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Hayes Engineering, Inc

# Drainage Analysis:
# Vallis Way
# Lynnfield, Massachusetts 01940


4-15-2021

April 15, 2021

**MITIGATIVE DRAINAGE ANALYSIS**
**VALLIS WAY**
**LYNNFIELD, MASSACHUSETTS**

April 15, 2021

The following Drainage Analysis has been prepared in conjunction with designing the drainage system for the single-family subdivision proposed at 109 Lowell Street to be known as Vallis Way in Lynnfield, Massachusetts.

## PROJECT DESCRIPTION

The scope of the project is to construct a new roadway, as shown on the plan, to create five new single family lots in addition to the existing home at #109 Lowell Street. The goal of this analysis is to determine potential hydrologic impacts by comparing runoff from the subject property under both the existing and proposed conditions in accordance with the requirements set forth in the Rules and Regulations of the Lynnfield Planning Board and the Massachusetts Department of Environmental Protection's (DEP's) Stormwater Management Standards. Drainage BMPs will consist of deep sump catch basins with gas traps, an infiltration pond with a forebay, and subsurface chamber systems as shown on the plans.

## PROJECT COMPLIANCE WITH STORMWATER STANDARDS

### Standard 1: No New Untreated Discharges

***No new storm water conveyances (e.g. outfalls) may discharge untreated storm water directly to or cause erosion in wetlands or waters of the Commonwealth.***

There are no wetlands or waters of the Commonwealth in the area of the project site. Additionally, there are no discharge points, with the exception of an emergency spillway, in the proposed design as all stormwater will be infiltrated.

While there is an emergency spillway from the infiltration pond, the pond has been designed with extra capacity to reduce the possibility of water flowing over the emergency spillway. The pond was designed with enough capacity that in the event there were two back to back 100 year storms the peak water elevation would be 0.6 feet below the emergency spillway. This was done by running a 100 year storm through the pond and figuring the peak water elevation in the pond. The pond was then resized in the model to discount the volume occupied by the water from the first 100 year storm and a second 100 year storm was routed through the pond.

### Standard 2: Peak Rate Attenuation

***Storm water management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.***

Refer to the attached summary tables and calculations for peak rate runoff analysis. To comply with the Lynnfield Rules and Regulations, the 2, 10, 25, and 100-year, Type III, 24-hour storms have been studied.

The existing subject site consists of several watersheds. Most of these watersheds flow to existing small depressions. The soils on the site are such that there is low runoff from each watershed which infiltrates into the ground with little if any ponding. There is one existing watershed on the northwest corner of the site which flows to an existing swale that flows towards #19 Smith Farm Trail.

The proposed subdivision will be graded to direct the runoff from the roadway and driveways to deep sump catch basins that are connected by piping to a forebay and infiltration pond. Runoff from the proposed roofs will be connected to infiltration systems. The watersheds are all depicted on the existing and proposed watershed maps which are included in this report.

The runoff computations for this project were all conducted utilizing the HydroCAD Stormwater Modeling System by HydroCAD Software Solutions, LLC. The methodology used is based on TR-55 and TR-20 as developed by the Soil Conservation Service of the USDA. Runoff curve numbers and concentration times were calculated for each sub-watershed in the existing and proposed condition. A computer model for both conditions was then created using the software program. Schematics of the models are included at the beginning of the respective (existing vs. proposed) sections of this report.

There are two sets of calculations: the existing and proposed 2-year, 10-year, 25-year and 100-year storms. Each calculation set includes: 1) summary sheets for each watershed and link; and 2) detailed summary sheets for the stormwater management basins for all design storms.

The results of the calculations indicate that all stormwater will be contained onsite and infiltrated via the chambers or the infiltration pond.

**Standard 3: Recharge**

***Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration ... 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 storm water management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Storm Water Handbook.***

This standard is presumed met when a specific volume of runoff from the proposed impervious areas is infiltrated into the ground. Hydrologic group "A" soils require 0.60 inches of runoff, (over the proposed impervious area) to be infiltrated every storm.

The soil types and hydrologic soil groups were determined using the Web Soil Survey from the National Cooperative Soil Survey for Essex County. The soil survey indicates that the soil in the relevant watershed area is Merrimac fine sandy loam and Merrimac-Urban land complex which are both in the Hydrologic group "A". The soils information is all contained in the soils section of this report. There are also logs for test holes that were excavated on the site for determination of soil types and groundwater elevations. A Recharge Worksheet is included in this report demonstrating that the required recharge volume is met and that the required recharge volume will infiltrate in less than the required 72 hours (State) and 24 hours (Lynnfield).

**Standard 4: Water Quality**

***Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).***

In order to address the issue of water quality, the drainage system has been designed to conform to the Department of Environmental Protection's Stormwater Management Policy. The system includes deep sump catch basins with gas traps and an infiltration pond with a forebay.

The DEP has assigned presumed total suspended solids (TSS) removal rates for each of these types of Best Management Practices (BMPs). The infiltration basin is rated to remove 80%, with adequate pretreatment which is provided with the deep sump hooded catch basins and the forebay.

**Standard 5: Land Use with Higher Potential Pollutant Loads**

***For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.***

NOT APPLICABLE

**Standard 6: Critical Areas**

***Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.***

The site is in the groundwater protection district. Water quality treatment is provided for 1 inch of runoff from the impervious surfaces.

**Standard 7: Redevelopment**

***A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5, and 6.***

The project does not meet the definition of Redevelopment.

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

***A plan to control construction-related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities shall be developed and implemented.***

A complete Construction Period Pollution Prevention and Erosion and Sedimentation Control is included with this study.

**Standard 9: Operation and Maintenance Plan**

***A Long-Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.***

An Operation and Maintenance is included with this study.

**Standard 10: Prohibition of Illicit Discharges**

***All illicit discharges to the stormwater management system are prohibited.***

No discharge to resource areas is proposed.

# BMP Performance
## Vallis Way
## Lynnfield, MA

## BMP Houses based on 4,321 S.F. house

| Storm | Q in (C.F.S.) | Q out Primary (C.F.S.) | Q out Infiltration (C.F.S.) | Water Level above bottom of stone (Ft.) |
|---|---|---|---|---|
| 2 Year | 0.29 | 0 | 0.06 | 1.5 |
| 10 Year | 0.43 | 0 | 0.06 | 2.45 |
| 25 Year | 0.50 | 0 | 0.06 | 3.07 |
| 100 Year | 0.62 | 0 | 0.06 | 4.28 |

Available Depth 5.50'

## BMP 2P Infiltration Pond

| Storm | Q in (C.F.S.) | Q out Spillway (C.F.S.) | Q out Infiltration (C.F.S.) | Water Level (Ft.) |
|---|---|---|---|---|
| 2 Year | 0.36 | 0 | 0.34 | 140.05 |
| 10 Year | 1.85 | 0 | 0.53 | 141.00 |
| 25 Year | 3.20 | 0 | 0.67 | 142.04 |
| 100 Year | 5.90 | 0 | 1.04 | 143.35 |

## BMP 2Pa Inf. Pond if first 100 Year Storm Had Just Occured

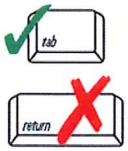
| Storm | Q in (C.F.S.) | Q out Spillway (C.F.S.) | Q out Infiltration (C.F.S.) | Water Level above bottom of stone (Ft.) |
|---|---|---|---|---|
| 2 Year | 0.36 | 0 | 0.36 | 143.41 |
| 10 Year | 1.85 | 0 | 1.08 | 143.57 |
| 25 Year | 3.2 | 0 | 1.15 | 143.99 |
| 100 Year | 5.90 | 0 | 1.32 | 144.90 |

**Massachusetts Department of Environmental Protection**
Bureau of Resource Protection - Wetlands Program

# Checklist for Stormwater Report

## A. Introduction

**Important:** When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.




A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

**Massachusetts Department of Environmental Protection**
Bureau of Resource Protection - Wetlands Program

# Checklist for Stormwater Report

## B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

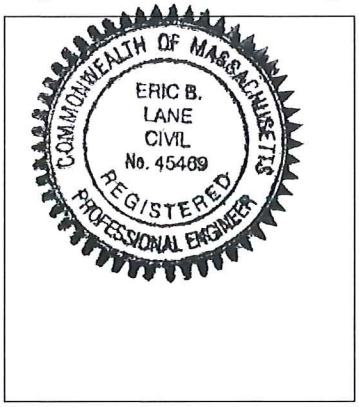
*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

## Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature




4-15-2021
Signature and Date

## Checklist

**Project Type:** Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

# Checklist for Stormwater Report

## Checklist (continued)

**LID Measures:** Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

**Standard 1: No New Untreated Discharges**

- ☒ No new untreated discharges
- ☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

# Checklist for Stormwater Report

## Checklist (continued)

### Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

### Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 3: Recharge** (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

