTRY OF DEEDS UNLESS OTHERWISE NOTED.

3. LOCUS OWNER OF RECORD:

   MINOT INC.
   DEED BOOK 11425 PAGE 406
   MAP 5, LOTS 05-A-006.A, 05-A-006.02, 05-A-006.04, 05-A-001.2, 05-A-002.389 & 05-A-007.01

4. TOPOGRAPHY, CONTOURS AND BENCHMARKS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). TEMPORARY BENCHMARKS, REFERENCED TO THE DATUM ARE INDICATED ON THE SURVEY.

   IN THE EVENT THAT BENCHMARKS (TBM'S), ESTABLISHED FOR THIS PROJECT AND PUBLISHED ON THIS SURVEY ARE DESTROYED, NOT RECOVERABLE OR A DISCREPANCY IS FOUND, THE USER SHOULD NOTIFY THIS FIRM IN WRITING PRIOR TO COMMENCING OR CONTINUING ANY WORK.

5. THE PROJECT AREA IS LOCATED IN FLOOD ZONES "X & A" AS SHOWN ON FLOOD INSURANCE RATE MAP FOR NORFOLK COUNTY, COMMUNITY PANEL NUMBER 25021C0204E, EFFECTIVE DATE JULY 17, 2012.

6. THE LOCUS PARCEL IS LOCATED IN THE TOWN OF RANDOLPH BLUE HILL RIVER HIGHWAY DISTRICT AS DEFINED BY THE TOWN OF RANDOLPH ZONING MAP.
   MINIMUM SETBACK REQUIREMENTS ARE:

   FRONT SETBACK:.....15'
   SIDE SETBACK:.....6'
   REAR SETBACK:.....15'

7. LOCATION OF SUBSURFACE UTILITIES SHOWN HEREON ARE APPROXIMATE AND ADDITIONAL UTILITIES MAY EXIST THAT ARE NOT SHOWN ON THIS PLAN. LOCATIONS ARE COMPILED FROM UTILITY PLANS OF RECORD AND DIG-SAFE FIELD MARKINGS. RIM AND INVERT INFORMATION HAS BEEN COMPILED AND FIELD VERIFIED WHERE POSSIBLE. THIS INFORMATION IS NOT TO BE USED FOR CONSTRUCTION. PRIOR TO ANY CONSTRUCTION, CONTACT DIG-SAFE (1-800-344-7233) TO FIELD VERIFY LOCATION OF ALL UTILITIES.

8. PLAN REFERENCES:

   LAND COURT PLAN 4921S
   PLAN BOOK 382 PAGE 570
   PLAN BOOK 437 PAGE 117
   PLAN BOOK 541 PAGE 682
   PLAN BOOK 67 PAGE 3227
   PLAN BOOK 4915 PAGE 153
   PLAN BOOK 4998 PAGE 667
   PLAN BOOK 221 PAGE 683
   PLAN BOOK 1773 PAGE END
   PLAN BOOK 4813 PAGE 209

9. WETLAND FLAGS SHOWN HEREON ARE BASED ON FIELD LOCATIONS BY CHA CONSULTING, INC. IN JUNE, 2019.

   WETLAND FLAGS WERE DELINEATED BY PARE CORP. ON MAY 15, 2018.

LEGEND:

- BUILDING LINE
- PARCEL BOUNDARY LINE
- EASEMENT LINE
- ADJOINING PARCEL LINE
- STREET/HIGHWAY LINE
- UNDERGROUND WATER LINE
- UNDERGROUND GAS LINE
- DRAIN LINE
- STONE WALL
- CHAIN LINK FENCE
- OVERHEAD UTILITY LINE
- TREE LINE

