

**Stamski And McNary, Inc.**

Engineering - Planning – Surveying

1000 Main Street; Acton, MA 01720 (978) 263-8585

[www.stamskiandmcnary.com](http://www.stamskiandmcnary.com)

# Stormwater Management Report

For

**100-102 Nonset Path**

Acton, MA

**July 1, 2013**

Applicant:

Nagog Woods Community Corporation  
100 Nonset Path  
Acton, MA 01718

## **Table of Contents**

Checklist for Stormwater Report

Narrative

Bio-Retention Area Sizing Calculations

Water Quality Volume Calculations and Groundwater Recharge Calculations

Soil Analysis

TSS Removal Calculations

Stormwater Operation and Maintenance Manual

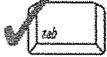
## **Checklist for Stormwater Report**



# 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.<sup>1</sup> 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<sup>2</sup>
- 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.

<sup>1</sup> 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.

<sup>2</sup> 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.



# 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.

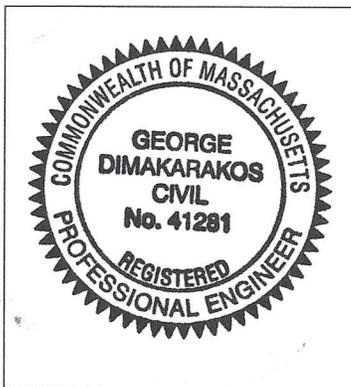
*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that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

7/2/13

## 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

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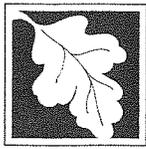
## Checklist (continued)

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

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

### Standard 1: No New Untreated Discharges

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



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 2: Peak Rate Attenuation

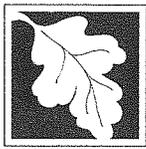
- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- Calculations provided 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<sup>1</sup>
- 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.

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<sup>1</sup> 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



# Checklist for Stormwater Report

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## Checklist (continued)

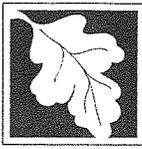
### Standard 3: Recharge (continued)

- 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

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## Checklist (continued)

### Standard 4: Water Quality (continued)

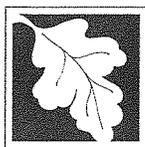
- The BMP is sized (and calculations provided) based on:
  - The ½" or 1" Water Quality Volume or
  - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the proprietary 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)

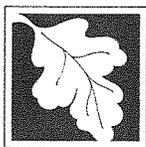
### Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- 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.

## **Narrative**

## Stormwater Management

The proposed project is to upgrade an existing tennis court to a proposed tennis court with a dome to allow for year round use.

### Pre-Development

The site is approximately 8.99 acres and contains a building, pool, tennis courts and associated appurtenances. There is Bordering Vegetated Wetland (BVW) and Unnamed Perennial Stream located on the southern portion of the site. The existing tennis courts are within the 200-foot Riverfront Area and are also 36.5 feet away from the BVW. Currently, there are no controls in place to manage stormwater runoff.

### Post-Development

The existing tennis court will be removed and a new court with associated walkways and grading put in its place. Impervious area will increase by approximately 4,198 sf due to new walkways associated with the tennis courts. Bio-retention areas are proposed with the new courts to treat the increase in impervious area.

### Compliance with MA DEP Stormwater Management Standards

Compliance with the Stormwater Management Standards is as follows:

#### **Standard 1: No Untreated Discharges**

No untreated discharges to the wetlands are proposed. The walkways and tennis courts are clean runoff that will be filtered by grass before entering the wetlands and two bio-retention areas are proposed to treat the increased impervious area.

#### **Standard 2: Peak Rate Attenuation**

The Post-Development peak discharge rates must not be increased from pre-development rates for the 2-year and 10-year storm events. Also, offsite flood impact from the 100-year storm must not be increased. With a combination of infiltration and detention, the peak runoff volume has been decreased. The peak runoff volumes are in the attached bio-retention area sizing calculations.

#### **Standard 3: Stormwater Recharge**

The bio-retention areas have been sized to infiltrate the required recharge volume as specified in the Massachusetts Stormwater Handbook to the maximum extent practicable. The "Simple Dynamic" method was used with a Rawls Rate of 1.02 in/hr in sizing the required storage volume to infiltrate the recharging runoff. Calculations were performed to insure drawdown within 72 hours to provide storage for the next storm event. Detailed calculations showing compliance with Standard 3 have been attached to this report.

