

Stormwater Management System Operation & Maintenance Plan

Prepared For:

Exeter Rose Farm, LLC
c/o Keith Pattison

Exeter Rose Farm

Project #47175.00

Oak Street Extension & Forest Street

Tax Map 54 Lots 5, 6 & 7 and Tax Map 63 Lot 205

September 26, 2017

Prepared By:





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Structural Engineers
Traffic Engineers
Land Surveyors
Landscape Architects
Scientists

A Division of TFMoran, Inc.

**Stormwater Management System
Operation & Maintenance Plan
Project # 47175.00**

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Maintenance of Property

MSC a division of TFMoran, Inc., has prepared the following Stormwater Management System Operation & Maintenance Plan for Exeter Rose Farm, LLC in the town of Exeter, New Hampshire. The intent of this plan is to provide the owner, and future property managers/owners of the site with a list of procedures that document the inspection and maintenance/inspection requirements of the Stormwater Management System for this development. This includes all temporary and permanent stormwater and erosion control measure during and post construction.

Owner Responsibility

The current owners, and its successors of the property, are required to submit three copies of an Operations and Maintenance Report completed on a yearly basis to the Town of Exeter Planning Department by December 31st. This report should be prepared by a qualified inspector with working knowledge of the site. Current owners and any future owners shall be open to working with the Town to achieve all stormwater goals promulgated by the EPA as they become applicable. The current owner, its heirs, successors or assigns holds the responsibility for overseeing and implementing the O&M Plan and shall be responsible for the proper operation and maintenance of the stormwater structures. Should ownership of the property change, the current owner(s) shall continue to be responsible until the succeeding owner(s) notifies the Town that said succeeding owner has assumed such responsibility. Upon subsequent transfers, the responsibility shall continue to be that of the transferring owner until the transferee owner notifies the Town of its assumption of responsibility. Included in the manual is a Stormwater Management O&M Plan identifying the key components of the stormwater system and a log for tracking inspections and maintenance. This manual is assignable to any future owners.

The following inspection and maintenance program is necessary in order to keep the Stormwater Management System functioning properly. These measures will greatly help to reduce potential environmental impacts. By following the enclosed procedures, Exeter Rose Farm, LLC and its successors will be able to maintain the functional design of the Stormwater Management System and maximize its ability to remove sediment and other contaminants from site-generated stormwater runoff.

General Inspection and Maintenance Requirements

Temporary stormwater, sediment and erosion control measures that required maintenance on the site include, but are not limited, to the following:

- Stabilized construction entrance
- Litter/Trash removal
- Construction Dumpster area (if used)
- Inlet Protection
- Silt sock barriers

Permanent stormwater, sediment and erosion control measures that required maintenance on the site include, but are not limited, to the following:

- Rip-Rap Protection
- Conveyance Swales
- Stone Check Dams
- Landscape
- Pavement
- Gravel Wetlands
- Forebays
- Catch Basins
- Drain Manholes
- Infiltration Basin
- Surface maintenance related to deicing/plowing

As-Built Requirements

An electronic version of the site as-built shall be submitted to the Town as per the requirements of 2.3.6.5 of the Municipal Separate Storm Sewer System (MS4). The stormwater system shall be maintained so that it is in good working order and meets all the requirements of the MS4 program. The Town of Exeter reserves the right to enter the site for any necessary inspection to determine the system is working properly. Paid receipts for any maintenance work shall be included as part of the yearly submission to the Town, including parking area sweeping, catch basin cleaning, etc.

Inspection and Maintenance Requirements

By implementing the following procedures, current owners will be able to maintain the functional design of the Stormwater Management System and maximize the system's ability to remove sediment and other contaminants from site-generated stormwater runoff.