- CBD — CONCRETE BOUND
- DH — DRILL HOLE
- TREE — PINE TREE
- TREE — DECIDUOUS TREE
- CB — SQUARE CATCH BASIN
- MHST — STORM MANHOLE
- INV. — INVERT
- WSO — WATER SHUT OFF
- WV — WATER VALVE
- HYD — HYDRANT
- MHSA — SEWER MANHOLE
- GSO — GAS SHUT OFF
- GV — GAS VALVE
- UP — UTILITY POLE
- GUY POLE — GUY POLE
- GW — GUY WIRE
- EB — ELECTRIC BOX
- WDL — WETLAND FLAG
- BOL — BOLLARD
- MBX — MAILBOX
- SPS — SINGLE POST SIGN

PROGRESS PRINT
JUNE 28, 2019

30 15 0 30 60
SCALE: 1" = 30'

TEST HOLE LOCATION PLAN
SITE: 34 SCANLON DRIVE
RANDOLPH, MA
FOR: VERTEX COMPANIES, INC.
400 LIBBEY INDUSTRIAL PARKWAY
WEYMOUTH, MA 02189

NO.	REVISIONS
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

DATE: 7/23/2019
DRAWN BY: CHA
CHECKED BY: JDO
JOB #: 57186

1 of 1

APPENDIX 4:
LONG TERM OPERATION AND MAINTENANCE PLAN

YANKEE BUS LINE HEADQUARTERS
LONG-TERM POLLUTION PREVENTION PLAN
March 2023

Maintenance Contact Information:

Area Drains, Catch Basins, Drain Manholes, Drywells, and Infiltration Chambers

(Private companies capable of performing maintenance)

1. Stormwater Compliance (South Portland, ME):
   Phone Number: 508-505-8723
2. Clean Harbors (Norwell, MA):
   Phone Number: 781-849-1800

General Material Storage

Provisions for storing materials and waste products inside or under cover: All materials stored on site shall be stored in a neat and orderly fashion in their appropriate containers and under a roof or other secure enclosure separate from an occupied structure. Waste products shall be placed in secure receptacles until they are emptied by a solid waste management company that is licensed in Massachusetts.

Spill prevention and response plans:

1. Prevention: All materials stored on site shall be stored in a neat and orderly fashion in their appropriate containers and under a roof or other secure enclosure. Products will be kept in their original containers with the original manufacturer's label. Products shall not be mixed with one another unless recommended by the manufacturer. If possible, all of the product shall be used before disposing of the container. The manufacturer's recommendations for proper use and disposal shall be followed.
2. Equipment: Materials and equipment necessary for spill cleanup will be present on the site all times. Equipment and materials will include but not be limited to; brooms, shovels, rags, gloves, goggles, absorbent materials (sand, sawdust, etc.), and plastic or metal trash containers specifically designed for this purpose. The materials and equipment necessary for spill cleanup are dependent upon the nature and quantity of the material stored on the site.
3. Response: Manufacturer's recommended methods for cleanup shall be followed. Spills shall be cleaned up immediately after discovery. The spill area shall be kept well ventilated and personnel shall wear appropriate protective clothing to prevent injury from contact with a hazardous substance. Spills of toxic or hazardous material shall be reported to the appropriate State and/or local authority in accordance with local and/or State regulations.

General Land Grading and Slopes Stabilization

Provisions for maintenance of lawns, gardens and other landscaped areas: The Housing Authority is responsible for these activities. General lawn areas shall be cut weekly during the growing season. Grassed swale and rain garden area shall be maintained as outlined.

Requirements for storage and use of fertilizers, herbicides, and pesticides will be in compliance with all applied laws:

1. Fertilizers: Fertilizers shall be applied in the minimum quantities recommended by the manufacturer.
2. Herbicides and Pesticides: All herbicide application shall conform to Massachusetts Pesticide Laws and Regulations per the Massachusetts Department of Agricultural Resources (MDAR) Pesticide Bureau.

