STORMWATER MANAGEMENT REPORT

for

THE VILLAGE AT SHEPLEY HILL
SAND HILL ROAD/LONGLEY ROAD
GROTON, MASSACHUSETTS

Prepared for:

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MERIDIAN ASSOCIATES
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STORMWATER NARRATIVE

Stormwater Narrative

The locus property is comprised of approximately 47.8± acres located at the intersection of Sand Hill Road and Longley Road. The locus is surrounded by residential properties with the exception of the western property line which abuts conservation land. The property is currently vacant woodlands and includes approximately 8 acres of bordering vegetated wetland interconnected and ultimately heading downgradient to the wetland on the conservation land to the west. Upland area from the existing roadways slopes up to the top of a hill running north through the site. Topography is mild at the top of the hill and bottom of the hill at about 5% with steeper side slopes to the west and east between 2:1 and 3:1.

The applicant is proposing a 14 lot subdivision with one residential duplex dwelling per lot. Two roadways 20 feet wide are proposed, one from Sand Hill Road and one from Longley Road. The roadway from Longley will intersect near the midpoint of the other as it continues to a cul de sac near the top of the existing hill. This proposal utilizes low impact development strategies as well as conventional stormwater management techniques. Incorporated in this design are surface infiltration basins, subsurface infiltration facilities, vortex units and deep sump catchbasins for treatment and recharge of stormwater. Proposed surface infiltration basins have been located in various locations onsite in the most permeable soil conditions to promote a decentralized system. Design strategies for the stormwater systems follow methods from the Massachusetts Stormwater Handbook along with the Town of Groton Stormwater Design Criteria.

Revision – February 5, 2021:

The applicant has removed one lot (to 13 total) and one residential duplex dwelling from the project. In addition, the location of the cul de sac has been adjusted and the associated roadway length has been reduced by approximately 220'

The following are the DEP Stormwater Standards as outlined in the Wetlands Regulations:

Standard 1: No new stormwater conveyances may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

There are no new untreated stormwater discharges proposed with the completion of this project. All stormwater from impervious surfaces discharging to the infiltration basin will be pretreated utilizing proposed deep sump catchbasins and vortex units as well as receive further treatment within the infiltration basin itself prior to discharge towards the existing wetland.

In addition, the each of the proposed surface infiltration basins is designed with a riprap overflow weir which will act as a level spreader to dissipate velocity and spread any excess discharging flow. This mechanism will prevent point discharge and potential erosion to the existing wetland area.

Standard 2: Peak Rate Attenuation - Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

Reference is made to the report entitled "Stormwater Analysis and Calculations for the Village at Shepley Hill" dated November 23, 2020, revised February 5, 2021.

The Stormwater Analysis utilizes the Soil Conservation Service Technical Report No. 55 and the U.S. Department of Commerce Technical Paper No. 40 to calculate peak runoff rates and volumes. Full detail of peak rate attenuation along with supplemental stormwater calculations utilizing HydroCAD as well as existing and post development watershed plans can be found in the referenced report.

The table below illustrates the predicted existing and post development stormwater flows for the 2, 10, 25 and 100-year storm events.

Peak Discharge Rates in CFS (cubic feet per second):

	2-Year 24-Hour Storm Event	10-Year 24-Hour Storm Event	25-Year 24 Hour Storm Event	100-Year 24-Hour Storm Event
Existing	14.2 CFS	52.4 CFS	79.3 CFS	123.8 CFS
Proposed	12.9 CFS	44.1 CFS	66.6 CFS	105.4 CFS

Peak Discharge Volumes in AF (acre-feet):

	2-Year 24-Hour Storm Event	10-Year 24-Hour Storm Event	25-Year 24 Hour Storm Event	100-Year 24-Hour Storm Event
Existing	2.5 AF	6.5 AF	9.2 AF	13.6 AF
Proposed	2.5 AF	6.5 AF	9.1 AF	13.5 AF

The details of this report show that the peak rates and volumes of runoff for the 2, 10, 25, and 100 year events have been reduced from existing to proposed conditions as required. We anticipate no adverse impacts or downstream flooding with the completion of this project.

Standard 3: Recharge - Loss of annual recharge to groundwater shall be eliminated or minimized…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 in accordance with the Mass Stormwater Handbook.

Loss of annual recharge to groundwater has been minimized through the use of stormwater Best Management Practices (BMP's), surface infiltration basins, subsurface infiltration facilities, and a proposed operation and maintenance program. Based on soil maps provided by U.S. Department of Agriculture Soil Conservation Service the locus property consists of multiple soil types which include hydrologic soil groups A, B and C.

Utilizing the current regulations along with the Town of Groton Stormwater Design Criteria (GSDC), the required recharge volume (Rv) is based on the following calculation:

Rv = Fx
Rv = Required Recharge Volume
F = Target Depth Factor associated with hydrologic soil groups located in table 2.3.2 in Volume 3 of the Stormwater Management Handbook (which match GSDC)
x = total onsite impervious area
Due to multiple soil designations, the overall required recharge volume is a compilation of the volumes calculated for the impervious area located within each hydrologic soil group designation as outlined below.

x = total onsite impervious area (within soil group designations)
F = 0.6 inches (A-soil)
F = 0.35 inches (B-soil)
F= 0.25 inches (C-soil)
x_A = 21,115 square feet (sf)
x_B = 31,380 square feet (sf)
x_c = 136,355 square feet (sf)
Rv (A-soil) = 1,056 cf
Rv (B-soil) = 916 cf
Rv (C-soil) = 2,841 cf
Rv (Total) = 4,813 cf

Volume of storage provided under the outlet of the proposed surface infiltration basins for recharge:
Basin #1 = 2,358 cf
Basin #2 = 5,140 cf
Basin #3 = 9,398 cf
Basin #4 = 5,349 cf
Basin #5 = 2,358 cf
Total Facilities = 24,603 cf > Rv (Total) = 4,813 cf

The Stormwater Handbook also requires recharge facilities be installed in soils capable of absorbing the recharge volume with the ability to drain within 72 hours. The formula for drawdown is as follows:

General Formula:

$$T_{DR} = \frac{required storage volume^{*}}{(Rawls Rate)(Bottom Surface Area of System)}$$

(*Required storage volume is equal to the larger of the calculated required recharge or treatment volumes. Treatment volume is greater for the surface basins as indicated in Standard 4).

Surface Infiltration Basin #1:

Volume to Treat = 1,628 *cf*

$$T_{DR} = \frac{\mathbf{1{,}628}\boldsymbol{cf}}{\left(\frac{\mathbf{8.27}\boldsymbol{in/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{1{,}085}\boldsymbol{sf})} = 2.2\ hrs$$

2.2 *hrs* < 72 *hrs*

Surface Infiltration Basin #2:

Volume to Treat = 3,259 *cf*

$$T_{DR} = \frac{\mathbf{3{,}259}\boldsymbol{cf}}{\left(\frac{\mathbf{8.27}\boldsymbol{in/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{2{,}585}\boldsymbol{f})} = 1.9\ hrs$$

1.9 *hrs* < 72 *hrs*

Surface Infiltration Basin #3:

Volume to Treat = 4,040 *cf*

$$T_{DR} = \frac{\mathbf{4{,}040}\boldsymbol{cf}}{\left(\frac{\mathbf{8.27}\boldsymbol{in/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{5{,}480}\boldsymbol{sf})} = 1.1\ hrs$$

1.1 *hrs* < 72 *hrs*

Surface Infiltration Basin #4:

Volume to Treat = 1,628 *cf*

$$T_{DR} = \frac{\mathbf{1{,}628}\boldsymbol{cf}}{\left(\frac{\mathbf{2.41}\boldsymbol{in/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{1{,}100}\boldsymbol{sf})} = 7.4\ hrs$$

7.4 *hrs* < 72 *hrs*

Surface Infiltration Basin #5:

Volume to Treat = 1,989 *cf*

$$T_{DR} = \frac{\mathbf{1{,}989}\boldsymbol{cf}}{\left(\frac{\mathbf{2.41}\boldsymbol{in/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{860}\boldsymbol{sf})} = 11.5\ hrs$$

11.5 *hrs* < 72 *hrs*

Subsurface Infiltration Facilities (all the same):

Rooftop area: 4,685 sf
Assume A-soils: 0.60”
Volume to Recharge = 235 *cf*

$$T_{DR} = \frac{\mathbf{235}\boldsymbol{cf}}{\left(\frac{\mathbf{2.41}\boldsymbol{in/hr}}{\mathbf{12}\boldsymbol{in/ft}}\right)(\mathbf{502}\boldsymbol{sf})} = 2.4\ hrs$$

2.4 *hrs* < 72 *hrs*

A portion of the total onsite impervious area is not directed into one of the proposed infiltration facilities. In accordance with the Stormwater Handbook, a capture area adjustment calculation is required when runoff from only a portion of the impervious area on a site is directed to one or more infiltration BMPs. The following are steps of the capture area adjustment calculation to demonstrate the required minimum of 65% of the impervious area onsite is being directed to an infiltration BMP. The calculation also determines the increase in storage capacity of the infiltration BMPs to ensure they are able to capture sufficient runoff from the impervious surfaces within the contributing drainage area to infiltrate the required recharge volume.