**Standard 4: Water Quality**

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 4: Water Quality** (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

**Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)**

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

**Standard 6: Critical Areas**

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable**

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control** (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

**Standard 9: Operation and Maintenance Plan**

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

**Standard 10: Prohibition of Illicit Discharges**

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☒ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

# 25 Year Storm Pipe Flow Calculations
# Vallis Way
# Lynnfield, Massachusetts

| Input | | | | | Results | | | | | Check | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Description | Slope (ft/ft) | Discharge (cfs) | Pipe Dia. (ft) | Manning's Coefficient | Sc (ft/ft) | Velocity (fps) | Vc (fps) | Depth (ft) | Dc (ft) | Check for Depth>1.8 | Max. Possible Dischage (cfs) |
| DMH 2+00 to DMH 2+75 | 0.009 | 0.0 | 1 | 0.013 | ###### | 0.00 | ###### | 0.00 | ### | OKAY | 3.61 |
| DMH 2+75 to DMH 5+50 | 0.005 | 0.87 | 1 | 0.013 | 0.0055 | 2.92 | 3.02 | 0.40 | 0.39 | OKAY | 2.69 |
| DMH 5+50 to DMH 8+12 | 0.005 | 0.87 | 1 | 0.013 | 0.0055 | 2.92 | 3.02 | 0.40 | 0.39 | OKAY | 2.69 |
| DMH 8+12 to DMH 9+54 | 0.005 | 1.93 | 1.25 | 0.013 | 0.0052 | 3.57 | 3.63 | 0.57 | 0.56 | OKAY | 4.89 |
| DMH 9+54 to OUTFALL | 0.008 | 3.20 | 1.25 | 0.013 | 0.0059 | 4.84 | 4.30 | 0.66 | 0.73 | OKAY | 6.18 |

4/14/2021

# 100 Year Storm Pipe Flow Calculations
# Vallis Way
# Lynnfield, Massachusetts

| Input | | | | | Results | | | | | Check | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Description | Slope (ft/ft) | Discharge (cfs) | Pipe Dia. (ft) | Manning's Coefficient | Sc (ft/ft) | Velocity (fps) | Vc (fps) | Depth (ft) | Dc (ft) | Check for Depth>1.8 | Max. Possible Dischage (cfs) |
| DMH 2+00 to DMH 2+75 | 0.009 | 0 | 1 | 0.013 | ###### | 0.00 | ###### | 0.00 | ### | OKAY | 3.61 |
| DMH 2+75 to DMH 5+50 | 0.005 | 1.85 | 1 | 0.013 | 0.0064 | 3.51 | 3.86 | 0.64 | 0.59 | OKAY | 2.69 |
| DMH 5+50 to DMH 8+12 | 0.005 | 1.85 | 1 | 0.013 | 0.0064 | 3.51 | 3.86 | 0.64 | 0.59 | OKAY | 2.69 |
| DMH 8+12 to DMH 9+54 | 0.005 | 3.85 | 1.25 | 0.013 | 0.0064 | 4.18 | 4.62 | 0.88 | 0.80 | OKAY | 4.89 |
| DMH 9+54 to OUTFALL | 0.008 | 5.92 | 1.25 | 0.013 | 0.0089 | 4.32 | 5.67 | 1.03 | 0.99 | OKAY | 6.18 |

4/14/2021

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

*Version 1, Automated: Mar. 4, 2008*

Location: #109 Lowell St, Lynnfield MA

## TSS Removal Calculation Worksheet

| B<br>BMP[1] | C<br>TSS Removal Rate[1] | D<br>Starting TSS Load* | E<br>Amount Removed (C*D) | F<br>Remaining Load (D-E) |
|---|---|---|---|---|
| **Infiltration Basin** | **0.80** | **1.00** | **0.80** | **0.20** |
| | **0.00** | **0.20** | **0.00** | **0.20** |
| | **0.00** | **0.20** | **0.00** | **0.20** |
| | **0.00** | **0.20** | **0.00** | **0.20** |
| | **0.00** | **0.20** | **0.00** | **0.20** |

**Total TSS Removal =** **80%**

**Separate Form Needs to be Completed for Each Outlet or BMP Train**

Project: LYF-0381B
Prepared By: EBL
Date: 14-Apr-21

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Hayes Engineering, Inc
603 Salem Street
Wakefield, MA 01880
Tel: (781) 246-2800
Fax: (781) 246-7596
Nantucket, MA 02554
Tel: (508) 228-7909

# Recharge Worksheet

Refer to File No. **LYF-0381B**

## Required Recharge Volume:

The *Required Recharge Volume* equals a depth of runoff corresponding to the soil type times the impervious areas covering that soil type at the post-development site.

$$R_v = F \times A_{impervious}$$

Where:

$R_v$ is the Required Recharge Volume
F is the Target Depth Factor associated with each Hydrologic Soil Group
$A_{impervious}$ is the proposed pavement and rooftop area at the site

| NRCS HYDROLOGIC SOIL TYPE | APPROX. SOIL TEXTURE | TARGET DEPTH FACTOR (F) |
|---|---|---|
| A | sand | 0.6-inch |
| B | loam | 0.35-inch |
| C | silty loam | 0.25-inch |
| D | clay | 0.1-inch |

*Recharge Target Depth by Hydrologic Soil Group*

*Required Recharge Volume Calculation to the Basin*

| **NRCS Hydrologic Soil Group** | **Target Depth Factor (F) (inches)** | **Proposed Impervious Area (A) (square feet)** | **Required Rechage Volume (Rv) (cubic feet)** |
|---|---|---|---|
| A (sand) | 0.60 | 105,477 | 5274 |
| B (loam) | 0.35 | 0 | 0 |
| C (silty loam) | 0.25 | 0 | 0 |
| D (clay) | 0.10 | 0 | 0 |
| | | **Total Recharge Volume Required** | **5274** |

Total Impervious Area = 2.42 acres
Total Impervious Area Directed to Recharge Area(s) = 2.42 acres
(See Mitigative Drainage Study dated 4/15/2021)
Area Adjustment = 2.42 acres / 2.42 acres = 1.0 (> 0.65 – OK)

## Draw Down Analysis:

*Static Method:*

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

Where:

Rv is the Storage Volume Provided
K is the Saturated Hydraulic Conductivity (for "Static" Method, use Rawls Rate)
Bottom Area is the Bottom Area of Recharge Structure

**1982 Rawls Rates**

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

**Infiltration Pond:** $Time_{drawdown} = \frac{Rv}{(K)(Bottom\ Area)}$

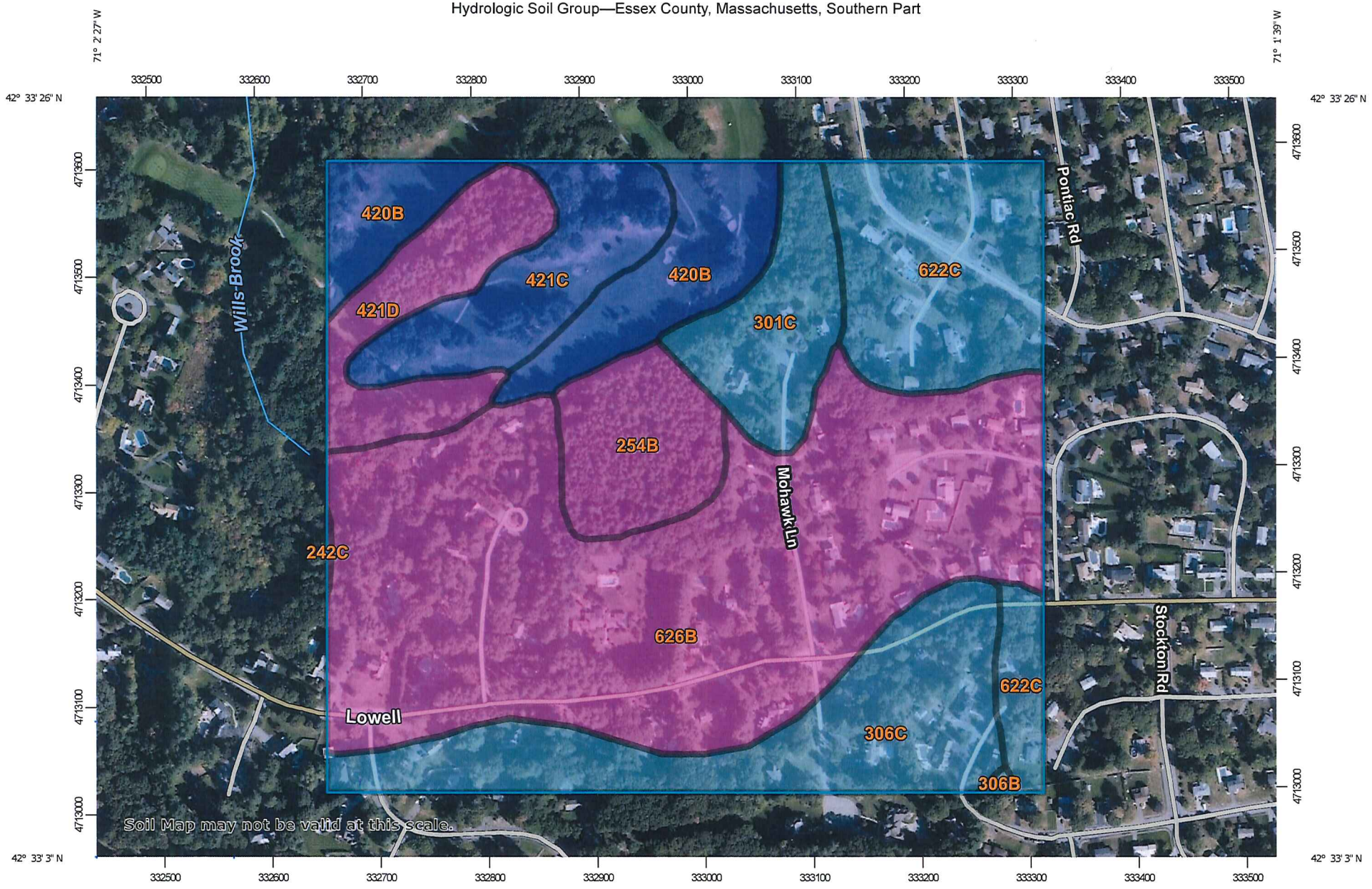
$$= \frac{5274\ cf}{(8.27"/hr)(2{,}198sf)} = 3.5\ hours$$