#### **Standard 4: Water Quality**

The required water quality volume for this project is 0.5" of runoff over the impervious area since the infiltration rate is less than 2.4 inches per hour. This volume will be

treated to meet the 80% TSS removal requirement of Standard 4. For this redevelopment, the bio-retention area will treat the added impervious runoff area. It is our opinion that the runoff from walkways will not contain sand and chemicals like a road, therefore the filtering of the water through grass will provide adequate pre-treatment. Calculations showing treatment levels are attached.

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

The site is will not contain “land uses with higher potential pollutant loads.”

**Standard 6: Critical Areas**

The site does not discharge runoff to critical areas.

**Standard 7: Redevelopment**

The proposed project is redevelopment.

**Standard 8: Construction Period Controls**

The erosion and sedimentation control measures will be followed in accordance with the Plan and will be consistent with the requirements of the NPDES Construction General Permit. The project will require coverage under the NPDES Construction General Permit.

**Standard 9: Operation and Maintenance Plan**

An Operation and Maintenance Plan is included in this report.

**Standard 10: Illicit Discharges to Drainage System**

An Illicit Discharge Compliance will be provided prior to the discharge of stormwater runoff to the post-construction stormwater BMP's.

**Design Basis**

1. The United States Department of Agriculture Natural Resource Conservation Service (N.R.C.S.) TR55 methodology was used to determine offsite rates of runoff.
2. The twenty-four hour rainfall, taken from N.R.C.S. publications, is 6.4 inches for the 100-year storm, 5.3 inches for the 25-year storm, 4.5 inches for the 10-year storm, and 3.1 inches for the 2-year storm event.
3. The soil types of the site were taken from the N.R.C.S. Soil Survey Map for Littleton.
4. Soil conditions were based on on-site soil evaluations.
5. The Natural Resources Conservation Service (N.R.C.S.) soil survey indicated the presences of Woodbridge Fine Sandy Loam and Freetown Muck. These soil groups rate as Hydrologic Groups C and D respectively.

## **Bio-Retention Area Sizing Calculations**

# Bio-Retention Area Sizing Calculation

Project: 100-102 Nonset Path

by: WJH

Rev. Date: 7/1/2013

Location: Acton, MA

checked:

Date:

## Bio-Retention Area - Infiltration

(100YR EVENT)

Soil Texture (Field Obs.): Sandy Loam

Infiltration Rate\*: 1.02 in/hr (Rawls)  
2.04 ft/day

### Area 1:

Average End Area: 385.2 ft<sup>2</sup>  
Height to Overflow: 0.5 ft  
Storage Capacity: 192.6 ft<sup>3</sup>

\*Based on Sandy Loam Soil

### Pre:

Open Space Area= 1691 S.F.  
CN= 74 (Open Space Runoff)  
Rainfall 100 YR Strom= 6.4 in.

### Post:

Impervious Area= 1691 S.F.  
CN= 98 (Impervious Runoff)  
Rainfall 100 YR Strom= 6.4 in.

Runoff Q(in)=  $(P-0.2S)^2/(P+0.8S)$ = 3.52

S=1000/CN-10 = 3.51

Runoff Volume=Area x Q = 497 C.F.

Runoff Q(in)=  $(P-0.2S)^2/(P+0.8S)$ = 6.16

S=1000/CN-10 = 0.20

Runoff Volume=Area x Q = 868 C.F.

Runoff to be Infiltrated (Post-Pre)= 868-497 = 372 C.F.

Bio-Retention Area Volume = 193 C.F.

Runoff Volume Infiltrated

Total area x Infiltration Rate x 24 hr = 786 C.F.