1. Calculate Rv for the project:
   From above Rv = 4,813 cf

2. Calculate the impervious area draining to recharge facilities:
   Area = 159,870 sf

3. Divide site total site impervious by the impervious area draining to recharge facilities:
   Total site impervious area = 188,850 sf
   188,850sf/159,870sf = 1.19

4. Multiply quotient from step 3 by the original Rv to determine the adjusted minimum storage volume needed to meet the recharge requirement:
   1.19 x 4,813 = 5,728 cf
   Infiltration facilities provide 24,603 cf of storage

5. Ensure minimum of 65% of the site impervious area is being directed to the infiltration facilities:
   159,870sf/188,850sf = 84%

In summary, the infiltration facilities onsite provide a total recharge storage volume of 24,603 cf which is greater than the adjusted minimum storage volume calculated by the capture area adjustment. The project also directs greater than 65% of the impervious area into the recharge facilities which will provide sufficient runoff to infiltrate the required recharge volume. This ensures the post development annual recharge rate will approximate the annual rate from existing development conditions.

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). The standard is met with pollution prevention plans, stormwater BMP's sized to capture required water quality volume, and pretreatment measures.

As discussed previously, there are no untreated stormwater discharges from the proposed project. The stormwater management system has been designed to remove a minimum of 80% of the average annual post-construction load of Total Suspended Solids (TSS) through the use of deep sump catchbasins, vortex units, and infiltration facilities. See the appendix for DEP TSS Removal Calculation Worksheets.

The Stormwater Management Handbook assigns TSS removal percentages to each treatment BMP. Each treatment BMP is sized to capture the required water quality volume calculated in accordance with the Handbook in order to achieve the assigned TSS removal rates. Although the Town of Groton does not qualify some of the surface infiltration basins as treatment basins due to the rapid infiltration rate, calculations are provided for those systems for reference. Pretreatment devices are proposed upgradient of the basins to provide the minimum required TSS removal rates. Calculations for vortex units are based on the required proprietary structure sizing calculations issued by MA DEP and are included in the appendix of this report.

The following are water quality treatment sizing calculations for surface infiltration basins:

General Equation from Stormwater Management Handbook

Vwq = (Dwq)(A)
Vwq = required water quality volume
Dwq = water quality depth (1" for all areas per Groton Stormwater Design Criteria)
A = impervious area

Area to Infiltration Basin #1:
Dwq = 1"
A = 19,530 sf
Vwq = (1"/12)x19,530 sf
Vwq = 1,628 cf
Volume under outlet within infiltration basin = 2,358 cf

Area to Infiltration Basin #2:
Dwq = 1"
A = 39,105 sf
Vwq = (1"/12)x39,105 sf
Vwq = 3,259 cf
Volume under outlet within infiltration basin = 5,140 cf

Area to Infiltration Basin #3:
Dwq = 1"
A = 48,480 sf
Vwq = (1"/12)x48,480 sf
Vwq = 4,040 cf
Volume under outlet within infiltration basin = 9,398 cf

Area to Infiltration Basin #4:
Dwq = 1"
A = 19,525 sf
Vwq = (1"/12)x19,525 sf
Vwq = 1,628 cf
Volume under outlet within infiltration basin = 5,349 cf

Area to Infiltration Basin #5:
Dwq = 1"
A = 23,860 sf
Vwq = (1"/12)x23,860 sf
Vwq = 1,989 cf
Volume under outlet within infiltration basin = 2,358 cf

A separate document entitled "Operation and Long Term Maintenance Plan" dated November 23, 2020 is included in the appendix of this report. Suitable practices for source control and long term pollution prevention have been identified and shall be implemented as discussed.

The utilization of properly sized treatment BMP's combined with the operation and maintenance plan provides compliance with this standard.

Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs) – Source control and pollution prevention shall be implemented in accordance with the Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.

Stormwater Standard 5 is not applicable to this project. The proposed development will not subject the site to higher potential pollutant loads as defined in the Massachusetts Department of Environmental protection Wetlands and Water Quality Regulations.

LUHPPLs are identified in 310 CMR 22.20B(2) and C(2)(a)-(k) and (m) and CMR 22.21(2)(a)(1)-(8) and (b)(1)-(6), areas within a site that are the location of activities that are subject to an individual National Pollutant Discharge Elimination System (NPDES) permit or the NPDES Multi-sector General Permit; auto fueling facilities, exterior fleet storage areas, exterior vehicle service and equipment cleaning areas; marinas and boatyards; parking lots with high-intensity-use; confined disposal facilities and disposal sites.

Standard 6: Critical Areas – Stormwater discharges to critical areas require the use of specific source control and pollution prevention measures and specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas.

Standard 6 is not applicable to this project given that stormwater will not be discharged to a critical area. Critical areas are defined as Outstanding Resource Waters and Special Resource Waters as designated in 314 CMR 4.0, recharge areas for public water supplies as defined in 310 CMR 22.02 (including Zone II and Interim Wellhead Protection Areas), bathing beaches as

defined in 105 CMR 445.000, cold-water fisheries and shellfish growing areas as defined in 314 CMR 9.02 and 310 CMR 10.04.

Standard 7: Redevelopments – A redevelopment project is required to meet Standards 1-6 only to the maximum extent practicable. Remaining standards shall be met as well as the project shall improve the existing conditions.

Stormwater Standard 7 is not applicable to this project. Within the Stormwater Management Handbook (volume 1, chapter 1, page 20), the definition of a redevelopment project includes, "development, rehabilitation, expansion and phased projects on previously developed sites, provided the redevelopment results in no net increase in impervious area". The proposed project is not a redevelopment, therefore meets each of the standards set forth in the Stormwater Handbook.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan shall be implemented.

A *Construction Period Pollution Prevention Plan for a Proposed Stormwater Management System* report is included in the Appendix of this report. This program details the construction period operation and maintenance plan and sequencing for pollution prevention measures and erosion and sedimentation controls. Locations of erosion control measures for the project are depicted on the site plan set accompanying this report.

Standard 9: A long term Operation and Maintenance Plan shall be implemented.

An *Operation and Long Term Maintenance Plan* is included in the Appendix of this report. This long term operation and maintenance program provides details and the schedule for routine and non-routine maintenance tasks to be implemented at the completion of the project.

Standard 10: Prohibition of Illicit Discharges – Illicit discharges to the stormwater management system are prohibited.

Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. Discharges to the stormwater management system from the following activities or facilities are permissible: Firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing and water used to clean residential buildings without detergents. All other illicit discharges are prohibited.

There are no known illicit discharges anticipated through the completion of this project. During construction and post construction procedures are provided to dissipate the potential for illicit discharges to the drainage system. Post construction preventions of illicit discharges are described in the Operation and Maintenance Plan under the Good Housekeeping Practices section of the report.

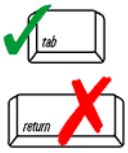
STORMWATER CHECKLIST

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

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): Some use of drywell for roof drainage.