*Required Recharge Volume Calculation to the Chambers*

| NRCS Hydrologic Soil Group | | Target Depth Factor (F) (inches) | | Proposed Impervious Area (A) (square feet) | | Required Rechage Volume (Rv) (cubic feet) |
|---|---|---|---|---|---|---|
| A (sand) | | 0.60 | | 4321 | | 216 |
| B (loam) | | 0.35 | | 0 | | 0 |
| C (silty loam) | | 0.25 | | 0 | | 0 |
| D (clay) | | 0.10 | | 0 | | 0 |
| | | | | **Total Recharge Volume Required** | | **216** |

**Infiltration Chambers:** $Time_{drawdown} = \frac{Rv}{(K)(Bottom\ Area)}$

$$= \frac{216\ cf}{(8.27"/hr)(289sf)} = 1.1\ hours$$




Map Scale: 1:4,980 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

## MAP LEGEND

**Area of Interest (AOI)**

- Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

**Soil Rating Lines**

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

**Soil Rating Points**

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

**Water Features**

- Streams and Canals

**Transportation**

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

**Background**

- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Essex County, Massachusetts, Southern Part
Survey Area Data: Version 17, Jun 9, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 13, 2019—Oct 5, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

# Hydrologic Soil Group

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 242C | Hinckley loamy sand, 8 to 15 percent slopes | A | 0.1 | 0.1% |
| 254B | Merrimac fine sandy loam, 3 to 8 percent slopes | A | 5.5 | 5.6% |
| 301C | Montauk fine sandy loam, 8 to 15 percent slopes, very stony | C | 5.7 | 5.9% |
| 306B | Paxton fine sandy loam, 0 to 8 percent slopes, very stony | C | 0.1 | 0.1% |
| 306C | Paxton fine sandy loam, 8 to 15 percent slopes, very stony | C | 12.4 | 12.9% |
| 420B | Canton fine sandy loam, 3 to 8 percent slopes | B | 8.5 | 8.8% |
| 421C | Canton fine sandy loam, 8 to 15 percent slopes, very stony | B | 6.6 | 6.9% |
| 421D | Canton fine sandy loam, 15 to 25 percent slopes, very stony | A | 5.9 | 6.1% |
| 622C | Paxton-Urban land complex, 3 to 15 percent slopes | C | 11.7 | 12.1% |
| 626B | Merrimac-Urban land complex, 0 to 8 percent slopes | A | 40.1 | 41.5% |
| **Totals for Area of Interest** | | | **96.6** | **100.0%** |

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Higher

Commonwealth of Massachusetts
City/Town of LYNNFIELD
# Form 11 - Soil Suitability Assessment

Hayes Engineering, Inc.
Land Su
Land Pl
Environmental En
603 Salem
Wakefield, MA
T: (781) 24
F: (781) 24
Nantucket: (508) 22
www.hayeseng.com

## A. Facility Information

LINDA VALLIS
Owner Name

109 LOWELL ST.
Street Address

Map/Lot #

LYNNFIELD
City

MA
State

01940
Zip Code

## B. Site Information

1. (Check one) ☑ New Construction ☐ Upgrade ☐ Repair

2. Soil Survey Available? ☑ Yes ☐ No If yes: NRCS (Source) 254B (Soil Map Unit)

MERRIMAC fsl
Soil Name

Soil Limitations

GLACIOFLUVIAL Deposits
Geologic/Parent Material

OUTWASH PLAIN
Landform

3. Surficial Geological Report Available? ☐ Yes ☐ No If yes: Year Published/Source | Publication Scale | Map Unit

4. Flood Rate Insurance Map

Above the 500-year flood boundary? ☐ Yes ☐ No Within the 100-year flood boundary? ☐ Yes ☐ No
If Yes, continue to #5.

5. Within a velocity zone? ☐ Yes ☐ No

6. Within a Mapped Wetland Area? ☐ Yes ☐ No MassGIS Wetland Data Layer: Wetland Type

7. Current Water Resource Conditions (USGS): Month/Year Range: ☐ Above Normal ☐ Normal ☐ Below Normal

8. Other references reviewed:

Commonwealth of Massachusetts
City/Town of LYNNFIELD
# Form 11 - Soil Suitability Assessment

F.

## G. Soil Evaluator Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator

April 13, 2012
Date

Gordon Rogerson SE2074
Typed or Printed Name of Soil Evaluator / License #

June 30, 2022
Expiration Date of License

Commonwealth of Massachusetts
City/Town of LYNNFIELD
# Form 11 - Soil Suitability Assessment

## C. On-Site Review (continued)

Deep Observation Hole Number: SWMA 1 | Date: 4-13-21 | Time: | Weather: SUNNY 48°

1. Location VALLIS WAY
   Ground Elevation at Surface of Hole: _____ feet | Latitude/Longitude: /
2. Land Use: WOODS (e.g., woodland, agricultural field, vacant lot, etc.) | Surface Stones (e.g., cobbles, stones, boulders, etc.): NONE | Slope (%): A
   Vegetation: OAK PINE | Landform: | Position on Landscape (SU, SH, BS, FS,
3. Distances from: Open Water Body: >100 feet | Drainage Way: _____ feet | Wetlands: >100 feet
   Property Line: 40 feet | Drinking Water Well: >100 feet | Other: _____ feet
4. Parent Material: Outwash Plain | Unsuitable Materials Present: ☐ Yes ☑ No
   If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock
5. Groundwater Observed: ☐ Yes ☑ No | If yes: Depth Weeping from Pit: NO | Depth Standing Water in Hole: NO
   Estimated Depth to High Groundwater: >144" inches | elevation

Commonwealth of Massachusetts
City/Town of LYNNFIELD
# Form 11 - Soil Suitability Assessment

## C. On-Site Review (continued)

Deep Observation Hole Number: SWMA-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 | | | |
| 0-10 | A | 10YR 3/3 | | | | fsl | 0 | 0% | gr | mfr | |
| 10-24 | Bw | 10YR 5/4 | | | | vg Cob CS | 20 | 20% | sg | mvfr | |
| 24-50 | C1 | 2.5Y 6/3 | | | | GrCS | 20 | 10% | sg | mvfr | |
| 50-60 | C2 | 2.5Y 7/4 | | | | S | 5 | 0% | sg | mvfr | |
| 60-144 | C3 | 2.5Y 6/3 | >144" | | | GrCS | 20 | 10% | sg | mvfr | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Additional Notes:

Commonwealth of Massachusetts
City/Town of LYNNFIELD
# Form 11 - Soil Suitability Assessment

## C. On-Site Review (continued)

Deep Observation Hole Number: SWMA-2 | 4-13-21 (Date) | (Time) | SUNNY 48° (Weather)

1. Location VALLAS WAY
   Ground Elevation at Surface of Hole: _____ feet | Latitude/Longitude: /
2. Land Use: WOODS (e.g., woodland, agricultural field, vacant lot, etc.) | NONE (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | A (Slope (%))
   OAK, PINE (Vegetation) | _____ (Landform) | _____ (Position on Landscape (SU, SH, BS, FS,
3. Distances from: Open Water Body _____ feet | Drainage Way _____ feet | Wetlands _____ feet
   Property Line _____ feet | Drinking Water Well _____ feet | Other _____ feet
4. Parent Material: OUTWASH | Unsuitable Materials Present: ☐ Yes ☒ No
   If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock
5. Groundwater Observed: ☐ Yes ☒ No | If yes: NONE (Depth Weeping from Pit) | NONE (Depth Standing Water in Hole)
   Estimated Depth to High Groundwater: 7132 inches | _____ elevation