Runoff Volume Infiltration > or = Runoff Volume

978 C.F. > or = 372 C.F. O.K.

**Area 2:**

Average End Area:	484.4	ft <sup>2</sup>
Height to Overflow:	0.6	ft
Storage Capacity:	290.64	ft <sup>3</sup>

\*Based on Sandy Loam Soil

**Pre:**

**Post:**

Open Space Area=	5733	S.F.	Impervious Area=	5733	S.F.
CN=	74	(Open Space Runoff)	CN=	98	(Impervious Runoff)
Rainfall 100 YR Strom=	6.4	in.	Rainfall 100 YR Strom=	6.4	in.
Runoff Q(in)= (P-0.2S) <sup>2</sup> /(P+0.8S)=	3.52		Runoff Q(in)= (P-0.2S) <sup>2</sup> /(P+0.8S)=	6.16	
S=1000/CN-10 =	3.51		S=1000/CN-10 =	0.20	
Runoff Volume=Area x Q =	1684	C.F.	Runoff Volume=Area x Q =	2944	C.F.

Runoff to be Infiltrated (Post-Pre)= 2944-1684 = 1260 C.F.

Bio-Retention Area Volume = 291 C.F.

Runoff Volume Infiltrated

Total area x Infiltration Rate x 24 hr = 988 C.F.

Runoff Volume Infiltration > or = Runoff Volume

1279 C.F. > or = 1260 C.F.

## **Water Quality Volume Calculations and Groundwater Recharge Calculations**

**STAMSKI AND McNARY, INC.**

1000 Main Street  
ACTON, MASSACHUSETTS 01720  
TEL (978) 263-8585  
FAX (978) 263-9883

JOB 5059-100 NONSET PATH

SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_

CALCULATED BY VJH DATE \_\_\_\_\_

CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_

SCALE \_\_\_\_\_

REQUIRED RECHARGE

$$R_v = F \times \text{IMPERVIOUS AREA}$$

-B SOILS ON SITE,  $F = 0.35''$

R10 RETENTION AREA 1:

$$R_v = \left( \frac{0.35''}{12''} \right) \times 1,691 \text{ SF}$$

$$R_v = 49.3 \text{ CF}$$

R10 RETENTION AREA 2:

$$R_v = \left( \frac{0.35''}{12''} \right) \times 5,733 \text{ SF}$$

$$R_v = 167.2 \text{ CF}$$

WATER QUALITY VOLUME

AREA 1:

$$V_{wq} = \frac{0.5''}{12''} \times 1,691 \text{ SF}$$

$$V_{wq} = 70.5 \text{ CF}$$

AREA 2:

$$V_{wq} = \frac{0.5''}{12''} \times 5,733 \text{ SF}$$

$$V_{wq} = 238.9 \text{ CF}$$

**STAMSKI AND McNARY, INC.**

1000 Main Street  
ACTON, MASSACHUSETTS 01720  
TEL (978) 263-8585  
FAX (978) 263-9883

JOB 5059-100 NONSET PATH

SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_

CALCULATED BY WJH DATE \_\_\_\_\_

CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_

SCALE \_\_\_\_\_

STORAGE VOLUME (SIMPLE DYNAMIC)AREA 1

$$A = R_v = (D + KT) \quad R_v = V_{w0}$$

$$A = 70.5 = (0.5 + (\frac{100}{12} \times 2))$$

$$A = 105.2 \text{ SF}$$

$$V = A \times D = 105.2 \times 0.5 = 52.6 \text{ CF} < 193 \text{ CF} \quad \underline{\text{O.k.}}$$

AREA 2

$$A = 238.9 = (0.5 + (\frac{100}{12} \times 2))$$

$$A = 356.6 \text{ SF}$$

$$V = 356.6 \times 0.5 = 178.3 \text{ CF} < 291 \text{ CF} \quad \underline{\text{O.k.}}$$

**STAMSKI AND McNARY, INC.**

1000 Main Street  
ACTON, MASSACHUSETTS 01720  
TEL (978) 263-8585  
FAX (978) 263-9883

JOB 5059-100 WANSSET PATH

SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_

CALCULATED BY VJH DATE \_\_\_\_\_

CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_

SCALE \_\_\_\_\_

72 HOUR DRAWDOWN

$$T = \frac{R_v}{K \times \text{SOT AREA}}$$

AREA 1:

$$T = \frac{49.2}{\left(\frac{1.02}{12}\right) \times 289}$$

T = 2.0 HOURS < 72 HOURS O.K.

AREA 2:

$$T = \frac{167.2}{\left(\frac{1.02}{12}\right) \times 391}$$

T = 5.0 HOURS < 72 HOURS O.K.