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.

APPENDIX

INSTRUCTIONS:
1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structureal BMP Table
2. The calcualtions must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: Sand Hill Road/Longley Road, MA

Train: Pretreatment to Surface Infiltration Basins

TSS Removal Calculation Worksheet

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump Catchbasin	25%	1.00	0.25	0.75
CDS vortex unit	80%**	0.75	0.60	0.15

Total TSS Removal = 85.0%

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

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

** See proprietary structure sizing calcs

Project: 6332
Prepared By: Meridian Associates, Inc.
Date: 11/23/2020

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

Proprietary Structure Sizing

6332 - Shepley Hill Capital
Sand Hill Rd/Longley Rd

CDS to Basin #1

Impervious area directed to structure 13,405 square feet
Treatment based on WQV rule 1 inch

Discharge Rate (Q) conversion:

Q=(qu)(A)(WQV)

qu --> unit peak discharge in cfs/mi^2/watershed inches
(qu based on figures 1 & 2 la/P tables with tc value of 0.1 hrs)
A --> impervious surface drainage area (in square miles)
*conversion factor: 0.0015625 mi^2/acre

qu --> 774 cfs/mi^2/in
A --> 0.31 acres
*convert ac to mi^2: 0.000481
WQV --> 1 inches

Q= 0.37 cfs
Treatment Capacity CDS-2015 = 1.4 cfs

CDS to Basin #2

Impervious area directed to structure 25,970 square feet
Treatment based on WQV rule 1 inch

Discharge Rate (Q) conversion:

Q=(qu)(A)(WQV)

qu --> unit peak discharge in cfs/mi^2/watershed inches
(qu based on figures 1 & 2 la/P tables with tc value of 0.1 hrs)
A --> impervious surface drainage area (in square miles)
*conversion factor: 0.0015625 mi^2/acre

qu --> 774 cfs/mi^2/in
A --> 0.60 acres
*convert ac to mi^2: 0.000932
WQV --> 1 inches

Q= 0.72 cfs
Treatment Capacity CDS-2015 = 1.4 cfs

CDS to Basin #3

Impervious area directed to structure 35,605 square feet
Treatment based on WQV rule 1 inch

Discharge Rate (Q) conversion:

Q=(qu)(A)(WQV)

qu --> unit peak discharge in cfs/mi^2/watershed inches
(qu based on figures 1 & 2 la/P tables with tc value of 0.1 hrs)
A --> impervious surface drainage area (in square miles)
*conversion factor: 0.0015625 mi^2/acre

qu --> 774 cfs/mi^2/in
A --> 0.82 acres
*convert ac to mi^2: 0.001277
WQV --> 1 inches

Q= 0.99 cfs
Treatment Capacity CDS-2015 = 1.4 cfs

CDS to Basin #4

Impervious area directed to structure 14,215 square feet
Treatment based on WQV rule 1 inch

Discharge Rate (Q) conversion:

Q=(qu)(A)(WQV)

qu --> unit peak discharge in cfs/mi^2/watershed inches
(qu based on figures 1 & 2 la/P tables with tc value of 0.1 hrs)
A --> impervious surface drainage area (in square miles)
*conversion factor: 0.0015625 mi^2/acre

qu --> 774 cfs/mi^2/in
A --> 0.33 acres
*convert ac to mi^2: 0.00051
WQV --> 1 inches

Q= 0.39 cfs
Treatment Capacity CDS-2015 = 1.4 cfs

CDS to Basin #5

Impervious area directed to structure	21,875	square feet
Treatment based on WQV rule	1	inch

Discharge Rate (Q) conversion:

Q=(qu)(A)(WQV)

qu --> unit peak discharge in cfs/mi^2/watershed inches
(qu based on figures 1 & 2 la/P tables with tc value of 0.1 hrs)
A --> impervious surface drainage area (in square miles)
*conversion factor: 0.0015625 mi^2/acre

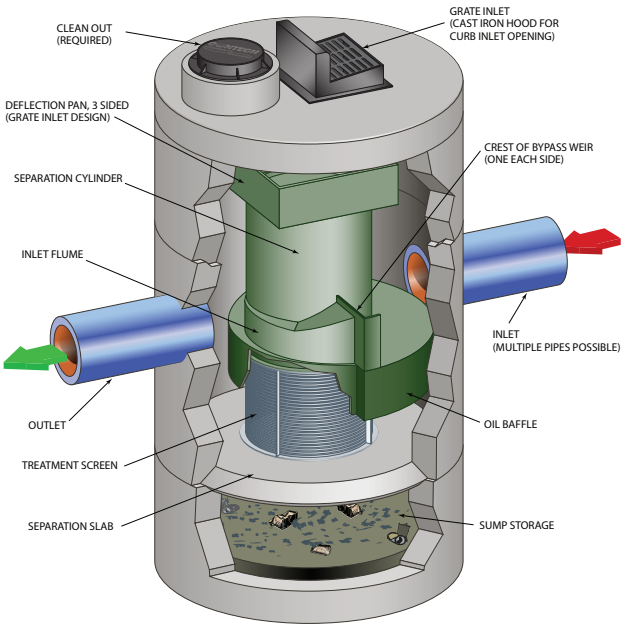
qu -->	774	cfs/mi^2/in
A -->	0.50	acres
*convert ac to mi^2:	0.000785	
WQV -->	1	inches

Q= 0.61 cfs

Treatment Capacity CDS-2015 = 1.4 cfs

Patented continuous deflection separation (CDS) technology

Using patented continuous deflective separation technology, the CDS system screens, separates and traps sediment, debris, and oil and grease from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material without blinding. Flow and screening controls physically separate captured solids, and minimize the re-suspension and release of previously trapped pollutants. Available in precast or cast-in-place. Offline units can treat flows from 30 to 8500 L/s (1 to 300 cfs). Inline units can treat up to 170 L/s (7.5 cfs), and internally bypass larger flows in excess of 1420 L/s (50 cfs). The pollutant removal capability of the CDS system has been proven in the lab and field.



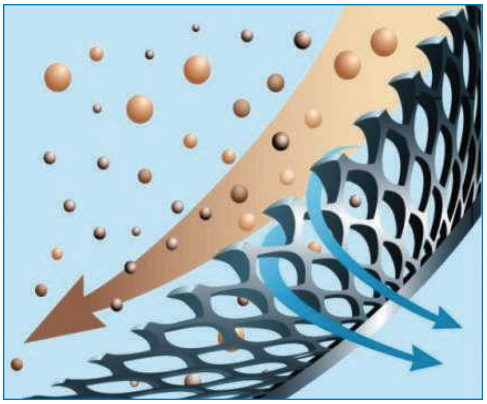
How does it work?

Stormwater enters the CDS unit's diversion chamber where the diversion weir guides the flow into the unit's separation chamber and pollutants are removed. All flows up to the system's treatment design capacity enter the separation chamber.

Swirl concentration and screen deflection forces floatables and solids to the center of the separation chamber where 100% of floatables and neutrally buoyant debris larger than the screen apertures are trapped.

Stormwater then moves through the separation screen, under the oil baffle and exits the system. The separation screen remains clog free due to continuous deflection.

During flow events exceeding the design capacity, the diversion weir bypasses excessive flows around the separation chamber, so captured pollutants will not wash out.