Commonwealth of Massachusetts
City/Town of LYNNFIELD
# Form 11 - Soil Suitability Assessment

## C. On-Site Review (continued)

Deep Observation Hole Number: SWMA-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 - 9 | A | 10YR 3/3 | | | | fsl | 0 | 0/0 | gr | mfr | |
| 9 - 24 | Bw | 10YR 5/4 | | | | vg Cob CS | 20 | 20/0 | sg | mvfr | |
| 24 - 63 | C1 | 2.5Y 6/3 | | | | gr CS | 20 | 10/0 | sg | mvfr | |
| 63 - 83 | C2 | 2.5Y 5/6 | | | | fs | 0 | 0/0 | m | mfr | |
| 83 - 115 | C3 | 2.5Y 6/3 | | | | gr CS | 20 | 10/0 | sg | mvfr | |
| 115 - 132 | C4 | 2.5Y 5/4 | 7132 | | | fs | 0 | 0/0 | m | mfr | |
| | | | | | | | | | | | |

Additional Notes:

Commonwealth of Massachusetts
City/Town of CYNNFIELD
# Form 11 - Soil Suitability Assessment

## C. On-Site Review (continued)

Deep Observation Hole Number: SWMA-3 | 4-13-21 (Date) | (Time) | CLOY 48° (Weather)

1. Location VALLIS WAY
   Ground Elevation at Surface of Hole: _____ feet | Latitude/Longitude: _____ /
2. Land Use: WOODS (e.g., woodland, agricultural field, vacant lot, etc.) | NONE (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | A (Slope (%))
   OAK, PINE, MAPLE (Vegetation) | _____ (Landform) | _____ (Position on Landscape (SU, SH, BS, FS,
3. Distances from: Open Water Body >100 feet | Drainage Way _____ feet | Wetlands >100 feet
   Property Line 30 feet | Drinking Water Well >100 feet | Other _____ feet
4. Parent Material: OUTWASH | Unsuitable Materials Present: ☐ Yes ☑ No
   If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock
5. Groundwater Observed: ☐ Yes ☑ No | If yes: NO (Depth Weeping from Pit) | NO (Depth Standing Water in Hole)
   Estimated Depth to High Groundwater: >132 inches | _____ elevation

Commonwealth of Massachusetts
City/Town of LYNNFIELD
# Form 11 - Soil Suitability Assessment

## C. On-Site Review (continued)

Deep Observation Hole Number: SWMA-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 | | | |
| 0-10 | A | 10YR 3/3 | | | | fsl | 0 | 0% | gr | mfr | |
| 10-24 | Bw | 10YR 5/6 | | | | ls | | | m | mfr | |
| 24-40 | C1 | 2.5Y 5/6 | | | | fs | 0 | 0% | m | mfr | |
| 40-132 | C2 | 2.5Y 6/3 | 7132 | | | grcs | 20 | 20% | sg | mvfr | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Additional Notes:

Commonwealth of Massachusetts
City/Town of LYNNFIELD
Form 11 - Soil Suitability Assessment

## D. Determination of High Groundwater Elevation

1. Method Used:

| | Obs. Hole # SWMA 1 | Obs. Hole # SWMA 2 | SWMA 3 |
|---|---|---|---|
| ☐ Depth observed standing water in observation hole | — inches | inches | |
| ☐ Depth weeping from side of observation hole | — inches | inches | |
| ☐ Depth to soil redoximorphic features (mottles) | > 144" inches | > 132" inches | > 132" |
| ☐ Depth to adjusted seasonal high groundwater ($S_h$) (USGS methodology) | inches | inches | |

Index Well Number _____ Reading Date _____

$S_h = S_c - [S_r \times (OW_c - OW_{max})/OW_r]$

Obs. Hole # _____ $S_c$ _____ $S_r$ _____ $OW_c$ _____ $OW_{max}$ _____ $OW_r$ _____ $S_h$ _____

Obs. Hole # _____ $S_c$ _____ $S_r$ _____ $OW_c$ _____ $OW_{max}$ _____ $OW_r$ _____ $S_h$ _____

## E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area

☐ Yes ☐ No

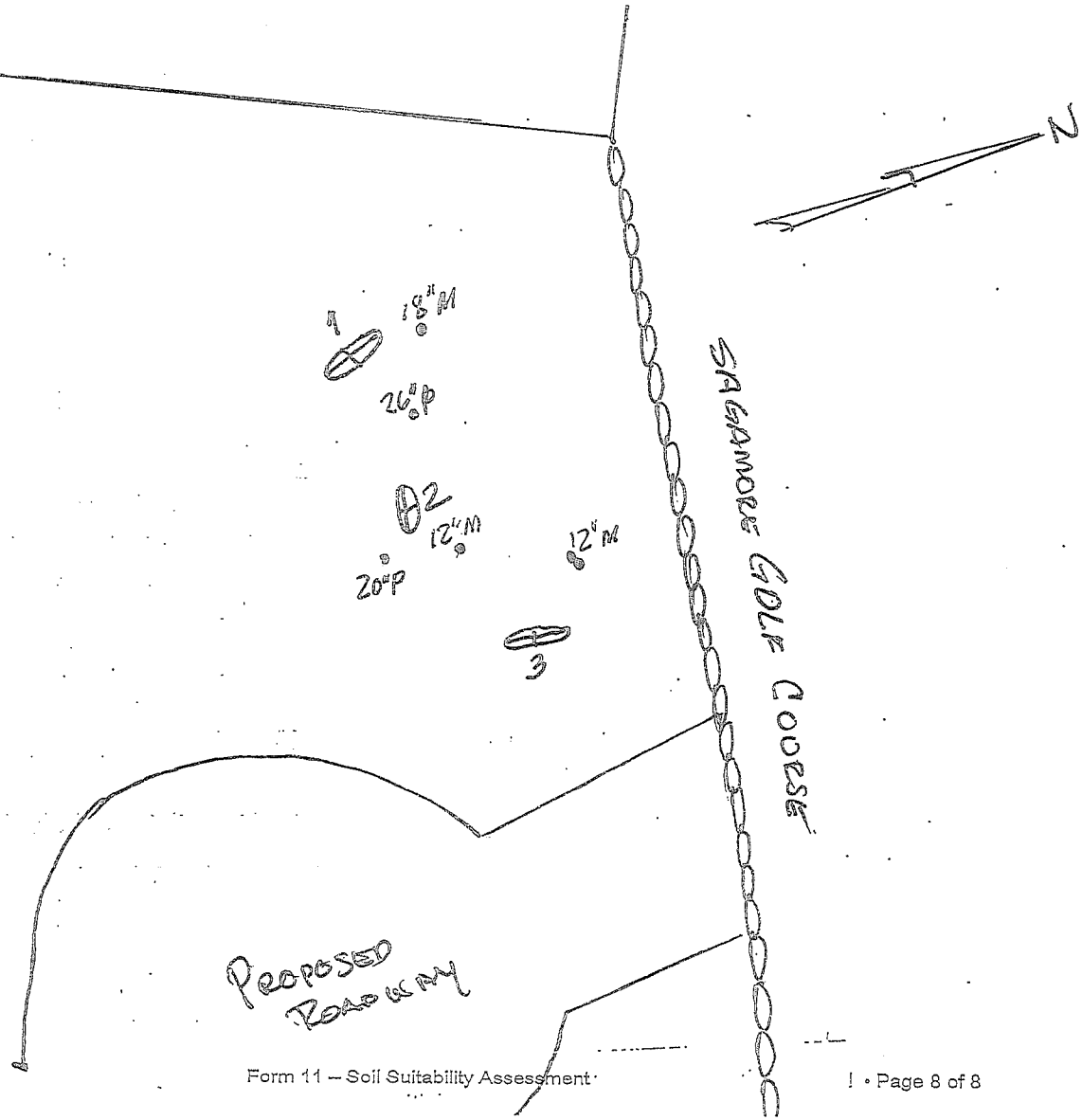
b. If yes, at what depth was it observed? Upper boundary: _____ inches Lower boundary: _____ inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of LYNNFIELD
# Form 11 - Soil Suitability Assessment

## Field Diagrams

Use this sheet for field diagrams:



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

# SITE DESCRIPTION

**Project Name and Location: (Latitude, Longitude, or Address)**

Vallis Way
#109 Lowell Street
Lynnfield, MA 01940

**Owner Name and Address**

Linda C. Vallis
109 Lowell Street
Lynnfield, MA 01940

**Applicant Name and Address**

Paul Caggiano
26666 Seagul Way, Unit C201
Malibu, CA 90265-4529

**Description: (Purpose and Types of Soil Disturbing Activities)**

The proposed project is the subdivision of a single lot with an existing single family house to create five lots with single family homes, driveways, roadway, stormwater BMPs, and all appurtenant site work. Soil disturbing activities include installation of erosion and sediment control devices; excavation; drainage system and utility installation; stormwater BMP installation and construction; house construction; road and driveway paving; and landscaping.