3. Store herbicides and pesticides in original containers that are closed and labeled, in a secure area out of reach of children and pets. Avoid storing herbicide and pesticides in damp areas where containers may become moist or rusted.
4. Herbicides and pesticides shall not be sprayed 2 hours prior to or during precipitation and during rain. The Town shall be responsible for monitoring weather conditions and adjusting the work schedule as appropriate for the herbicide and application method to be used.
5. Herbicides & Pesticides shall not be stored outside Conservation Commissions Jurisdictional areas (within 100-ft of the wetland or 200-ft of the riverfront)

All surfaces and slopes shall be checked bi-annually to see that vegetation is in good condition. Any rills or damage from erosion shall be repaired immediately to avoid further damage. If seeps develop on the slopes, the area will be evaluated to determine if the seep will cause an unstable condition and shall be stabilized immediately if necessary. Problems found during the inspections by the DPW shall be repaired promptly. Areas requiring re-vegetation shall be replanted immediately. Slopes and other exposed surfaces receiving vegetation will be maintained as necessary to support healthy vegetation.

Areas of steep slopes (2.5:1 or greater) shall be stabilized using jute mesh or a similar approved erosion blanket.

Street Sweeping

It is proposed that the parking and drive areas be swept with a vacu-brush street sweeper on a semi-annual basis, with at least two sweepings per year. One sweep shall be done at the end of the winter season (prior to the heavy rains), and the other sweep at the end of autumn (prior to snowfall).

Small areas such as walkways shall be cleaned with a suitable walk-behind vacuum, or broom.

Stormwater Management System

Area Drains, Catch Basins, Drain Manholes, Drywells:
All area drains, catch basins, drain manholes, and drywells shall be inspected annually, and cleaned out when sumps are approximately one foot full. The use of "clam shells" for sediment removal shall not be allowed; a vacuum truck shall be the approved method of cleaning. Integrity and functionality of oil hoods shall also be checked at the time of the inspection.

Water Quality Unit (WQU):
Water Quality Unit shall be as follows per manufacturer's recommendations:

- Units should be inspected post-construction, prior to being put into service.
- Inspect every six months for the first year of operation to determine the oil and sediment accumulation rate. In subsequent years, inspections can be based on first-year observations
- Cleaning is required once the sediment depth reaches 15% of storage capacity, (generally taking one year or longer).
- Inspect the unit immediately after an oil, fuel or chemical spill.
- A licensed waste management company should remove captured petroleum waste products from any oil, chemical or fuel spills and dispose responsibly

Rain Garden/ Bioretention Area:
For the first year inspect soil and repair eroded areas monthly. Re-mulch void areas as needed. Remove litter and debris monthly. Treat diseased vegetation as needed. Remove and replace dead vegetation twice per year (spring and fall).

Proper selection of plant species and support during establishment of vegetation should minimize—if not eliminate—the need for fertilizers and pesticides. Remove invasive species as needed to prevent these species from spreading into the bioretention area. Upon failure, excavate bioretention area, scarify bottom and sides, replace filter fabric and soil, replant, and mulch. Never store snow in bioretention areas.

Because the soil media filters contaminants from runoff, the cation exchange capacity of the soil media will eventually be exhausted. When the cation exchange capacity of the soil media decreases, change the soil media to prevent contaminants from migrating to the groundwater, or from being discharged via an underdrain outlet. Using small shrubs and plants instead of larger trees will make it easier to replace the media with clean material when needed. Plant maintenance is critical. Concentrated salts in roadway runoff may kill plants, necessitating removal of dead vegetation each spring and replanting.