CDS

- Removes sediment, trash and free oil and grease
- Patented screening technology captures and retains 100% of floatables, including neutrally buoyant and all other material larger than the screen aperture
- Operation independent of flow
- Performance verified through lab and field testing
- Unobstructed maintenance access
- Customizable/flexible design and multiple configurations available
- Separates and confines pollutants from outlet flow
- Inline, offline, grate inlet and drop inlet configurations available
- Multiple screen aperture sizes available
- Allows for multiple inlet pipes

Available Models

CDS Model	Typical Internal MH Diameter or Equivalent ID[1] (ft)	Typical Depth[2] Below Pipe Invert (ft)	Treatment Capacity[3] (cfs)	Screen Diameter/ Height (ft)	Maximum Sediment Storage Capacity (CF)
2015_4	4	4.5	1.4	2.0/1.5	50
w/ 1' added sump	4	5.5	1.4	2.0/1.5	63
w/ 2' added sump	4	6.5	1.4	2.0/1.5	75
w/ 3' added sump	4	7.5	1.4	2.0/1.5	88
2015	5	4.7	1.4	2.0/1.5	79
w/ 1' added sump	5	5.7	1.4	2.0/1.5	98
w/ 2' added sump	5	6.7	1.4	2.0/1.5	118
2020	5	5.3	2.2	2.0/2.0	90
w/ 1' added sump	5	6.3	2.2	2.0/2.0	110
w/ 2' added sump	5	7.3	2.2	2.0/2.0	129
2025	5	5.6	3.2	2.0/2.5	97
w/ 1' added sump	5	6.6	3.2	2.0/2.5	117
w/ 2' added sump	5	7.6	3.2	2.0/2.5	136
3020	6	5.4	3.9	3.0/2.0	134
w/ 1' added sump	6	6.4	3.9	3.0/2.0	163
w/ 2' added sump	6	7.4	3.9	3.0/2.0	191
3030	6	6.2	6.1	3.0/3.0	157
w/ 1' added sump	6	7.2	6.1	3.0/3.0	185
w/ 2' added sump	6	8.2	6.1	3.0/3.0	213
4030	8	7.2	7.9	4.0/3.0	329
w/ 1' added sump	8	8.2	7.9	4.0/3.0	379
w/ 2' added sump	8	9.2	7.9	4.0/3.0	429
4040	8	8.3	12.4	4.0/4.0	381
w/ 1' added sump	8	9.3	12.4	4.0/4.0	431
w/ 2' added sump	8	10.3	12.4	4.0/4.0	482

1. Structure diameter represents the typical inside dimension of the concrete structure. Offline systems will require additional concrete diversion components
2. Depth below pipe can vary to accommodate site specific design. Depth below pipe invert represents the depth from the pipe invert to the inside bottom of concrete structure.
3. Treatment Capacity is based on laboratory testing using OK-110 (average d50 particle size of approximately 100 microns) and a 2400 micron screen.

Sediment Depths Indicating Required Servicing*

CDS Model	Sediment Depth (in.)
2015_4	18"
2015	18"
2020	18"
2025	18"
3020	18"
3030	18"
4030	27"
4040	27"
Every 1' of added sump depth	Add 9"

* Based on 75% capacity of isolated sump.

CONSTRUCTION PERIOD POLLUTION PREVENTION PLAN FOR A PROPOSED STORMWATER MANAGEMENT SYSTEM

located at

THE VILLAGE AT SHEPLEY HILL
SAND HILL ROAD/LONGLEY ROAD
GROTON, MASSACHUSETTS

Applicant:

Shepley Hill Capital Partners LLC
P.O. Box 1044
Sudbury, Massachusetts 01776

Prepared by:

Meridian Associates, Inc.
500 Cummings Center, Suite 5950
Beverly, Massachusetts 01915
(978) 299-0447

November 23, 2020

Project Name: The Village at Shepley Hill
Sand Hill Road/Longley Road
Groton, Massachusetts

Owner Name: Shepley Hill Capital Partners LLC
P.O. Box 1044
Sudbury, Massachusetts 01776

Party Responsible for Maintenance: Shepley Hill Capital Partners LLC
P.O. Box 1044
Sudbury, Massachusetts 01776
978-212-5318

Project Description:

The locus property is comprised of approximately 47.8± acres located at the intersection of Sand Hill Road and Longley Road. The locus is surrounded by residential properties with the exception of the western property line which abuts conservation land. The property is currently vacant woodlands and includes approximately 8 acres of bordering vegetated wetland interconnected and ultimately heading downgradient to the wetland on the conservation land to the west. Upland area from the existing roadways slopes up to the top of a hill running north through the site. Topography is mild at the top of the hill and bottom of the hill at about 5% with steeper side slopes to the west and east between 2:1 and 3:1.

The applicant is proposing a 14 lot subdivision with one residential duplex dwelling per lot. Two roadways 20 feet wide are proposed, one from Sand Hill Road and one from Longley Road. The roadway from Longley will intersect near the midpoint of the other as it continues to a cul de sac near the top of the existing hill. Associated stormwater management improvements have been incorporated into the design to provide treatment as well as onsite recharge of stormwater.

Erosion and Sedimentation Control Measures During Construction Activities

Town of Groton Erosion Control Criteria

Reference is made to the Town of Groton Stormwater Design Criteria Section 352-19 Erosion Control. Criteria referenced shall be incorporated as part of this program. Section referenced is included at the end of document.

Erosion Control Sock

Erosion Control Socks are proposed to be installed around the perimeter of the redevelopment as a limit of work. The barriers are burlap fabric mitts filled with compost blends and shall be installed prior to the commencement of any work on-site and in accordance with the design plans. An additional supply of socks shall be on-site to replace and/or repair socks that have been disturbed. The lines of socks shall be inspected and maintained on a weekly basis during construction.

Deposited sediments shall be removed when the level of deposition reaches approximately one-half the height of the Erosion Control Sock.

Storm Drain Inlet Protection

A temporary storm inlet protection filter will be placed around all catchbasin units. The purpose of the filter is to prevent the inflow of sediments into the closed drainage system. The filter shall remain in place until a permanent vegetative cover is established and the transport of sediment is no longer visibly apparent. The filter shall be inspected and maintained on a weekly basis and after every storm of 0.25 inches or more of rainfall/precipitation.

Surface Stabilization

The surface of all disturbed areas shall be stabilized during and after construction as soon as practical but no more than fourteen (14) days after construction activity has temporarily or permanently ceased on that portion of the site. Temporary measures shall be taken during construction to prevent erosion and siltation. No construction sediment shall be allowed to enter any infiltration systems. All disturbed slopes will be stabilized with a permanent vegetative cover. Stabilization netting or tackifier applied with hydroseeding shall be used on all slopes 3:1 or greater. Some or all of the following measures will be utilized on this project as conditions may warrant.

a. Temporary Seeding
b. Temporary Mulching
c. Permanent Seeding
d. Placement of Sod
e. Hydroseeding
f. Placement of Hay
g. Placement of Jute Netting

Street Sweeping

Any sediment tracked onto public right-of-ways or parking areas shall be swept at the end of each working day.

Surface Infiltration Basin

The surface infiltration basins shall be checked weekly and after major storm events during construction for rilling, erosion, and debris removal. Avoid compaction of the parent material by working from the edge of the area proposed as the location of the surface infiltration basin.

Subsurface Infiltration

The performance of the subsurface infiltration facilities shall be checked weekly and after every major storm event during construction. No construction period runoff should be directed into the subsurface infiltration facilities. Excavation for the facility shall be performed from the edge of the facility location to avoid compaction of the parent material. Prior to the installation of the top surface, implement erosion and sediment controls around the perimeter of the open system to prevent sheet flow or windblown sediment from entering the system.

Catchbasins and Stormwater Water Quality Unit (CDS Unit)

The performance of the catchbasins and water quality unit shall be checked weekly and after every major storm event during construction. Prevent construction period runoff from being discharged into the units until construction is complete and soil is stabilized.

Interim Erosion Control

Additional erosion control measures shall be implemented as conditions warrant during construction or as directed by the owner or owner's representative.

Construction Entrance

Install the construction entrance as detailed on the site plans. The entrance should be maintained in a condition that will prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic topdressing with additional stone. Inspect entrance/exit pad and sediment disposal area weekly and after heavy rains or heavy use. Remove mud and sediment tracked or washed onto public roads immediately. Mud and soil particles will eventually clog the voids in the gravel and the effectiveness of the gravel pad will not be satisfactory. When this occurs, the pad should be top dressed with new stone. Complete replacement of the pad may be necessary when the pad becomes completely clogged. Reshape pad as needed for drainage and runoff control. Repair any broken road pavement immediately.