**Sequence of Major Activities**

The order of activities shall be as follows:

1. Install erosion and sediment control devices
2. Clear vegetation from road and lot areas.
3. Excavate and stockpile topsoil
4. Stabilize stockpiles within 14 days of last construction activity in that area
5. Stabilize exposed surfaces where the period of exposure shall be more than two months, but less than twelve months within 14 days of last construction activity in that area
6. Commence grading and excavation activities.
7. Commence roadway and stormwater management area construction (grade to subgrade elevations, install drainage structures; install utilities, install gravel to appropriate elevations, install binder coat of pavement followed by curbing).

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

8. Develop individual lots (grade yard, driveway and foundation areas, install drainage, septic and utility structures, complete driveway and house construction, grade to finish elevations).
9. Install binder coat of pavement followed by curbing
10. Loam and seed all disturbed areas.
11. Install final pavement course and final inspection of all stormwater BMPs.

# CONTROLS

**Erosion and Sediment Control Stabilization Practices**

**The Site Contractor / Project Manager ("Manager") is responsible for ensuring that erosion and sedimentation control practices and controls are followed upon commencement of, and during project construction.**

A. Protecting and Minimizing Exposed Areas

The project will temporarily leave bare earth open to erosion. Steps shall be taken to minimize this area of exposure by preserving existing vegetation and providing soil stabilization. Equipment and trucks shall be routed only over the existing pavement or areas of proposed work and workers shall minimize foot traffic in vegetated areas adjacent to the work area as much as possible. During site work, utilization of stabilization techniques is necessary for controlling erosion on exposed areas, including grading, seeding and otherwise stabilizing the areas.

B. Sediment And Erosion Control / Soil Stabilization

i) Prior to any construction occurring adjacent to identified resource areas (shown on the plan and/or marked in the field), proper erosion and siltation barriers shall be installed so that throughout and until completion of construction, those areas will be afforded maximum protection. Temporary stockpiles of soil shall be surrounded with an erosion control barrier to prevent sediments from exiting the subject property. All erosion control barriers must be maintained in functioning condition and periodically inspected until areas of bare soil are stabilized to ensure that they are in functioning condition. Any accumulations of sediments present along erosion control barriers shall be removed as soon as possible after deposition in order to ensure the effectiveness of all sedimentation controls.

On sites where grading or other work will occur on moderately steep slopes (3:1 and greater) located immediately upgradient of wetlands, the contractor shall work on one portion of the slope at a time, ensuring the stability of the disturbed soil by immediately loaming and seeding the slope, or otherwise vegetating the slope as desired, and installing erosion control mats (straw or cocoanut fiber designed for the slope steepness). If work

is interrupted and the slope is to be left bare or otherwise unstabilized for duration of a day or more, a series of erosion control fences oriented parallel to the slope.

**Vegetational Covers**

Temporary Vegetational Cover
Any area proposed for removal of vegetation where soil will be exposed for more than 10 days shall be mulched or otherwise treated to prevent erosion. On sediment-producing areas in the buffer zone, where the period of exposure will be more than 30 days, the following procedures should be followed for a cover of annual rye. When bare soils are not completely graded and vegetated by September 30 of any year, winter rye shall be planted as specified in table and mulched with three (3) inches of hay or straw.

a. Install needed surface water control measures.

b. Perform all cultural operations at right angles to the slope.

c. Establish grass or other ground cover species as recommended in the attached excerpt (pgs 144 -146) from Massachusetts Erosion and Sedimentation Guidelines for Urban and Suburban Areas, 2003.

1. Permanent Vegetational Cover

To reduce damages from the potential incidence of sedimentation and runoff to other properties, and to avoid erosion on the site itself, a permanent type cover shall be established in disturbed areas located adjacent to resource areas immediately upon completion of grading. Seeding herbaceous cover is usually the most economical and practical way to stabilize any large area. For this site, all disturbed areas where lawns are desired will be seeded in fall during the period of August 1 to October 1; or in spring by May 15 with a commercial lawn mixture utilizing standard landscape methods and as recommended by the seed manufacturer. Grass sod or landscape plantings may be used instead of seed, if preferred.

In upland/ buffer zone areas, outside of lawn locations, where an erosion control - wildlife seed mixture is desired, prepare soil and use one of grass seed mixes #1 through #6 as recommended in the attached excerpts (pgs 136 -139) from Massachusetts Erosion and Sedimentation Guidelines for Urban and Suburban Areas 2003, to establish a stable, permanent cover.

## REFERENCES

Department of Environmental Protection, Bureau of Resource Protection and U.S. Environmental Protection Agency, Massachusetts Erosion and Sedimentation Guidelines for Urban and Suburban Areas: A Guide for Planners, Designers and Municipal Officials.

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

Massachusetts Executive Office of Environmental Affairs, Boston, Massachusetts, Reprint: May 2003.

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



### Seeding Dates
Seeding operations should be performed as an early spring seeding (April 1-May 15) with the use of cold treated seed. A late fall early winter dormant seeding (November 1 - December 15) can also be made, however the seeding rate will need to be increased by 50%.

### Seeding Methods
Seeding should be performed by one of the following methods:

- Drill seedings (de-awned or de-bearded seed should be used unless the drill is equipped with special features to accept awned seed).
- Broadcast seeding with subsequent rolling, cultipacking or tracking the seeding with small track construction equipment. Tracking should be oriented up and down the slope.
- Hydroseeding with subsequent tracking. If wood fiber mulch is used, it should be applied as a separate operation after seeding and tracking to assure good seed to soil contact.

### Mulch
Mulch the seedings with straw applied at the rate of ½ tons per acre. Anchor the mulch with erosion control netting or fabric on sloping areas.

## Seed Mixtures for Permanent Cover
Recommended mixtures for permanent seeding are provided on the following pages. Select plant species which are suited to the site conditions and planned use. Soil moisture conditions, often the major limiting site factor, are usually classified as follows:

***Dry*** - Sands and gravels to sandy loams. No effective moisture supply from seepage or a high water table.

***Moist*** - Well drained to moderately well drained sandy loams, loams, and finer; or coarser textured material with moderate influence on root zone from seepage or a high water table.

***Wet*** - All textures with a water table at or very near the soil surface, or with enduring seepage.

When other factors strongly influence site conditions, the plants selected must also be tolerant of these conditions.

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



## Permanent Seeding Mixtures

| Mix | Site | Seed Mixture | Seed, Pounds per: Acre | 1,000 sf | Remarks |
|---|---|---|---|---|---|
| 1 | Dry | Little Bluestem or Broomsedge | 10 | 0.25 | * Use Warm Season planting procedure.<br>* Roadsides |
| | | Tumble Lovegrass* | 1 | 0.10 | * Sand and Gravel Stabilization |
| | | Switchgrass | 10 | 0.25 | * Clover requires inoculation with nitrogen-fixing bacteria |
| | | Bush Clover* | 2 | 0.10 | |
| | | Red Top | 1 | 0.10 | * Rates for this mix are for PLS. |
| 2 | Dry | Deertongue | 15 | 0.35 | * Use Warm Season planting procedures. |
| | | Broomsedge | 10 | 0.25 | * Acid sites/Mine spoil |
| | | Bush Clover* | 2 | 0.10 | * Clover requires inoculation with nitrogen-fixing bacteria. |
| | | Red Top | 1 | 0.10 | *Rates for this mix are for PLS. |
| 3 | Dry | Big Bluestem | 10 | 0.25 | * Use Warm Season planting procedures. |
| | | Indian Grass | 10 | 0.25 | * Eastern Prairie appearance |
| | | Switchgrass | 10 | 0.25 | * Sand and Gravel pits. |
| | | Little Bluestem | 10 | 0.25 | * Golf Course Wild Areas |
| | | Red Top or | 1 | 0.10 | * Sanitary Landfill Cover seeding |
| | | Perennial Ryegrass | 10 | 0.25 | * Wildlife Areas<br>*OK to substitute Poverty Dropseed in place of Red Top/Ryegrass.<br>*Rates for this mix are for PLS. |
| 4 | Dry | Flat Pea | 25 | 0.60 | * Use Cool Season planting procedures |
| | | Red Top or | 2 | 0.10 | * Utility Rights-of-Ways (tends to suppress |
| | | Perennial Ryegrass | 15 | 0.35 | woody growth) |
| 5 | Dry | Little Bluestem | 5 | 0.10 | * Use Warm Season planting procedures. |
| | | Switchgrass | 10 | 0.25 | * Coastal sites |
| | | Beach Pea* | 20 | 0.45 | * Rates for Bluestein and Switchgrass are for |
| | | Perennial Ryegrass | 10 | 0.25 | PLS. |
| 6 | Dry - Moist | Red Fescue | 10 | 0.25 | * Use Cool Season planting procedure. |
| | | Canada Bluegrass | 10 | 0.25 | * Provides quick cover but is non-aggressive; |
| | | Perennial Ryegrass | 10 | 0.25 | will tend to allow indigenous plant colonization. |
| | | Red Top | 1 | 0.10 | * General erosion control on variety of sites, including forest roads, skid trails and landings. |
| 7 | Moist-Wet | Switchgrass | 10 | 0.25 | * Use Warm Season planting procedure. |
| | | Virginia Wild Rye | 5 | 0.10 | * Coastal plain/flood plain |
| | | Big Bluestem | 15 | 0.35 | * Rates for Bluestem and Switchgrass are for |
| | | Red Top | 1 | 0.10 | PLS. |