Maintenance Schedule:

Activity	Time of Year	Frequency
Inspect and remove trash	Year round	Monthly
Mulch	Spring	Annually
Remove dead vegetation	Fall or spring	Annually
Replace dead vegetation	Spring	Annually
Prune	Spring or fall	Annually

INSPECTION REPORT FORM FOR STORM WATER SYSTEM

Project: Tyngsborough Middle School - Tyngsborough, MA
50 Norris Road, Tyngsborough, MA

INSPECTOR:_____ **DATE:**_____

Regular Inspection: ☐
Inspection after Rainfall: ☐ **Amount of Rainfall:**_____**inches**

BMP	Functioning Correctly	Notes/Action Taken
	Y/N	
	Y/N	
	Y/N	
	Y/N	
	Y/N	
	Y/N	
	Y/N	

Additional Observations: _____

_____

_____

Action Required: _____

_____

_____

To be performed by:_____ **On or Before:**_____

ILLICIT DISCHARGE COMPLIANCE STATEMENT

SITE ADDRESS: 34 Scanlon Drive, Randolph, MA 02368

OWNER/APPLICANT:

PLAN REFERENCE: Yankee Bus Line Headquarters C401 Civil Utilities Plans

DATE:

As required by Standard 10 of the Massachusetts Stormwater Standards, I, the undersigned, being the authorized owner/responsible party of the above referenced property do hereby certify that no illicit discharges exist on the site and that the stormwater management system, as shown on the above referenced plan, does not contain or permit any illicit discharges to enter the stormwater management system.

Through the implementation of the Long-Term Pollution Prevention Plan and Operation and Maintenance Plan, measures are set forth to prevent illicit discharges from entering the stormwater management drainage system. Further, I certify that the stormwater management system as shown on the referenced plan will be maintained in accordance with the conditions of the Long-Term Pollution Prevention Plan.

NAME: MICHAEL A. CAHILL

SIGNED: _____

DATE: 04.19.23

YANKEE BUS HEADQUARTERS
OPERATION AND MAINTENANCE PLAN
April 2023

During Construction the General Contractor shall be responsible for the following:

1. **Erosion Control**

   Erosion control barriers will be placed along down-gradient portion of the site as indicated on the project plans. Additional erosion control barriers will be placed at the limit of work as needed and in any sensitive areas as work progresses. A stockpile of additional erosion control barriers shall be kept on site at all times

   Erosion control shall be left in place until directed by the Conservation Commission to remove it.

2. **Site Access**

   Site access, for construction equipment will be from the existing driveway entrance. Site access, for construction equipment will be via a new construction entrance which will be installed at the onset of the project by the general contractor per construction entrance detail on Civil Details sheet C-500)

3. **Construction Staging**

   A construction staging area will be established on the existing pavement within the site adjacent to the existing building. All construction materials, supplies, trailers and offices, portable toilets, and equipment shall be stored within the limits of the staging area. Temporary trailers and offices may also be located within the developed portion of the site. All temporary stockpiles will be surrounded with straw wattles and silt fencing as required.

4. **Site Grading/Site Work**

   The site grading related site activities may only commence when the site is stable from erosion and all required control measures are in place and functional. Site work during wet periods should be avoided if possible and limited to only those areas that will not have adverse impacts on wetland resource areas.

5. **Permanent Stabilization**

   Disturbed portions of the site where construction activities permanently cease shall be stabilized with permanent seed no later than 5 days after the last construction activity. Stabilization shall be done by hydroseeding all graded and exposed areas as soon as possible. If hydroseeding in performed during non-growing season then newly hydroseeded areas shall be covered with a thick layer of straw. Newly seeded areas shall be inspected on a monthly basis and the hay replaced, as required, until the vegetation is well established.

6. **Dust and Sediment Control**

   Silt Sacks:
   Catch basin filters shall be placed at all inlets to drainage structures and prior to pavement removal. Outlet protection work shall be constructed before runoff is allowed to enter the drainage system. Construction and location of catch basin filters shall be as indicated on the Drawings.

Straw wattles and silt fence:
Straw wattles and silt fence shall be installed as indicated on the Drawings.

Wattles shall be placed in a row with ends tightly abutting the adjacent wattles. Each wattle shall be securely anchored in place by 2 stakes or re-bars driven through the wattles. The first stake in each wattle shall be angled toward the previously laid wattle to force the wattles together.