Topsoil Stockpile

Locate the topsoil stockpile so it does not interfere with work on the site. Side slopes of the stockpile should not exceed 2:1. Surround all stockpiles with silt fence or erosion control socks. Either seed or cover stockpiles with clear plastic or other mulching materials within 7 days of the formation of the stockpile.

Removal

All facilities used as temporary measures shall be cleaned prior to being put into final operation. When construction is complete, the contractor shall remove all siltation devices after re-vegetation of disturbed areas and after written approval from the project engineer.

Provisions for storing paints, cleaners, automotive waste and other potentially hazardous household waste products inside or under cover

- All materials on site will be stored inside in a neat, orderly, manner in their appropriate containers with the original manufacturer's label. Appropriate cover of materials shall be provided to prevent these chemicals from contact with rainwater.
- Only store enough material necessary. Whenever possible, all of a product shall be used up before disposing of container
- Manufacturer, local, and State recommendations for proper use and disposal shall be followed.

Construction Vehicles & Equipment

- All fueling and maintenance of vehicles and equipment shall be performed outside resource buffer zones. Storage, handling and disposal of fuels and liquids in relation to construction

vehicles and equipment shall be conducted in compliance with National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges from Construction Activities (CGP) 2017 Section 2.3.

Spill prevention and response plans

- Spill Control Practices shall be in conformance with the guidelines set forth in the National Pollutant Discharge Elimination System (NPDES) CGP 2017.
- Clean up spills immediately, using dry cleanup methods where possible and dispose of used materials properly. Do not clean surfaces or spills by hosing the area down. Eliminate the source of the spill to prevent a discharge or a continuation of an ongoing discharge.
- Spill kits shall be readily available onsite during construction.

Provisions for maintenance of lawns, gardens, and other landscaped areas

- Grass shall not be cut shorter than 2 to 3 inches.
- Refer to landscape plans for maintenance of planted areas.
- Use low volume water approaches such as drip-type or sprinkler systems. Water plants only when needed to enhance root growth and avoid runoff problems.
- The use of mulch shall be utilized where possible. Mulch helps retain water and prevents erosion.

Requirements for storage and use of fertilizers, herbicides and pesticides

- Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to storm water. Storage will be in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.
- Do not fertilize before a rainstorm.
- Consider using organic fertilizers. They release nutrients more slowly.
- Pesticides shall be applied on lawns and gardens only when necessary and applied only in the minimum amounts recommended by the manufacturer.

Provisions for solid waste management

- All solid waste shall be disposed of or recycled in accordance with local town regulations.

Snow disposal and plowing

- Snow shall be plowed and stored on gravel, grass, or other permeable surfaces to allow filtration to occur.
- Once snow melts all sand, salt and debris shall be extracted from the surface and properly disposed of.
- Snow shall not be disposed of in any wetland resource area or waterbody.
- Avoid disposing snow on top of storm drain catchbasins.

Winter Road Salt and/or Sand use and storage restrictions

- Salt storage piles should be located outside the 100-year buffer zone and shall be covered at all times.
- The amount of road salt applied should be regulated to prevent over salting of roadways and increasing runoff concentrations. Alternative materials, such as sand or gravel, should be used in especially sensitive areas.

Roadway and Parking Lot sweeping schedule

- Pavement sweeping shall be conducted at a frequency of not less than once per year.
- Removal of any accumulated sand, grit, and debris from driveway after the snow melts shall be completed shortly after snow melts for the season.

STORMWATER MANAGEMENT
CONSTRUCTION PHASE

INSPECTION SCHEDULE AND EVALUATION CHECKLIST

PROJECT LOCATION: Sand Hill Road/Longley Road, Groton, Massachusetts
Major Event = Rainstorm of ¼-inch or more

Inspection Date	Inspector	Area Inspected	Best Management Practice (yes/no)	Required Inspection Frequency if BMP	Comments	Recommendation	Follow-up Inspection Required (yes/no)
		Erosion Control Sock	No	Weekly and After Major Storm Events			
		Storm Drain Inlet Protection	Yes	Weekly and After Major Storm Events			
		Subsurface Infiltration Facility	Yes	Weekly and After Major Storm Events			
		Surface Infiltration Basins	Yes	Weekly and After Major Storm Events			
		Construction Entrance	No	Weekly and After Major Storm Events			
		Soil Stockpile Area	No	Weekly and After Major Storm Events			

(1) Refer to the Massachusetts Stormwater Handbook, Volume Two: Stormwater Technical Handbook (February 2008) for recommendations regarding frequency for inspection and maintenance of specific BMP's.

(2) Inspections to be conducted by a qualified professional knowledgeable in the principles & practice of erosion and sediment controls and pollution prevention

Limited or no use of sodium chloride salts, fertilizers or pesticides recommended.
Other notes: (Include deviations from: Conservation Approval, PB Approval, Construction Sequence and Approved Plan)

Stormwater Control Manager: _____

TMDL must be selected. The applicant shall submit a narrative describing how they will meet the requirements of the TMDL.

§ 352-17. Critical areas.

Stormwater discharges to critical areas, as defined in the Massachusetts Stormwater Handbook, shall use specific source control and pollution prevention measures and the specific structural stormwater best management practices outlined in the Massachusetts Stormwater Handbook.

§ 352-18. Redevelopment.

Redevelopment projects must meet the same criteria as new development to the maximum extent practicable. At a minimum, existing stormwater conditions must be improved, including reduction of peak rates, reduction of discharge volume, increased recharge, and increased water quality treatment.

§ 352-19. Erosion control.

The following criteria shall be met for erosion control, prior to any land disturbance activities commencing on the site:

A. Development shall be oriented to the site so that the cutting and stripping of vegetation and grading are minimized.

B. Prior to any land disturbance activities commencing on the site, the developer shall physically mark limits of no land disturbance on the site with tape, signs, or orange construction fence, so that workers can see the areas to be protected. These areas must be inspected by a representative of the Committee before clearing commences.

C. Appropriate erosion and sediment control measures shall be installed prior to soil disturbance. Measures shall be taken to control erosion within the project area. Sediment in runoff water shall be trapped and retained within the project area. Wetland areas and surface waters shall be protected from sediment. Erosion controls must be inspected by a representative of the Committee before clearing commences.

D. Runoff shall be controlled and conveyed into storm drains and other outlets so it will not erode the land or cause off-site damage; sediment in runoff shall be trapped by using staked straw bales, silt fencing, or sedimentation traps, or other approved erosion control devices.

E. Sediment basins shall be constructed where necessary to detain runoff and to trap sediment during construction.

F. Sediment shall be removed once the volume reaches 1/4 the height of the silt fence or straw bale.

G. Off-site runoff shall be diverted from highly erodible soils and steep slopes to stable areas.

H. Erosion and sediment controls shall be coordinated with the sequence of grading, development and construction operations; control measures shall be in effect prior to commencement of each increment/phase of the process.

I. Land disturbance activities exceeding two acres in size shall not be disturbed without a sequencing plan that requires stormwater controls to be installed and the soil stabilized, as disturbance beyond the two acres continues. Mass clearings and grading of the entire site should be avoided. Prior to any construction on the site, the applicant shall submit a construction phasing plan to the Committee for review and approval. The plan shall show how construction will proceed with a minimum of disturbance at any one time and shall specify approximate dates for initial disturbance and final stabilization for each phase.

J. Soil and other materials shall not be stockpiled or redistributed, either temporarily or permanently, in locations or in such a manner as would cause suffocation of tree root systems.

K. Topsoil shall be stripped from disturbed areas, stockpiled in approved areas and stabilized with temporary vegetative cover if it is to be left for more than 30 calendar days; perimeter sediment controls shall be installed around each area of stockpiled topsoil.

L. Soil stockpiles shall be stabilized or covered at the end of each workday.

M. The area of disturbance shall be kept to a minimum. Disturbed areas remaining idle for more than 14 days shall be stabilized.

N. Grading shall be kept to a minimum; tree removal shall be minimized.

O. For active construction areas such as borrow or stockpile areas, roadway improvements and areas within 50 feet of a building under construction, a perimeter sediment control system shall be installed and maintained to contain soil.