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



## Permanent Seeding Mixtures

| Mix | Site | Seed Mixture | Seed, Pounds per: Acre | 1,000 sf | Remarks |
|---|---|---|---|---|---|
| 8 | Moist | Creeping Bentgrass | 5 | 0.10 | * Use Cool Season planting procedures. |
| | Wet | Fringed Bromegrass | 5 | 0.10 | * Pond Banks |
| | | Fowl Meadowgrass | 5 | 0.10 | * Waterways/ditch banks |
| | | Bluejoint Reedgrass or Rice Cutgrass | 2 | 0.10 | |
| | | Perennial Ryegrass | 10 | 0.25 | |
| 9 | Moist | Red Fescue | 5 | 0.10 | *Salt Tolerant |
| | Wet | Creeping Bentgrass | 2 | 0.10 | * Fescue and Bentgrass provide low growing appearance, while Switchgrass provides tall cover for wildlife. |
| | | Switchgrass | 8 | 0.20 | |
| | | Perennial Ryegrass | 10 | 0.25 | |
| 10 | Moist | Red Fescue | 5 | 0.10 | * Use Cool Season planting procedure. |
| | Wet | Creeping Bentgrass | 5 | 0.10 | * Trefoil requires inoculation with nitrogen fixing bacteria. |
| | | Virginia Wild Rye | 8 | 0.20 | |
| | | Wood Reed Grass* | 1 | 0.10 | * Suitable for forest access roads, skid trails and other partial shade situations. |
| | | Showy Tick Trefoil* | 1 | 0.10 | |
| 11 | Moist | Creeping Bentgrass | 5 | 0.10 | * Use Cool Season planting procedure. |
| | Wet | Bluejoint Reed Grass | 1 | 0.10 | * Suitable for waterways, pond or ditch banks. |
| | | Virginia Wild Rye | 3 | 0.10 | * Trefoil requires inoculation with nitrogen fixing bacteria. |
| | | Fowl Meadow Grass | 10 | 0.25 | |
| | | Showy Tick Trefoil* | 1 | 0.10 | |
| | | Red Top | 1 | 0.10 | |
| 12 | Wet | Blue Joint Reed Grass | 1 | 0.10 | * Use Cool Season planting procedure. |
| | | Canada Manna Grass | 1 | 0.10 | * OK to seed in saturated soil conditions, but not in standing water. |
| | | Rice Cut Grass | 1 | 0.10 | |
| | | Creeping Bent Grass | 5 | 0.10 | * Suitable as stabilization seeding for created wetland. |
| | | Fowl Meadow Grass | 5 | 0.10 | * All species in this mix are native to Massachusetts. |
| 13 | Dry-Moist | American Beachgrass | 18" centers | 18' centers | *Vegetative planting with dormant culms, 3-5 culms per planting |
| 14 | Inter-Tidal | Smooth Cordgrass Saltmeadow Cordgrass | 12-18" centers | 12-18" centers | * Vegetative planting with transplants. |

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



Notes:

* Species such as Tumble Lovegrass, Fringed Bromegrass, Wood Reedgrass, Bush Clover and Beach Pea, while known to be commercially available from specific seed suppliers, may not always be available from your particular seed suppliers. The local Natural Resources Conservation Service office may be able to help with a source of supply. In the event a particular species listed in a mix can not be obtained, however, it may be possible to substitute another species.

*Seed mixtures by courtesy of Natural Resources Conservation Service, Amherst, MA.*

## (PLS) Pure Live Seed

Warm Season grass seed is sold and planted on the basis of pure live seed. An adjustment is made to the bulk rate of the seed to compensate for inert material and non-viable seed. Percent of pure live seed is calculated by multiplying the percent purity by the percent germination; (% purity) x (% germination) = percent PLS.

For example, if the seeding rate calls for 10 lbs./acre PLS and the seed lot has a purity of 70% and germination of 75%, the PLS factor is:

(.70 x .75) =.53

10 lbs. divided by .53 = approx. 19 lbs.

Therefore, 19 lbs of seed from the particular lot will need to be applied to obtain 10 lbs. of pure live seed.

***Special Note***

Tall Fescue, Reed Canary Grass, Crownvetch and Birdsfoot Trefoil are no longer recommended for general erosion control use in Massachusetts due to the invasive characteristics of each. If these species are used, it is recommended that the ecosystem of the site be analyzed for the effects species invasiveness may impose. The mixes listed in the above mixtures include either species native to Massachusetts or non-native species that are not perceived to be invasive, as per the Massachusetts Native Plant Advisory Committee.

## Wetlands Seed Mixtures

For newly created wetlands, a wetlands specialist should design plantings to provide the best chance of success. Do not use introduced, invasive plants like reed canarygrass (Phalaris arundinacea) or purple loosestrife (Lythrum salicaria). Using plants such as these will cause many more problems than they will solve.

The following grasses all thrive in wetland situations:

- Fresh Water Cordgrass (*Spartina pectinata*)
- Marsh/Creeping Bentgrass (*Agrostis stolonifera, var. Palustric*)
- Broomsedge (*Andropogon virginicus*)
- Fringed Bromegrass (*Bromus ciliatus*)
- Blue Joint Reed Grass (*Calamagrostis cavedensis*)
- Fowl Meadow Grass (*Glyceria striata*)
- Riverbank Wild Rye (*Elymus riparius*)
- Rice Cutgrass (*Leersia oryzoides*)
- Stout Wood Reed (*Cinna arundinacea*)
- Canada Manna Grass (*Glyceria canadensis*)

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



A sample wetlands seed mix developed by The New England Environmental Wetland Plant Nursery is shown on the following page.

## Wetland Seed Mixture

The New England Environmental Wetland Plant Nursery has developed a seed mixture which is specifically designed to be used in wetland replication projects and stormwater detention basins. It is composed of seeds from a variety of indigenous wetland species. Establishing a native wetland plant understory in these areas provides quick erosion control, wildlife food and cover, and helps to reduce the establishment of undesirable invasive species such as Phragmites and purple loosestrife (Lythrum salicaria). The species have been selected to represent varying degrees of drought tolerance, and will establish themselves based upon microtopography and the resulting variation in soil moisture.

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| Common Name (*Scientific Name*) | % in Mix | Comments |
|---|---|---|
| Lurid Sedge (*Carex lurida*) | 30 | A low ground cover that tolerates mesic sites in addition to saturated areas; prolific seeder in second growing season. |
| Fowl Meadow Grass (*Glyceria Canadensis*) | 25 | Prolific seed producer that is a valuable wildlife food source. |
| Fringed Sedge (*Carex crinita*) | 10 | A medium to large sedge that tolerates saturated areas; good seed producer. |
| Joe-Pye Weed (*Eupatoriadelphus maculatus*) | 10 | Flowering plant that is valuable for wildlife cover. Grows to 4 feet. |
| Brook Sedge (*Carex spp., Ovales group*) | 10 | Tolerates a wide range of hydrologic conditions. |
| Woolgrass (*Scirpus cyperinus*) | 5 | Tolerates fluctuating hydrology. |
| Boneset (*Eupatorium perfoliatum*) | 5 | Flowering Plant that is valuable for wildlife cover. Grows to 3 feet. |
| Tussock Sedge (*Carex stricta*) | <5 | Grows in elevated hummocks on wet sites, may grow rhizomonously on drier sites. |
| Blue Vervain (*Verbena hastata*) | <5 | A native plant that bears attractive, blue flowers. |

The recommended application rate is one pound per 5,000 square feet when used as an understory cover. This rate should be increased to one pound per 2,500 square feet for detention basins and other sites which require a very dense cover. For best results, a late fall application is recommended. This mix is not recommended for standing water.

### Maintenance

Inspect seeded areas for failure and make necessary repairs and reseed immediately. Conduct or follow-up survey after one year and replace failed plants where necessary.