## **Soil Analysis**



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

C. On-Site Review *(minimum of two holes required at every proposed disposal area)*

Deep Observation Hole A: 7-1-13 8-9 OVERCAST  
Date Time Weather

1. Deep Observation Hole Logs

Deep Hole Number HH-1 Ground Elevation at Surface of Hole \_\_\_\_\_

Location (Identify on Plan) \_\_\_\_\_

2. Land Use: YARD SOME 0-2  
(e.g. woodland, agricultural field, vacant lot, etc.) Surface Stones Slope (%)  
Vegetation GRASS Landform \_\_\_\_\_ Position on landscape (attach sheet) \_\_\_\_\_

3. Distances from: Open Water Body \_\_\_\_\_ Drainage Way \_\_\_\_\_ Possible Wet Area \_\_\_\_\_  
Property Line \_\_\_\_\_ Drinking Water Well \_\_\_\_\_ Other \_\_\_\_\_  
feet feet feet

4. Parent Material: TILL Unsuitable Materials Present: Yes  No   
If Yes: Disturbed Soil  Fill Material  Impervious Layer(s)  Weathered/Fractured Rock  Bedrock

5. Groundwater Observed: Yes  No   
If Yes: Depth Weeping from Pit \_\_\_\_\_ Depth Standing Water In Hole \_\_\_\_\_  
Estimated Depth to High Groundwater: \_\_\_\_\_  
Inches elevation



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

Deep Observation Hole A: Deep Hole Number: HH-1

Depth (In.)	Soil Horizon/Layer	Soil Matrix: Color-Molst (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6	A	10YR 2/2	—	—	—	SL	2	—	M	F	
6-12	B	10YR 3/4	—	—	—	SL	2	2	M	F	
12-36	C	10YR 4/6	—	—	—	SL	5	2	^	F	

Additional Notes \_\_\_\_\_



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

C. On-Site Review (minimum of two holes required at every proposed disposal area)

Deep Observation Hole A: 7-1-13 8-9 OVERCAST  
Date Time Weather

1. Deep Observation Hole Logs

Deep Hole Number HH2 Ground Elevation at Surface of Hole \_\_\_\_\_

Location (Identify on Plan) \_\_\_\_\_

2. Land Use: WOODLAND STONE 0-5  
(e.g. woodland, agricultural field, vacant lot, etc.) Surface Stones Slope (%)  
HANDMADE Landform Position on landscape (attach sheet)

3. Distances from: Open Water Body \_\_\_\_\_ feet  
Drainage Way \_\_\_\_\_ feet  
Possible Wet Area \_\_\_\_\_ feet  
Property Line \_\_\_\_\_ feet  
Drinking Water Well \_\_\_\_\_ feet  
Other \_\_\_\_\_ feet

4. Parent Material: TILL Unsuitable Materials Present: Yes  No

If Yes: Disturbed Soil  Fill Material  Impervious Layer(s)  Weathered/Fractured Rock  Bedrock

5. Groundwater Observed: Yes  No

If Yes: Depth Weeping from Pit \_\_\_\_\_ Depth Standing Water In Hole \_\_\_\_\_

Estimated Depth to High Groundwater: \_\_\_\_\_ inches \_\_\_\_\_ elevation



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

Deep Observation Hole A: Deep Hole Number: HH1-2

Depth (In.)	Soil Horizon/Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6	A	10YR3/2				SL	5	-	M	F	
6-14	B	10YR3/4				SL	5	5	M	F	
14-24	C	10YR5/4				SL	10	10	M	F	

Additional Notes ROCKS + STONES @ 2'