P. A stabilized construction entrance shall be constructed at all entrance/exit points of the site to reduce the amount of soil carried onto roadways and off the site.

Q. Dust shall be controlled at the site.

R. On the cut side of roads, ditches shall be stabilized immediately with rock riprap or other nonerodible liners or, where appropriate, vegetative measures such as sod.

S. All graded areas beyond the street right-of-way shall be covered with four inches of topsoil and planted with a native species of vegetative cover, sufficient to prevent erosion.

T. Temporary seeding, mulching or other suitable stabilization methods shall be used to protect exposed soil areas during construction; as feasible, natural vegetation shall be retained and protected; during the months of October through March, when seeding may be impractical, an anchored mulch or sod shall be applied as approved by the Committee or by the Committee's designee; diversions and/or prepared outlets may be required in critical areas during construction.

U. Permanent seeding should be undertaken in the spring from March through May and in late summer and early fall from August to October 15. During the peak summer months and in the fall after October 15, when seeding is found to be impractical, an appropriate temporary mulch shall be applied. Permanent seeding may be undertaken during the summer if plans provide for adequate mulching and watering.

V. Permanent vegetation and erosion control structures, as necessary, shall be installed, preferably immediately after construction is completed but otherwise no later than the first full spring season immediately thereafter; they shall comply with the erosion and sedimentation vegetative practices recommended by the U.S. Soil Conservation Service.

W. Temporary ground cover or erosion/sedimentation controls shall be established on any unbuilt lots as required by the Committee.

X. Native species shall be used for revegetation.

Y. All slopes steeper than 3:1 (h:v, 33.3%), as well as perimeter dikes, sediment basins or traps, and embankments shall, upon completion, be immediately stabilized with sod, seed and anchored straw mulch, or other approved stabilization measures.

Areas outside of the perimeter sediment control as shown on the Erosion and Control Plan shall not be disturbed.

Z. Monitoring and maintenance of erosion and sediment control measures throughout the course of construction shall be required. The applicant shall submit to the Stormwater Committee a complete operation and maintenance plan for temporary and permanent erosion control measures, as part of the application package.

AA. Temporary sediment trapping devices shall not be removed until permanent stabilization is established in all contributory drainage areas. Similarly, stabilization shall be established prior to converting sediment traps/basins into permanent (post-construction) stormwater management facilities. All facilities used as temporary measures shall be cleaned prior to being put into final operation.

BB. All temporary erosion and sediment control measures shall be removed after final site stabilization. Disturbed soil areas resulting from the removal of temporary measures shall be permanently stabilized within 30 days. The applicant's engineer shall submit written certification that this condition has been met.

§ 352-20. Stormwater pollution prevention plan.

Prior to the start of construction, the applicant must submit a narrative addressing pollution prevention measures to be taken at the site during the construction period. If the proponent is required to have a NPDES permit, a copy of the SWPPP can be filed in lieu of the narrative. The narrative must include emergency contact information during construction activities.

§ 352-21. Illicit discharges.

There shall be no illicit discharges from the site. The applicant shall submit an illicit discharge compliance statement verifying no illicit discharges exist on the site. For redevelopment projects, the applicant must provide a summary of the steps taken to verify no illicit discharges.

§ 352-22. Operation and maintenance plans.

A. A long-term operation and maintenance plan (O&M plan) for the permanent stormwater management system is required at the time of application for all projects. The long-term O&M plan shall

OPERATION AND LONG TERM MAINTENANCE PLAN

located at

THE VILLAGE AT SHEPLEY HILL
SAND HILL ROAD/LONGLEY ROAD
GROTON, MASSACHUSETTS

Applicant:

Shepley Hill Capital Partners LLC
P.O. Box 1044
Sudbury, Massachusetts 01776

Prepared by:

Meridian Associates, Inc.
500 Cummings Center, Suite 5950
Beverly, Massachusetts 01915
(978) 299-0447

November 23, 2020

Project Name: The Village at Shepley Hill
Sand Hill Road/Longley Road
Groton, Massachusetts

Owner Name: Shepley Hill Capital Partners LLC
P.O. Box 1044
Sudbury, Massachusetts 01776

Party Responsible for Maintenance: Shepley Hill Capital Partners LLC
P.O. Box 1044
Sudbury, Massachusetts 01776
978-212-5318

Project Description:

The locus property is comprised of approximately 47.8± acres located at the intersection of Sand Hill Road and Longley Road. The locus is surrounded by residential properties with the exception of the western property line which abuts conservation land. The property is currently vacant woodlands and includes approximately 8 acres of bordering vegetated wetland interconnected and ultimately heading downgradient to the wetland on the conservation land to the west. Upland area from the existing roadways slopes up to the top of a hill running north through the site. Topography is mild at the top of the hill and bottom of the hill at about 5% with steeper side slopes to the west and east between 2:1 and 3:1.

The applicant is proposing a 14 lot subdivision with one residential duplex dwelling per lot. Two roadways 20 feet wide are proposed, one from Sand Hill Road and one from Longley Road. The roadway from Longley will intersect near the midpoint of the other as it continues to a cul de sac near the top of the existing hill. Associated stormwater management improvements have been incorporated into the design to provide treatment as well as onsite recharge of stormwater.

Inspection and Maintenance Measures After Construction

Erosion Control

Eroded sediments can adversely affect the performance of the stormwater management system. Eroding or barren areas should be immediately re-vegetated.

Subsurface Infiltration Facilities

The infiltration facilities should be inspected after the first several rainfall events or first few months after construction, after all major storms (2-year), and on regular bi-annual scheduled dates. Open provided inspection ports and visibly inspect for sediment and or ponded water. Ponded water inside the system after several days often indicates that the bottom of the system is clogged. A stadia rod may be used to measure the depth of sediment if any in the row. If the depth of sediment is in excess of 3" then the row should be cleaned with high pressure water through a culvert cleaning nozzle. Refer to maintenance guide from manufacturer for additional detail.

Surface Infiltration Basin

Once the basin is in use, inspect after every major storm (a storm that is equal or greater than the 2 year 24 hour storm of 3.1") for the first few months to ensure it is stabilized and functioning properly. Subsequently, inspect the infiltration basin at least twice per year. Important items to check during the inspection include cracking, erosion, leakage in the embankments, tree growth on the embankments, condition of riprap, sediment accumulation and the health of all turf.

Mow the side slopes and basin bottom at least once in the spring and once in the fall. Remove grass clippings and accumulated organic matter to prevent an impervious organic mat from forming. Remove trash and debris at the same time. Use deep tilling to break up clogged surfaces and revegetate immediately.

Remove sediment from the basin as necessary but wait until the floor of the basin is thoroughly dry. Use light equipment to remove the top layer so as to not compact the underlying soil. Deeply till the remaining soil and revegetate as soon as possible.

The grassed areas immediately at the discharge point and down-slope of the rip-rap shall be inspected after major storm events, or at minimum twice per year. These locations may be subject to concentrated flows and therefore may be prone to erosion and the formation of gulleys or channels. If any gulleys or channels are observed, they should immediately be repaired by installing sod and reseeding with grass. These areas shall be reseeded until a stable groundcover is established.

Outlet Protection

Inspect rip rap outlet structures after heavy rains for erosion at sides and ends of apron and for stone displacement. Rock may need to be added if sediment builds up in the pore spaces of the outlet pad. Make repairs immediately using appropriate stone sizes. Do not place stones above finished grade.

Deep Sump Catchbasins

The catchbasins shall be inspected two (2) times per year, and if necessary, any maintenance shall be performed so that it functions as designed. The catchbasins shall be cleaned once per year or when sediment in the bottom of the sump reaches 24 inches below the bottom of the outlet. Inlet and outlet pipes should be checked for clogging. Catchbasin grates shall be kept free of snow and ice in the winter months and kept free of leaves, sand and debris during warmer months. At a minimum, inspection of the catchbasin shall be performed during the last week of April and the first week of October each year.

Debris and Litter Removal

Trash may collect in the BMP's, potentially causing clogging of the facilities. All debris and litter shall be removed when necessary, and after each storm event.