Inspection and Maintenance /Checklist

	<i>Frequency</i>	<i>Inspect</i>	<i>Action</i>
<i>Temporary Controls</i>			
Stabilized Construction Entrance	Weekly	<ul style="list-style-type: none"> • Inspect adjacent roadway for sediment tracking • Inspect stone for sediment accumulation 	<ul style="list-style-type: none"> • Sweep adjacent roadways as soon as sediment is tracked • Top dress with additional stone when necessary to prevent tracking
Litter/Trash Removal	Routinely	Inspect site especially construction areas	Remove debris and clean areas as necessary
Construction Dumpster Area Maintenance (if used)	Routinely	Dumpster Areas	Remove any accumulated debris and dispose of properly
Inlet Protection	During construction and after measurable rainfall	Inspect for accumulated sediment	Empty sediment bag if more than ½ filled with sediment or debris. Replace bag if torn or punctured to ½" diameter or greater on the lower half of the bag
Silt Sock Barrier	Weekly	Inspect accumulated sediment level, rips and tears	<ul style="list-style-type: none"> • Repair or replace damaged lengths • Remove and dispose accumulated sediment once level reaches 1/3 of barrier
<i>Permanent Controls</i>			
Rip Rap Outlet Protection	Spring and Fall and after rainstorms exceeding 2.5 inches in 24 hrs	<p>Inspect for damage or displaced stones</p> <p>Inspect for torn or visible fabric</p>	<ul style="list-style-type: none"> • Repair and replace stone and / or fabric immediately • Remove accumulated sediment, trash and blocking materials

Conveyance Swale	Annually	Inspect for erosion, sediment accumulation, vegetation loss, and presence of invasive species	<ul style="list-style-type: none"> Remove debris and accumulated sediment (sediment accumulation should not exceed 3") Repair eroded areas Remove invasive species and dead vegetation Reseed as warranted
	Spring and Fall	<ul style="list-style-type: none"> Inspect height of vegetation 	<ul style="list-style-type: none"> Mow when necessary—allow length of vegetation to remain at least 4"
Stone Check Dams	Spring and Fall after rainstorms exceeding 2.5 inches in 24 hrs	<ul style="list-style-type: none"> Inspect for sediment accumulation, permeability of stone, damaged or displaced stone Inspect for standing water 	<ul style="list-style-type: none"> Repair and replace stone immediately Remove accumulated sediment, trash and blocking materials Regrade as necessary
Landscape (see Appendix A for additional information on invasive species)	Spring	Mulch: Inspect mulch areas for trash and debris and thickness of mulch	Remove weeds and debris. Top dress with new mulch when necessary
	Spring	Trees and Shrubs: Inspect for broken, weak or diseased branches and debris	Prune to maintain shape to avoid splitting, remove broken, weak or diseased branches, replace as necessary
	As necessary	Lawn	Mow as required
	Spring and Fall	Inspect landscaped areas for debris and litter	Remove debris and litter as necessary
Pavement	Spring and Fall	Inspect pavement for debris	Sweeping as required
Gravel Wetlands	4 times per year for the 1 st year	Inspect for animal burrows and short circuits	Repair soil erosion, fill holes and lightly compact

		<p>Inspect for depth of sediment in the sedimentation chamber is <12" or 10% of the pretreatment volume</p> <p>Inspect draw down time</p>	<p>Remove material with rakes to avoid compaction</p> <p>When drawdown >36 hrs – remove material with rakes to avoid compaction of the gravel wetland surface</p>
	Spring and Fall following the 1 st year	<p>Inspect for animal burrows and short circuits</p> <p>Inspect for depth of sediment in the sedimentation chamber is <12" or 10% of the pretreatment volume</p> <p>Inspect draw down time</p>	
	Annually	<p>Inspection outlet control devices and high-flow bypass for erosion</p> <p>Inspect vegetation cover</p>	<p>Repair and Replace as necessary</p> <p>If 50% cover is not established in two years, reinforcement planting should be performed</p>
	Every 3 years	<p>Inspection growth of vegetation</p>	<p>Cut and remove vegetation from the Gravel Wetland System and forebay in order to maintain nitrogen removal performance (see Appendix B for additional information)</p>
Forebays	Annually	<p>Inspect for debris and accumulated sediment</p> <p>Inspect for damage or displaced stones</p>	<p>Remove debris and accumulated sediment as necessary</p> <p>Repair and replace stones as needed</p>