If vegetative cover is inadequate to prevent rill erosion, overseed and fertilize in accordance with soil test results.

If a stand has less than 40% cover, reevaluate choice of plant materials and quantities of lime and fertilizer. Re-establish the stand following seedbed preparation and seeding recommendations, omitting lime and fertilizer in the absence of soil test results. If the season prevents resowing, mulch or jute netting is an effective temporary cover.

Seeded areas should be fertilized during the second growing season. Lime and fertilize thereafter at periodic intervals, as needed.

## References

North Carolina Department of Environment, Health, and Natural Resources, ***Erosion and Sediment Control Field Manual***, Raleigh, NC, February 1991.

Personal communication, Richard J. DeVergilio, USDA, Natural Resources Conservation Service, Amherst, MA.

U.S. Environmental Protection Agency, ***Storm Water Management For Construction Activities***, EPA-832-R- 92-005, Washington, DC, September, 1992.

Washington State Department of Ecology, ***Stormwater Management Manual for the Puget Sound Basin***, Olympia, WA, February, 1992.

## Seeding, Temporary

Planting rapid-growing annual grasses, small grains, or legumes to provide initial, temporary cover for erosion control on disturbed areas.

### Purpose

To temporarily stabilize areas that will not be brought to final grade for a period of more than 30 working days.

To stabilize disturbed areas before final grading or in a season not suitable for permanent seeding.

Temporary seeding controls runoff and erosion until permanent vegetation or other erosion control measures can be established.

Root systems hold down the soils so that they are less apt to be carried offsite by storm water runoff or wind.

Temporary seeding also reduces the problems associated with mud and dust from bare soil surfaces during construction.

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



## Where Practice Applies

On any cleared, unvegetated, or sparsely vegetated soil surface where vegetative cover is needed for less than one year. Applications of this practice include diversions, dams, temporary sediment basins, temporary road banks, and topsoil stockpiles.

Where permanent structures are to be installed or extensive re-grading of the area will occur prior to the establishment of permanent vegetation.

Areas which will not be subjected to heavy wear by construction traffic.

Areas sloping up to 10% for 100 feet or less, where temporary seeding is the only practice used.

## Advantages

This is a relatively inexpensive form of erosion control but should only be used on sites awaiting permanent planting or grading. Those sites should have permanent measures used.

Vegetation will not only prevent erosion from occurring, but will also trap sediment in runoff from other parts of the site.

Temporary seeding offers fairly rapid protection to exposed areas.

## Disadvantages/Problems

Temporary seeding is only viable when there is a sufficient window in time for plants to grow and establish cover. It depends heavily on the season and rainfall rate for success.

If sown on subsoil, growth will be poor unless heavily fertilized and limed. Because overfertilization can cause pollution of stormwater runoff, other practices such as mulching alone may be more appropriate. The potential for over-fertilization is an even worse problem in or near aquatic systems.

Once seeded, areas should not be travelled over.

Irrigation may be needed for successful growth. Regular irrigation is not encouraged because of the expense and the potential for erosion in areas that are not regularly inspected.

## Planning Considerations

Temporary seedings provide protective cover for less than one year. Areas must be reseeded annual or planted with perennial vegetation.

Temporary seeding is used to protect earthen sediment control practices and to stabilize denuded areas that will not be brought into final grade for several weeks or months. Temporary seeding can provide a nurse crop for permanent vegetation, provide residue for soil protection and seedbed preparation, and help prevent dust production during construction.

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



Use low-maintenance native species wherever possible.

Planting should be timed to minimize the need for irrigation.

Sheet erosion, caused by the impact of rain on bare soil, is the source of most fine particles in sediment. To reduce this sediment load in runoff, the soil surface itself should be protected. The most efficient and economical means of controlling sheet and rill erosion is to establish vegetative cover. Annual plants which sprout rapidly and survive for only one growing season are suitable for establishing temporary vegetative cover. Temporary seeding is effective when combined with construction phasing so bare areas of the site are minimized at all times.

Temporary seeding may prevent costly maintenance operations on other erosion control systems. For example, sediment basin clean-outs will be reduced if the drainage area of the basin is seeded where grading and construction are not taking place. Perimeter dikes will be more effective if not choked with sediment.

Proper seedbed preparation and the use of quality seed are important in this practice just as in permanent seeding. Failure to carefully follow sound agronomic recommendations will often result in an inadequate stand of vegetation that provides little or no erosion control.

Soil that has been compacted by heavy traffic or machinery may need to be loosened. Successful growth usually requires that the soil be tilled before the seed is applied. Topsoiling is not necessary for temporary seeding; however, it may improve the chances of establishing temporary vegetation in an area.

## Planting Procedures

### Time of Planting

Planting should preferably be done between April 1 and June 30, and September 1 through September 30. If planting is done in the months of July and August, irrigation may be required. If planting is done between October 1 and March 31, mulching should be applied immediately after planting. If seeding is done during the summer months, irrigation of some sort will probably be necessary.

### Site Preparation

Before seeding, install needed surface runoff control measures such as gradient terraces, interceptor dike/swales, level spreaders, and sediment basins.

### Seedbed Preparation

The seedbed should be firm with a fairly fine surface.

Perform all cultural operations across or at right angles to the slope. See **Topsoiling** and **Surface Roughening** for more information on seedbed preparation. A minimum of 2 to 4 inches of tilled topsoil is required.

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



## Liming and Fertilization

Apply uniformly 2 tons of ground limestone per acre (100 lbs. per 1,000 Sq. Ft.) or according to soil test.

Apply uniformly 10-10-10 analysis fertilizer at the rate of 400 lbs. per acre (14 lbs. per 1,000 Sq. Ft.) or as indicated by soil test. Forty percent of the nitrogen should be in organic form.

Work in lime and fertilizer to a depth of 4 inches using any suitable equipment.

Seedings for Temporary Cover

| *Species* | *Seeding Rates lbs/sq.ft.* 1,000 Sq.Ft. | Acre | *Recommended* Seeding Dates |
|---|---|---|---|
| Annual Ryegrass | 1 | 40 | April 1 to June 1<br>Aug. 15 to Sept. 15 |
| Foxtail Millet | 0.7 | 30 | May 1 to June 30 |
| Oats | 2 | 80 | April 1 to July 1<br>August 15 to Sept. 15 |
| Winter Rye | 3 | 120 | Aug. 15 to Oct. 15 |

"Hydro-seeding" applications with appropriate seed-mulch-fertilizer mixtures may also be used.

## Seeding

Select adapted species from the accompanying table.

Apply seed uniformly according to the rate indicated in the table by broadcasting, drilling or hydraulic application.

Cover seeds with suitable equipment as follows:

- Rye grass ¼ inch
- Millet ½ to ¾ inch
- Oats 1 to 1-1/2 inches
- Winter rye 1 to 1-1/2 inches.

## Mulch

Use an effective mulch, such as clean grain straw; tacked and/or tied down with netting to protect seedbed and encourage plant growth.

## Common Trouble Points

***Lime and fertilizer not incorporated to at least 4 inches***

May be lost to runoff or remain concentrated near the surface where they may inhibit germination.

***Mulch rate inadequate or straw mulch not tacked down***

Results in poor germination or failure, and erosion damage. Repair damaged areas, reseed and mulch.

***Annual ryegrass used for temporary seeding***
Ryegrass reseeds itself and makes it difficult to establish a good cover of permanent vegetation.
***Seed not broadcast evenly or rate too low***
Results in patchy growth and erosion.

### Maintenance

Inspect within 6 weeks of planting to see if stands are adequate. Check for damage after heavy rains. Stands should be uniform and dense. Fertilize, reseed, and mulch damaged and sparse areas immediately. Tack or tie down mulch as necessary.

Seeds should be supplied with adequate moisture. Furnish water as needed, especially in abnormally hot or dry weather or on adverse sites. Water application rates should be controlled to prevent runoff.

## References

Massachusetts Department of Environmental Protection, Office of Watershed Management, Nonpoint Source Program, Massachusetts ***Nonpoint Source Management Manual,*** Boston, Massachusetts, June, 1993.

North Carolina Department of Environment, Health, and Natural Resources, ***Erosion and Sediment Control Field Manual***, Raleigh, NC, February 1991.

U.S. Environmental Protection Agency, ***Storm Water Management For Construction Activities***, EPA-832-R- 92-005, Washington, DC, September, 1992.

Washington State Department of Ecology, ***Stormwater Management Manual for the Puget Sound Basin***, Olympia, WA, February, 1992.

## Silt Curtain

A temporary sediment barrier installed parallel to the bank of a stream or lake. Used to contain the sediment produced by construction operations on the bank of a stream or lake and allow for its removal.

### Where Practice Applies

The silt curtain is used along the banks of streams or lakes where sediment could pollute or degrade the stream or lake.