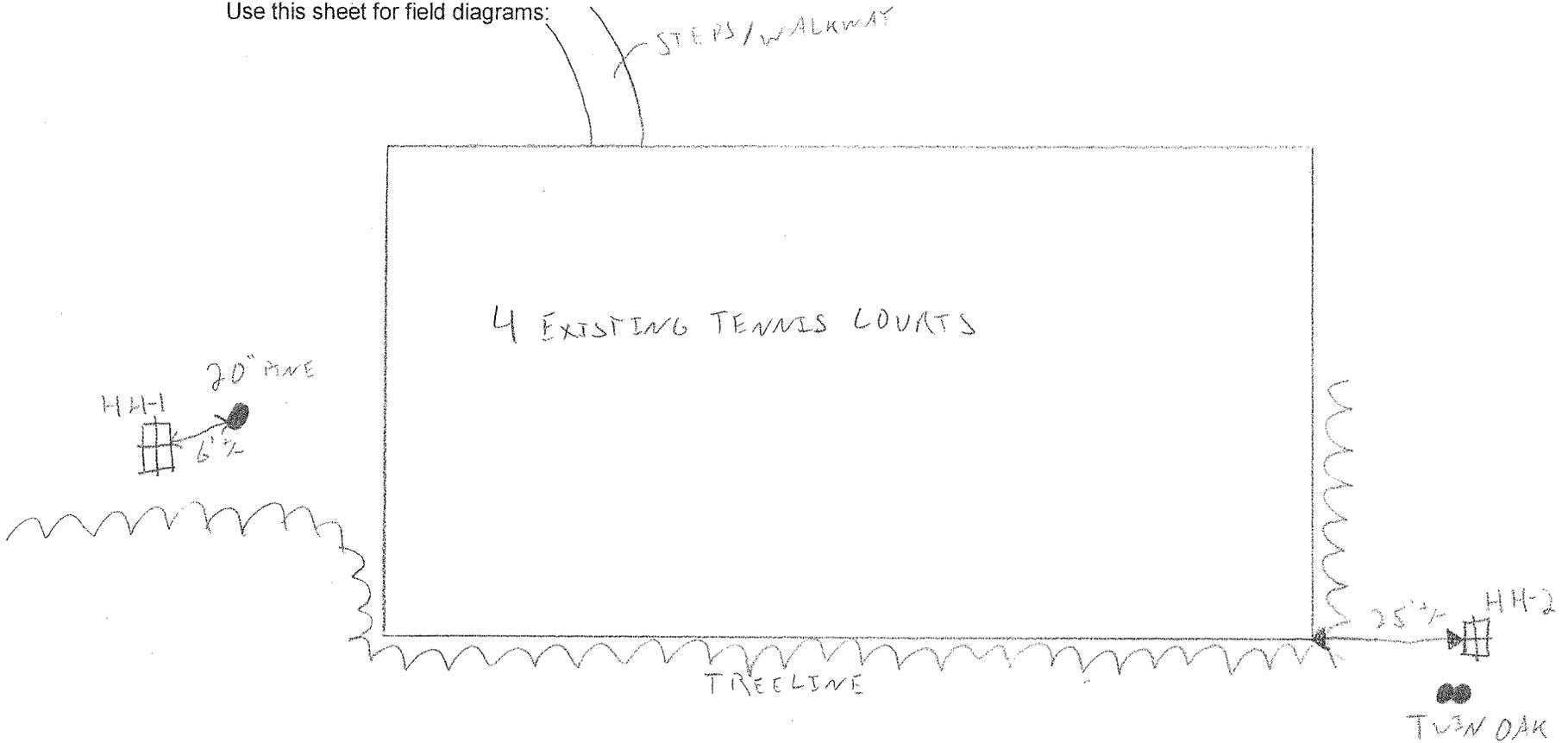
Commonwealth of Massachusetts

City/Town of

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

## Field Diagrams

Use this sheet for field diagrams:



## **TSS Removal Calculations**

**INSTRUCTIONS:**

*Non-automated: Mar. 4, 2008*

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations 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:

**TSS Removal  
Calculation Worksheet**

A BMP <sup>1</sup>	B TSS Removal Rate <sup>1</sup>	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Bio-Retention Area 1	90%	1.00	0.90	0.10

**Total TSS Removal =**

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

Project:   
 Prepared By:   
 Date:

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

**INSTRUCTIONS:**

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations 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:

	A	B	C	D	E
	BMP <sup>1</sup>	TSS Removal Rate <sup>1</sup>	Starting TSS Load*	Amount Removed (B*C)	Remaining Load (C-D)
<b>TSS Removal Calculation Worksheet</b>	Bio-Retention Area 2	90%	1.00	0.90	0.10

**Total TSS Removal =**

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

Project:   
 Prepared By:   
 Date:

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