Catch basins	Spring and Fall	Inspect for sediment Inspect for hydrocarbons Inspect Hoods	If sump is more than half full of sediment, remove sediment as necessary Remove and dispose of properly Repair and replace as necessary
Drain Manholes	Spring and Fall	Inspect for accumulated sediment and debris	Clean any material upon inspection and deposit of properly
Infiltration Basin	Spring and Fall and after rainstorms exceeding 2.5 inches in 24 hrs	<ul style="list-style-type: none"> • Inspect level of accumulated sediment • Inspect for debris • Inspect outlet structures • Inspect vegetative cover • Inspect embankments and spillways • Inspect infiltration function within 72-hrs following a rainfall event 	<ul style="list-style-type: none"> • Remove accumulated sediment • Remove debris from inlet and outlets • Repair as necessary • Mow embankments and removed woody vegetation • Repair embankments and spillways as necessary • Restore infiltration by removing accumulated sediments and reconstruction of the infiltration basin if deemed necessary
Surface Maintenance Deicing/Plowing	See Attachment 2 for Deicing Log		

Annual Report:

- Prepare an annual Inspection and Maintenance Report and keep on file by Exeter Rose Farm, LLC and future property owners or assigns and/or condominium association of the property. The report should include a summary of the systems maintenance requirements and repairs and 3 copies of completed logs and checklists shall be submitted to the Town of Exeter, NH by December 31st of each year.

Inspection and Maintenance Checklist / Log

The following pages contain a blank copy an Inspection and Maintenance Plan Log (Attachment 1) a blank copy of the Stormwater Management Systems Inspection and Maintenance Log (Attachment 2). These forms are provided to assist the property manager with the inspection and maintenance of the Stormwater Management System.

Owner's Certification

Contact Information

Owner (pending): Exeter Rose Farm, LLC
Contact Person Keith Pattison
953 Islington Street, #23D
Portsmouth, New Hampshire
603-425-8/598

I have reviewed this document and understand the responsibilities contained. I agree to perform the required maintenance on the stormwater management system.

Owner's Signature (future owner's and successors, if applicable)

Print Name

Title

Date

Any inquiries in regards to the design, function, and/or maintenance of any one of the above mentioned facilities or tasks shall be directed to the project engineer:

MSC a division of TFMoran, Inc.
170 Commerce Way, Suite 102
Portsmouth, NH 03801
(603) 431-2222



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ATTACHMENT 1



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ATTACHMENT 2



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APPENDIX A



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CONTROL OF INVASIVE PLANTS

During maintenance activities, check for the presence of invasive plants and remove in a safe manner as described on the following pages. They should be controlled as described on the following pages.

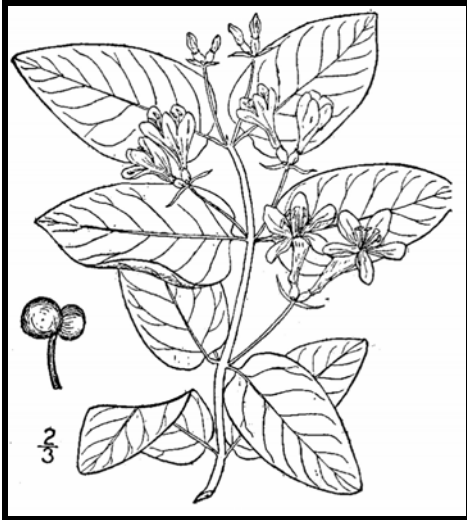
Background:

Invasive plants are introduced, alien, or non-native plants, which have been moved by people from their native habitat to a new area. Some exotic plants are imported for human use such as landscaping, erosion control, or food crops. They also can arrive as "hitchhikers" among shipments of other plants, seeds, packing materials, or fresh produce. Some exotic plants become invasive and cause harm by:

- becoming weedy and overgrown;
- killing established shade trees;
- obstructing pipes and drainage systems;
- forming dense beds in water;
- lowering water levels in lakes, streams, and wetlands;
- destroying natural communities;
- promoting erosion on stream banks and hillsides; and
- resisting control except by hazardous chemical.



Prepared by the Invasives Species Outreach Group, volunteers interested in helping people control invasive plants. Assistance provided by the Piscataquog Land Conservancy and the NH Invasives Species Committee. Edited by Karen Bennett, Extension Forestry Professor and Specialist.