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

**Structural Practices**

**Straw Wattle –** shall be installed as shown on the approved plans to help prevent erosion and sedimentation to the downstream wetland resources on the project.
**Catch Basin –** shall be fitted with "silt sack"-type devices during construction to prevent the accumulation of sediments in the catch basin sumps. Catch basins are to be cleaned as needed during construction using a truck-mounted vacuum device.
**Tracking Pad -** shall be installed in the initial stage of construction as shown on the approved plans to reduce deposition of sediments on the existing paved road.

**Stormwater Management**

The proposed stormwater management plan in the drainage analysis outlines the impacts of stormwater runoff for the project as it related to the downstream areas of comparison. Elements incorporated in the design of the stormwater management plan include the following best management practices (BMPs):

1. Deep Sump Catch basins with Gas Traps
2. Forebay
3. Infiltration basin
4. Infiltration chambers

Utilization of these BMPs as part of the overall watershed management plan will be instrumental in reducing the peak rate of runoff from the site into the wetland.

## OTHER CONTROLS

**Waste Disposal:**

**Waste Materials:** all waste material shall be collected and stored in secure metal dumpsters rented from a licensed solid waste management company in Massachusetts. The dumpsters shall meet all local and State solid waste management regulations as outlined in 310 CMR 19.00. All trash and construction debris generated on site shall be disposed of in the dumpsters. The dumpsters shall be emptied as often as necessary during construction and transferred to an approved solid waste facility licensed to accept municipal solid waste and/or construction and demolition debris. No construction waste shall be buried on site. All personnel shall be instructed regarding the correct procedure for waste disposal.
**Hazardous Waste:** All hazardous waste materials shall be disposed of in a manner specified by local or State regulation or by the manufacturer. Site personnel shall be instructed in these practices.
**Sanitary Waste:** All sanitary waste shall be collected from portable units, as needed, by a septage hauler licensed in Massachusetts, in accordance with the requirements of the local Board of Health.

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**Offsite Vehicle Tracking:**
Construction entrance and exit shall be via Lowell Street. Accumulated sediments must be removed on a regular basis from the site entrance and adjacent roadway via street sweeping or hand sweeping operations as necessary.

# TIMING OF CONTROLS/MEASURES

As indicated in the Sequence of Major Activities, the installation of erosion and sediment control devices and installation of stabilized construction entrances shall be in place prior to major earth excavation activities. Areas where construction activities are exposed more than two months, but less than 12 months shall be stabilized with the temporary stabilization practices referred to above. Once construction activity has been completed in a particular area, that area shall then be stabilized with permanent seed and mulch.

# MAINTENANCE/INSPECTION PROCEDURES

**Erosion and Sediment Control Inspection and Maintenance Practices**
The following items represent the inspection and maintenance practices that shall be used to maintain sediment and erosion control for the project.

1. All control measures shall be inspected at least once every fourteen (14) days and following any storm event of 0.5 inches or greater.
2. All measures shall be maintained in good working order; if a repair is necessary, it shall be initiated within 24 hours of the report.
3. Built up sediment shall be removed from erosion control when it has reached one-third the height of the wattle.
4. Siltation Control shall be inspected for depth of sediment and tears.
5. The catch basin grate shall be inspected for grate elevation relative to current surface condition; condition of silt sacks, and degree to which sediment has accumulated on the grate and in the sump of the catch basin.
6. Temporary and permanent seeding and any plantings shall be inspected for bare spots, washouts, and healthy growth.
7. A maintenance inspection report shall be prepared following each inspection. A copy of the report form to be completed by the inspector is attached with this document.
8. The Site Contractor/ Project Manager ("Manager") shall select three individuals who will be responsible for inspections, maintenance and repair activities. The "Manager" shall be responsible for filling out the inspection and maintenance report.
9. Personnel selected for inspections and maintenance responsibilities shall receive training from the "Manager". They will be trained in all the inspection and

maintenance practices necessary for keeping the erosion and sediment control devices used on site in good working order.

**Non-Stormwater Discharges**

It is expected that the following non-stormwater discharges will occur from the site during the construction period:

1. Pavement wash waters
2. No non-stormwater discharges shall be directed to unstabilized earth surfaces.

## INVENTORY FOR POLLUTION PREVENTION PLAN

The materials or substances listed below are expected to be present on site during construction:

- Bituminous Concrete
- Concrete
- Petroleum Based Products
- Cleaning Solvents
- Adhesives
- Grout
- Masonry Block
- Fertilizers

## SPILL PREVENTION

The following are the material management practices that shall be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff.

**Equipment fueling and Storage:**

Equipment and associated fuels and lubricants shall be stored in designated locations.

**Good Housekeeping:**

The following good housekeeping practices must be followed on site during the construction project.

1. A concerted effort shall be made to store only enough product required to complete a particular task
2. All materials stored on site shall be stored in a neat and orderly fashion in their appropriate containers and, if possible, under a roof or other secure enclosure

3. Products shall be kept in their original containers with the original manufacture's label
4. Substances shall not be mixed with one another unless recommended by the manufacturer
5. Whenever possible, all of a product shall be used up before disposing of the container
6. Manufacture's recommendations for proper use and disposal shall be followed
7. The site superintendent shall inspect daily to ensure proper use and disposal of materials on site.

**Hazardous Products:**

Then following practices are intended to reduce the risks associated with hazardous materials.

1. Products shall be kept in original containers unless they are not re-sealable
2. Where feasible, the original labels and material safety data shall be retained, whereas they contain important product information
3. If surplus product must be disposed, follow manufacturer's or local and State recommended methods for proper disposal.

**PRODUCT SPECIFIC PRACTICES**

The following product specific practices shall be followed on site:

**Petroleum Products:**

All on site vehicles shall be monitored for leaks and receive regular preventative maintenance to reduce the risk of leakage. Petroleum products shall be stored in tightly sealed containers which are clearly labeled. Any bituminous concrete or asphalt substances used on site shall be applied according to the manufacturer's recommendations.

**Fertilizers:**

Fertilizers shall be applied in the minimum amounts recommended by the manufacturer. Once applied, fertilizers shall be worked into the soil to limit exposure to stormwater. Storage shall be in a covered shed or trailer. The contents of any partially used bags of fertilizers shall be transferred to a sealable plastic bag or bin to avoid spills.

**Paints:**

All containers shall be tightly sealed and stored when not required for use. Excess paint shall not be discharged into any catch basin, drain manhole, or any portion of the stormwater management system. Excess paint shall be properly disposed of according to manufacturer's recommendations or State and local regulations.

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**Concrete Trucks:**

Concrete trucks shall not be allowed to wash out or discharge surplus concrete or drum wash water on site.

**SPILL CONTROL PRACTICES**

**The Site Contractor / Project Manager ("Manager") is responsible for ensuring that materials spill control practices are followed upon commencement of, and during project construction.**

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices must be followed for spill prevention and cleanup:

1. Manufacturer's recommended methods for cleanup for on-site materials must be readily available at the construction office, and site personnel shall be made aware of the procedures and the location of the information.
2. Materials and equipment necessary for spill cleanup shall be kept in the material storage area on site. Equipment and materials shall include, but not be limited to brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand sawdust, and plastic and metal trash containers specifically for this purpose.
3. All spills shall be cleaned up immediately after discovery.
4. The spill area shall be kept well ventilated and personnel shall wear appropriate protective clothing to prevent injury from contact with hazardous substance.
5. 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.
6. The spill prevention plan shall be adjusted to include measures to prevent a particular type of spill from reoccurring and how to clean up the spill if there is another occurrence. A description of the spill, what caused it, and the clean up measures shall also be included.
7. The "Manager" shall be the spill preventions and cleanup coordinator. The "Manager" shall designate at least three other site personnel who will be trained in the spill control practices identified above.

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

**Vallis Way**
**LYNNFIELD, MASSACHUSETTS**

**INSPECTION AND MAINTENANCE REPORT FORM**

TO BE COMPLETED EVERY 14 DAYS AND WITHIN 24 HOURS OF A RAINFALL EVENT OF 0.5 INCHES OR GREATER

Date: _____

Inspector: _____ Inspector's Title: _____

Days Since Last Rainfall: _____ Amount of Last Rainfall _____

| | BMP | BMP Installed? (circle one) | | BMP Maintenance Required or Performed? (circle one) | | Corrective Action Needed And Notes |
|---|---|---|---|---|---|---|
| **1** | Catch Basin with Gas Trap | Yes | No | Yes | No | |
| **2** | Erosion Control Barrier | Yes | No | Yes | No | |
| **3** | Siltsack | Yes | No | Yes | No | |
| **4** | Forebay | Yes | No | Yes | No | |
| **5** | Infiltration Basin | Yes | No | Yes | No | |
| **6** | Subsurface Chambers | Yes | No | Yes | No | |
| **7** | | | | | | |

Additional Comments: _____