Construction Entrance:
The area of the construction entrance should be cleared of all vegetation, roots, and other objectionable material. The filter fabric should be placed on the subgrade prior to the gravel placement. The gravel shall be placed to the specified dimensions depicted on the plans.

The Construction Entrance shall be a minimum of 50-feet in length and 20-feet wide.

Dust Control:
A mechanical street sweeper shall be utilized to clean the existing paved areas on an as-needed basis.

For emergency control of dust apply water to affected areas. The source of supply and the method of application for water are the responsibility of the contractor.

Pollution Prevention Measures

1. Before, during, and after construction, functional erosion and sedimentation controls shall be implemented to prevent the siltation of the wetland areas down-gradient of the site. Wattles, crushed stone, siltation fencing, temporary stabilization and other controls shall be properly maintained and are not to be removed until the site is permanently stabilized. Other controls shall be added as warranted during construction to protect environmentally-sensitive areas. Sufficient extra materials (e.g., wattles and other control materials) shall be stored on site for emergencies.

2. Casting of excavated materials shall be stored away from wetland areas and sensitive land areas.

3. Any stockpiling of loose materials shall be properly stabilized to prevent erosion and siltation. Preventative controls such as hay bales, temporary seeding/mulching and jute covering shall be implemented to prevent such an occurrence.

4. There shall be no flooding, ponding, or flood related damage caused by the project or surface run-off emanating from the project on lands of an abutter, nearby or down-gradient of the site.

5. There shall be no contaminant migration caused by the project to nearby and down-gradient properties, nearby aquifers, and nearby resource areas.

6. The Site Operator shall make sufficient provisions to control any unexpected drainage and erosion conditions that may arise during construction that may create damage on abutting properties. Said control measures are to be implemented at once.

7. During construction flood prevention, erosion, and sedimentation controls shall be in place before the natural ground cover is disturbed. Said controls shall be in place prior to other construction work and shall be

monitored and approved by the Site Operator. They shall be properly maintained and are not to be removed until the site is stabilized.

8. The Site Operator shall designate a person or persons to inspect and supervise the drainage and erosion controls for the project. The Conservation Commission shall be notified as to the means to contact said individual or individuals on a 24-hour basis on all working and non-working days of the project. Said means of contact shall include at least 2 separate telephone number of said designated person or persons.

9. There shall be periodic inspection of wattles, and other erosion controls by the Operator's Designee to assure there continued effectiveness.

10. Street sweeping shall be used to keep public ways free and clear of sediment and dirt from the site activities.

Other Control Measures

Waste Materials. All trash and construction debris from the site will be hauled to an approved landfill or recycling facility. No construction waste material will be buried on the site. All personnel will receive instructions regarding the correct procedure for waste disposal. Notices describing these practices will be posted in the construction office. The site superintendent will be responsible for seeing that these procedures are followed. Employee waste and other loose materials will be collected so as to prevent the release of floatables during rainfall events.

After Construction the Owner (Yankee Bus) shall be responsible for the following:

Erosion Controls

Erosion controls shall not be removed or dismantled without approval from the Engineer or Conservation Commission. Sediment deposits that are removed or left in place after the barriers have been dismantled shall be graded manually to conform to the existing topography and vegetated using seeding or other long term cover as approved in the Landscape Plan. Bare ground that cannot be permanently stabilized within 30 days shall be stabilized by temporary measures.

Street Sweeping ($500 per sweeping)

It is proposed that the parking and drive areas be swept with a wet brush street sweeper on a semi-annual basis, with at least two sweepings per year. One sweep shall be done at the end of the winter season (prior to the heavy rains), and the other sweep at the end of autumn (prior to snowfall).

Stormwater Management System

Catch Basins, Area Drains, and Drain Manholes ($500 per structure per inspection/cleaning):
The catch basins, drain manholes, roof drains, and area drains shall be inspected semi-annually, and cleaned out when sumps are approximately 15% full or at a minimum of once per year. The use of "clam shells" for sediment removal shall not be allowed; a vacuum truck shall be the approved method of cleaning. Integrity and functionality of oil hoods shall also be checked at the time of the inspection.