Tatarian honeysuckle

Lonicera tatarica

USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 3: 282.

Non-native invasive plants crowd out natives in natural and managed landscapes. They cost taxpayers billions of dollars each year from lost agricultural and forest crops, decreased biodiversity, impacts to natural resources and the environment, and the cost to control and eradicate them.

Invasive plants grow well even in less than desirable conditions such as sandy soils along roadsides, shaded wooded areas, and in wetlands. In ideal conditions, they grow and spread even faster. There are many ways to remove these non-native invasives, but once removed, care is needed to dispose the removed plant material so the plants don't grow where disposed.

Knowing how a particular plant reproduces indicates its method of spread and helps determine

the appropriate disposal method. Most are spread by seed and are dispersed by wind, water, animals, or people. Some reproduce by vegetative means from pieces of stems or roots forming new plants. Others spread through both seed and vegetative means.

Because movement and disposal of viable plant parts is restricted (see NH Regulations), viable invasive parts can't be brought to most transfer stations in the state. Check with your transfer station to see if there is an approved, designated area for invasives disposal. This fact sheet gives recommendations for rendering plant parts non-viable.

Control of invasives is beyond the scope of this fact sheet. For information about control visit www.nhinvasives.org or contact your UNH Cooperative Extension office.

New Hampshire Regulations

Prohibited invasive species shall only be disposed of in a manner that renders them nonliving and nonviable. (Agr. 3802.04)

No person shall collect, transport, import, export, move, buy, sell, distribute, propagate or transplant any living and viable portion of any plant species, which includes all of their cultivars and varieties, listed in Table 3800.1 of the New Hampshire prohibited invasive species list. (Agr 3802.01)

How and When to Dispose of Invasives?

To prevent seed from spreading remove invasive plants before seeds are set (produced). Some plants continue to grow, flower and set seed even after pulling or cutting. Seeds can remain viable in the ground for many years. If the plant has flowers or seeds, place the flowers and seeds in a heavy plastic bag “head first” at the weeding site and transport to the disposal site. The following are general descriptions of disposal methods. See the chart for recommendations by species.

Burning: Large woody branches and trunks can be used as firewood or burned in piles. For outside burning, a written fire permit from the local forest fire warden is required unless the ground is covered in snow. Brush larger than 5 inches in diameter can't be burned. Invasive plants with easily airborne seeds like black swallow-wort with mature seed pods (indicated by their brown color) shouldn't be burned as the seeds may disperse by the hot air created by the fire.

Bagging (solarization): Use this technique with softer-tissue plants. Use heavy black or clear plastic bags (contractor grade), making sure that no parts of the plants poke through. Allow the bags to sit in the sun for several weeks and on dark pavement for the best effect.

Tarping and Drying: Pile material on a sheet of plastic and cover with a tarp, fastening the tarp to the ground and monitoring it for escapes. Let the material dry for several weeks, or until it is clearly nonviable.

Chipping: Use this method for woody plants that don't reproduce vegetatively.

Burying: This is risky, but can be done with watchful diligence. Lay thick plastic in a deep pit before placing the cut up plant material in the hole. Place the material away from the edge of the plastic before covering it with more heavy plastic. Eliminate as much air as possible and toss in soil to weight down the material in the pit. Note that the top of the buried material should be at least three feet underground. Japanese knotweed should be at least 5 feet underground!

Drowning: Fill a large barrel with water and place soft-tissue plants in the water. Check after a few weeks and look for rotted plant material (roots, stems, leaves, flowers). Well-rotted plant material may be composted. A word of caution- seeds may still be viable after using this method. Do this before seeds are set. This method isn't used often. Be prepared for an awful stink!

Composting: Invasive plants can take root in compost. Don't compost any invasives unless you know there is no viable (living) plant material left. Use one of the above techniques (bagging, tarping, drying, chipping, or drowning) to render the plants nonviable before composting. Closely examine the plant before composting and avoid composting seeds.






Japanese knotweed
Polygonum cuspidatum
USDA-NRCS PLANTS Database /
Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 1: 676.