Water Quality Vortex Treatment Unit (Contech CDS)

Inspection and maintenance of the CDS unit shall follow documentation guidance as prepared by the manufacturer. At minimum, inspections should be performed twice per year once in the spring after snowmelt and once in late fall. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. Visual inspections should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. Additionally, the visual inspection shall include quantifying the accumulation of trash and sediment in the system. The CDS system should be cleaned when the level of sediment in the isolated sump storage chamber has reached 75% of capacity. Cleaning of the system should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build up exists in this area. Oils and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from deep sump catchbasins.

<u>Good Housekeeping Practices</u> (in accordance with Standard 10 of the Stormwater Management Handbook to prevent illicit discharges)

Provisions for storing paints, cleaners, automotive waste and other potentially hazardous household waste products inside or under cover

- All materials on site will be stored inside in a neat, orderly, manner in their appropriate containers with the original manufacturer's label.
- Only store enough material necessary. Whenever possible, all of a product shall be used up before disposing of container
- Manufacturer, local, and State recommendations for proper use and disposal shall be followed.

Vehicle washing controls

- A commercial car wash shall be used when possible. Car washes treat and/or recycle water.
- Cars shall be washed on gravel, grass, or other permeable surfaces to allow filtration to occur.
- Use biodegradable soaps.
- A water hose with a nozzle that automatically turns off when left unattended.

Spill prevention and response plans

- Spill Control Practices shall be in conformance with the guidelines set forth in the National Pollutant Discharge Elimination System (NPDES) Stormwater Pollution Prevention Plan (SWPPP)

Provisions for maintenance of lawns, gardens, and other landscaped areas

- Refer to approved landscape design plans for maintenance measures.
- Grass shall not be cut shorter than 2 to 3 inches.
- Use low volume water approaches such as drip-type or sprinkler systems. Water plants only when needed to enhance root growth and avoid runoff problems.
- The use of mulch shall be utilized where possible. Mulch helps retain water and prevents erosion.

Requirements for storage and use of fertilizers, herbicides and pesticides

- Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to storm water. Storage will be in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.
- Do not fertilize before a rainstorm.
- Consider using organic fertilizers. They release nutrients more slowly.
- Pesticides shall be applied on lawns and gardens only when necessary and applied only in the minimum amounts recommended by the manufacturer.

Pet waste management

- Scoop up and seal pet wastes in a plastic bag. Dispose of properly, in the garbage.

Provisions for operation and management of septic systems

- Follow town Board of Health requirements as well as requirements of the State Environmental Code Title 5.

Provisions for solid waste management

- All solid waste shall be disposed of or recycled in accordance with local town regulations.

Snow disposal and plowing plans relative to Wetland Resource Area

- Snow shall be plowed and stored on gravel, grass, or other permeable surfaces to allow filtration to occur.
- Once snow melts all sand salt and debris shall be extracted from the surface and properly disposed of.
- Avoid disposing snow on top of storm drain catchbasins.

Winter De-Icing and/or Sand use and storage restrictions

- De-icing compounds shall be covered and stored in re-sealable containers to avoid spills.
- The amount of road salt applied should be regulated to prevent over salting of driveway and increasing runoff concentrations. Alternative materials, including Calcium Chloride ($CaCl_2$), Calcium Magnesium Acetate (CMA) and non-Sodium based DEP approved de-icing compounds such as sand or gravel should be considered and shall be used in especially sensitive areas.

Roadway and Parking Lot sweeping schedule

- Pavement sweeping shall be conducted at a frequency of not less than once per year
- Removal of any accumulated sand, grit, and debris from roadway after the snow melts shall be completed shortly after snow melts for the season.

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

- Not Applicable

Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan

- To be determined by the owner.

List of Emergency contacts for implementing Long-Term Pollution Prevention Plan

- To be determined by the owner.

STORMWATER MANAGEMENT
POST-CONSTRUCTION PHASE

INSPECTION SCHEDULE AND EVALUATION CHECKLIST

PROJECT LOCATION: Sand Hill Road/Longley Road, Groton, Massachusetts

Inspection Date	Inspector	Area Inspected	Best Management Practice (yes/no)	Required Inspection Frequency if BMP	Recommendation	Follow-up Inspection Required (yes/no)
		Catchbasins	Yes	Twice per year (clean as necessary)		
		Water Quality Units	Yes	Twice a year (clean as necessary)		
		Subsurface Infiltration Facilities	Yes	Twice a year		
		Surface Infiltration Basins	Yes	Twice a year		

Comments: _____

(1) Refer to the Massachusetts Stormwater Handbook, Volume Two: Stormwater Technical Handbook (February 2008) for recommendations regarding frequency for inspection and maintenance of specific BMP's.

(2) Inspections to be conducted by a qualified professional knowledgeable in the principles & practice of erosion and sediment controls and pollution prevention

Limited or no use of sodium chloride salts, fertilizers or pesticides recommended.
Other notes: (Include deviations from: Conservation Approval, PB Approval, Construction Sequence and Approved Plan)

Stormwater Control Manager: _____

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CDS® Inspection and Maintenance Guide

CDS TECHNOLOGIES

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.3	3.0	0.9	1.3	1.0
CDS2020	5	1.3	3.5	1.1	1.3	1.0
CDS2025	5	1.3	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, earth stabilization and wastewater treament products. For information, visit www.ContechES.com or call 800.338.1122

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CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

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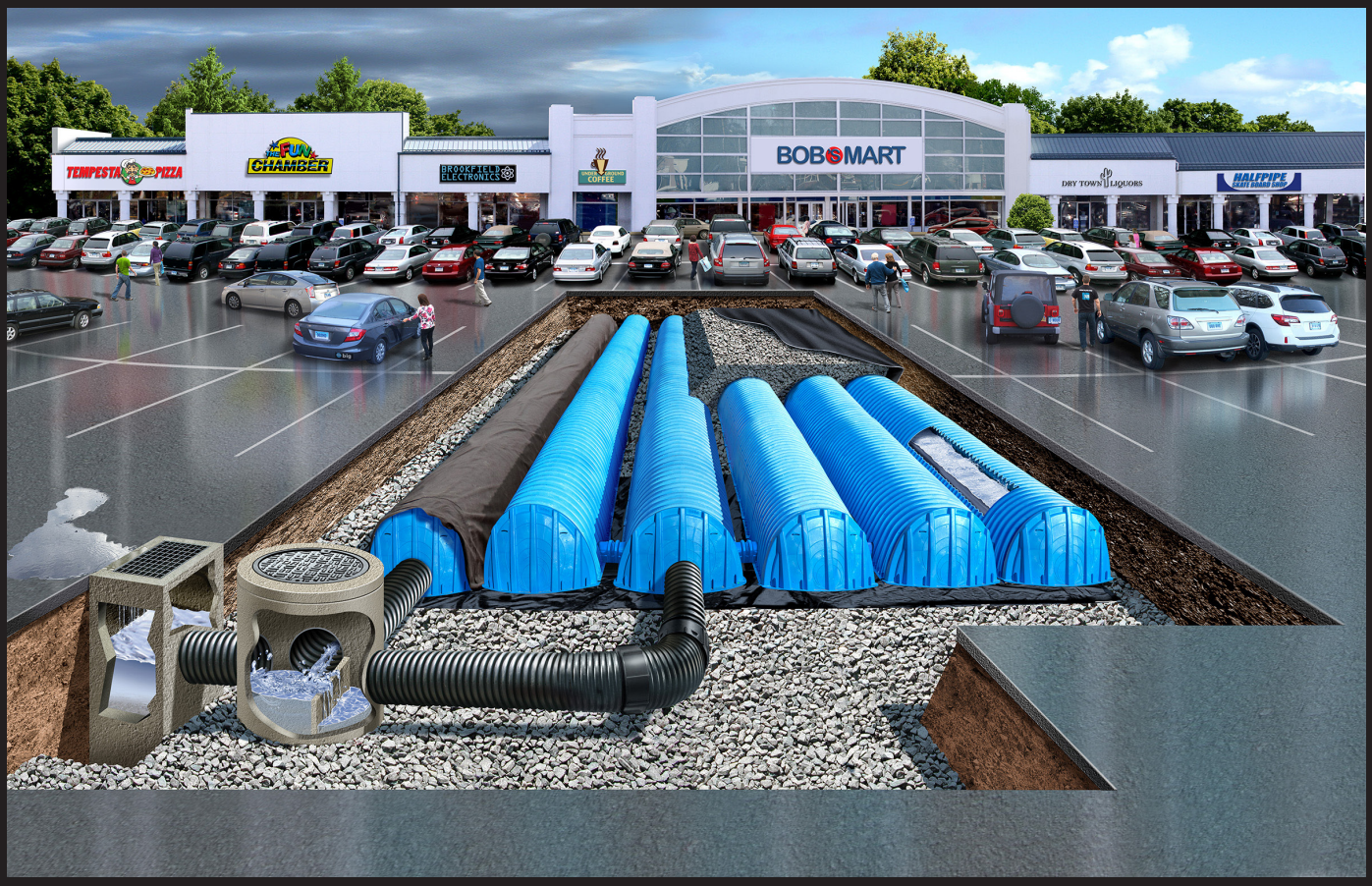