Water Quality Unit (WQU) ($1,000 per structure per inspection/cleaning):
Water Quality Unit shall be as follows and per manufacturer's recommendations:

- Units should be inspected and cleaned/emptied post-construction, prior to being put into service.
- Inspect every six months for the first year of operation to determine the oil and sediment accumulation rate. In subsequent years, inspections can be based on first-year observations
- Cleaning is required once the sediment depth reaches 15% of storage capacity or at a minimum of once per year.
- Inspect the unit immediately after an oil, fuel, or chemical spill.
- A licensed waste management company should remove captured petroleum waste products from any oil, chemical, or fuel spills and dispose responsibly.
- Owner to follow the requirements of the manufacturer for maintenance and cleaning of the units with a frequency as noted above, and where the requirements of this Operations and Maintenance Plan are more rigorous than manufacturer's requirements, defer to this Operations and Maintenance Plan.

Rain Garden/ Bioretention Area
For the first year inspect soil and repair eroded areas monthly. Re-mulch void areas as needed. Remove litter and debris monthly. Treat diseased vegetation as needed. Remove and replace dead vegetation twice per year (spring and fall).

Proper selection of plant species and support during establishment of vegetation should minimize—if not eliminate—the need for fertilizers and pesticides. Remove invasive species as needed to prevent these species from spreading into the bioretention area. Upon failure, excavate bioretention area, scarify bottom and sides, replace filter fabric and soil, replant, and mulch. Never store snow in bioretention areas.

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Maintenance Schedule:

Activity	Time of Year	Frequency
Inspect and remove trash	Year round	Monthly
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Remove dead vegetation	Fall or spring	Annually
Replace dead vegetation	Spring	Annually
Prune	Spring or fall	Annually

Snow Storage

No snow shall be stored within stormwater BMP's or wetlands.

INSPECTION REPORT FORM FOR STORM WATER SYSTEM

Project: Yankee Bus Headquarters - Randolph, MA
34 Scanlon Drive, Randolph, MA

INSPECTOR:_____ **DATE:**_____

Regular Inspection: ☐
Inspection after Rainfall: ☐ **Amount of Rainfall:**_____**inches**

BMP	Functioning Correctly	Notes/Action Taken
	Y/N	
	Y/N	
	Y/N	
	Y/N	
	Y/N	
	Y/N	
	Y/N	

Additional Observations: _____

Action Required: _____

To be performed by:_____ **On or Before:**_____

APPENDIX 5:
WATERSHED SKETCHES

TGAS

THE GALANTE ARCHITECTURE STUDIO INC

146 MT AUBURN ST CAMBRIDGE, MA 02138

6 1 7 5 7 6 2 5 0 0

WWW.GALANTEARCHITECTURE.COM

N

Project Number
2221

Project Title
Yankee Bus Line HQ

34 Scanlon Drive
Randolph, MA 02368

samiotes

Samiotes Consultants Inc.
Civil Engineers + Land Surveyors

20 A Street
Framingham, MA 01701

T 508.877.6688
F 508.877.8349
www.samiotes.com

Drawing Title

EXISTING WATERSHED

Date/Issued For
03.14.23

Planning Board Submission

NOT FOR CONSTRUCTION

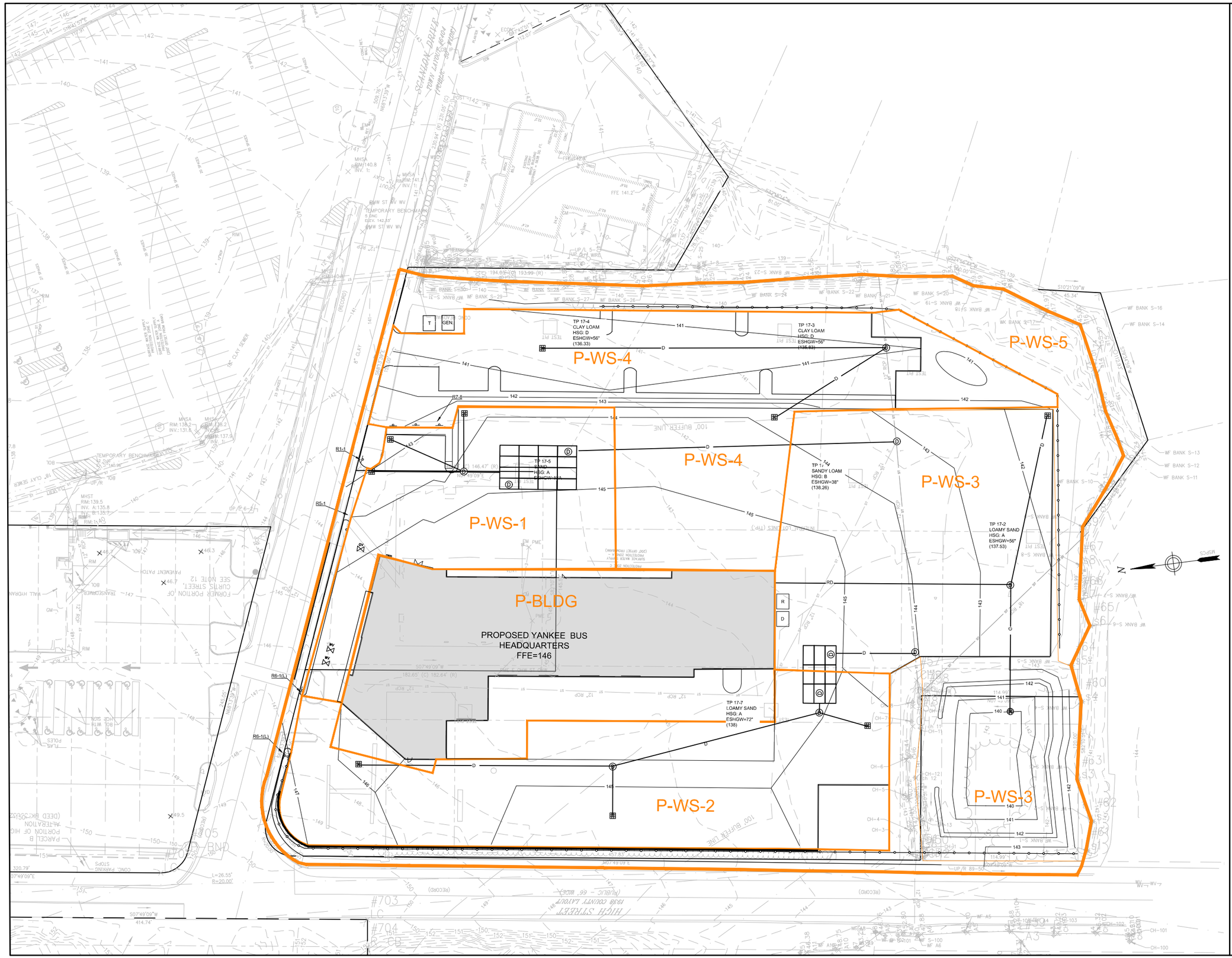
Print 24x36

Scale
As Noted

Drawn By
MEK

Drawing Number

EX-WS



TGAS

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146 MT AUBURN ST CAMBRIDGE, MA 02138

6 1 7 5 7 6 2 5 0 0

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Project Number
2221

Project Title
Yankee Bus Line HQ

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Randolph, MA 02368

samiotes

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Drawing Title

PROPOSED WATERSHED

Date/Issued For
04.xx.23
Planning Board
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NOT FOR CONSTRUCTION

Print 24x36

Scale
As Noted

Drawn By
MEK

Drawing Number