OPERATION & MAINTENANCE GUIDELINES

FOR CULTEC STORMWATER MANAGEMENT SYSTEMS

CULTEC®

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Visit www.cultec.com/downloads.html for Product Downloads and CAD details.

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January 2020

These instructions are for single-layer traffic applications only. For multi-layer applications, contact CULTEC.
All illustrations and photos shown herein are examples of typical situations. Be sure to follow the engineer's drawings.
Actual designs may vary.

This manual contains guidelines recommended by CULTEC, Inc. and may be used in conjunction with, but not to supersede, local regulations or regulatory authorities. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Introduction

The CULTEC Subsurface Stormwater Management System is a high-density polyethylene (HDPE) chamber system arranged in parallel rows surrounded by washed stone. The CULTEC chambers create arch-shaped voids within the washed stone to provide stormwater detention, retention, infiltration, and reclamation. Filter fabric is placed between the native soil and stone interface to prevent the intrusion of fines into the system. In order to minimize the amount of sediment which may enter the CULTEC system, a sediment collection device (stormwater pretreatment device) is recommended upstream from the CULTEC chamber system. Examples of pretreatment devices include, but are not limited to, an appropriately sized catch basin with sump, pretreatment catchment device, oil grit separator, or baffled distribution box. Manufactured pretreatment devices may also be used in accordance with CULTEC chambers. Installation, operation, and maintenance of these devices shall be in accordance with manufacturer's recommendations. Almost all of the sediment entering the stormwater management system will be collected within the pretreatment device.

Best Management Practices allow for the maintenance of the preliminary collection systems prior to feeding the CULTEC chambers. The pretreatment structures shall be inspected for any debris that will restrict inlet flow rates. Outfall structures, if any, such as outlet control must also be inspected for any obstructions that would restrict outlet flow rates. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Operation and Maintenance Requirements

I. Operation

CULTEC stormwater management systems shall be operated to receive only stormwater run-off in accordance with applicable local regulations. CULTEC subsurface stormwater management chambers operate at peak performance when installed in series with pretreatment. Pretreatment of suspended solids is superior to treatment of solids once they have been introduced into the system. The use of pretreatment is adequate as long as the structure is maintained and the site remains stable with finished impervious surfaces such as parking lots, walkways, and pervious areas are properly maintained. If there is to be an unstable condition, such as improvements to buildings or parking areas, all proper silt control measures shall be implemented according to local regulations.

II. Inspection and Maintenance Options

A. The CULTEC system may be equipped with an inspection port located on the inlet row. The inspection port is a circular cast box placed in a rectangular concrete collar. When the lid is removed, a 6-inch (150 mm) pipe with a screw-in plug will be exposed. Remove the plug. This will provide access to the CULTEC Chamber row below. From the surface, through this access, the sediment may be measured at this location. A stadia rod may be used to measure the depth of sediment if any in this row. If the depth of sediment is in excess of 3 inches (76 mm), then this row should be cleaned with high pressure water through a culvert cleaning nozzle. This would be carried out through an upstream manhole or through the CULTEC StormFilter Unit (or other pretreatment device). CCTV inspection of this row can be deployed through this access port to deter mine if any sediment has accumulated in the inlet row.

B. If the CULTEC bed is not equipped with an inspection port, then access to the inlet row will be through an upstream manhole or the CULTEC StormFilter.

1. Manhole Access
This inspection should only be carried out by persons trained in confined space entry and sewer inspection services. After the manhole cover has been removed a gas detector must be lowered into the manhole to ensure that there are not high concentrations of toxic gases present. The inspector should be lowered into the manhole with the proper safety equipment as per OSHA requirements. The inspector may be able to observe sediment from this location. If this is not possible, the inspector will need to deploy a CCTV robot to permit viewing of the sediment.

2. StormFilter Access
Remove the manhole cover to allow access to the unit. Typically a 30-inch (750 mm) pipe is used as a riser from the StormFilter to the surface. As in the case with manhole access, this access point requires a technician trained in confined space entry with proper gas detection equipment. This individual must be equipped with the proper safety equipment for entry into the StormFilter. The technician will be lowered onto the StormFilter unit. The hatch on the unit must be removed. Inside the unit are two filters which may be removed according to StormFilter maintenance guidelines. Once these filters are removed the inspector can enter the StormFilter unit to launch the CCTV camera robot.

C. The inlet row of the CULTEC system is placed on a polyethylene liner to prevent scouring of the washed stone beneath this row. This also facilitates the flushing of this row with high pressure water through a culvert cleaning nozzle. The nozzle is deployed through a manhole or the StormFilter and extended to the end of the row. The water is turned on and the inlet row is back-flushed into the manhole or StormFilter. This water is to be removed from the manhole or StormFilter using a vacuum truck.

III. Maintenance Guidelines

The following guidelines shall be adhered to for the operation and maintenance of the CULTEC stormwater management system:

A. The owner shall keep a maintenance log which shall include details of any events which would have an effect on the system's operational capacity.

B. The operation and maintenance procedure shall be reviewed periodically and changed to meet site conditions.

C. Maintenance of the stormwater management system shall be performed by qualified workers and shall follow applicable occupational health and safety requirements.

D. Debris removed from the stormwater management system shall be disposed of in accordance with applicable laws and regulations.

IV. Suggested Maintenance Schedules

A. Minor Maintenance
The following suggested schedule shall be followed for routine maintenance during the regular operation of the stormwater system:

Frequency	Action
Monthly in first year	Check inlets and outlets for clogging and remove any debris, as required.
Spring and Fall	Check inlets and outlets for clogging and remove any debris, as required.
One year after commissioning and every third year following	Check inlets and outlets for clogging and remove any debris, as required.

B. Major Maintenance
The following suggested maintenance schedule shall be followed to maintain the performance of the CULTEC stormwater management chambers. Additional work may be necessary due to insufficient performance and other issues that might be found during the inspection of the stormwater management chambers. (See table on next page)

	Frequency	Action
Inlets and Outlets	Every 3 years	• Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
	Spring and Fall	• Check inlet and outlets for clogging and remove any debris as required.
CULTEC Stormwater Chambers	2 years after commissioning	• Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. • Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.
	9 years after commissioning every 9 years following	• Clean stormwater management chambers and feed connectors of any debris. • Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. • Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.
	45 years after commissioning	• Clean stormwater management chambers and feed connectors of any debris. • Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. • Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. • Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. • Attain the appropriate approvals as required. • Establish a new operation and maintenance schedule.
Surrounding Site	Monthly in 1st year	• Check for depressions in areas over and surrounding the stormwater management system.
	Spring and Fall	• Check for depressions in areas over and surrounding the stormwater management system.
	Yearly	• Confirm that no unauthorized modifications have been performed to the site.

For additional information concerning the maintenance of CULTEC Subsurface Stormwater Management Chambers, please contact CULTEC, Inc. at 1-800-428-5832.