Be diligent looking for seedlings for years in areas where removal and disposal took place.

Suggested Disposal Methods for Non-Native Invasive Plants

This table provides information concerning the disposal of removed invasive plant material. If the infestation is treated with herbicide and left in place, these guidelines don't apply. Don't bring invasives to a local transfer station, unless there is a designated area for their disposal, or they have been rendered non-viable. This listing includes wetland and upland plants from the New Hampshire Prohibited Invasive Species List. The disposal of aquatic plants isn't addressed.

Woody Plants	Method of Reproducing	Methods of Disposal
Norway maple <i>(Acer platanoides)</i> European barberry <i>(Berberis vulgaris)</i> Japanese barberry <i>(Berberis thunbergii)</i> autumn olive <i>(Elaeagnus umbellata)</i> burning bush <i>(Euonymus alatus)</i> Morrow's honeysuckle <i>(Lonicera morrowii)</i> Tatarian honeysuckle <i>(Lonicera tatarica)</i> showy bush honeysuckle <i>(Lonicera x bella)</i> common buckthorn <i>(Rhamnus cathartica)</i> glossy buckthorn <i>(Frangula alnus)</i>	Fruit and Seeds 	<p>Prior to fruit/seed ripening</p> <p>Seedlings and small plants</p> <ul style="list-style-type: none"> ▪ Pull or cut and leave on site with roots exposed. No special care needed. <p>Larger plants</p> <ul style="list-style-type: none"> ▪ Use as firewood. ▪ Make a brush pile. ▪ Chip. ▪ Burn. <hr/> <p>After fruit/seed is ripe</p> <p>Don't remove from site.</p> <ul style="list-style-type: none"> ▪ Burn. ▪ Make a covered brush pile. ▪ Chip once all fruit has dropped from branches. ▪ Leave resulting chips on site and monitor.
oriental bittersweet <i>(Celastrus orbiculatus)</i> multiflora rose <i>(Rosa multiflora)</i>	Fruits, Seeds, Plant Fragments 	<p>Prior to fruit/seed ripening</p> <p>Seedlings and small plants</p> <ul style="list-style-type: none"> ▪ Pull or cut and leave on site with roots exposed. No special care needed. <p>Larger plants</p> <ul style="list-style-type: none"> ▪ Make a brush pile. ▪ Burn. <hr/> <p>After fruit/seed is ripe</p> <p>Don't remove from site.</p> <ul style="list-style-type: none"> ▪ Burn. ▪ Make a covered brush pile. ▪ Chip – only after material has fully dried (1 year) and all fruit has dropped from branches. Leave resulting chips on site and monitor.

Non-Woody Plants	Method of Reproducing	Methods of Disposal
<p>garlic mustard (<i>Alliaria petiolata</i>)</p> <p>spotted knapweed (<i>Centaurea maculosa</i>)</p> <ul style="list-style-type: none"> ▪ Sap of related knapweed can cause skin irritation and tumors. Wear gloves when handling. <p>black swallow-wort (<i>Cynanchum nigrum</i>)</p> <ul style="list-style-type: none"> ▪ May cause skin rash. Wear gloves and long sleeves when handling. <p>pale swallow-wort (<i>Cynanchum rossicum</i>)</p> <p>giant hogweed (<i>Heracleum mantegazzianum</i>)</p> <ul style="list-style-type: none"> ▪ Can cause major skin rash. Wear gloves and long sleeves when handling. <p>dame's rocket (<i>Hesperis matronalis</i>)</p> <p>perennial pepperweed (<i>Lepidium latifolium</i>)</p> <p>purple loosestrife (<i>Lythrum salicaria</i>)</p> <p>Japanese stilt grass (<i>Microstegium vimineum</i>)</p> <p>mile-a-minute weed (<i>Polygonum perfoliatum</i>)</p>	<p>Fruits and Seeds</p> 	<p>Prior to flowering</p> <p>Depends on scale of infestation</p> <p>Small infestation</p> <ul style="list-style-type: none"> ▪ Pull or cut plant and leave on site with roots exposed. <p>Large infestation</p> <ul style="list-style-type: none"> ▪ Pull or cut plant and pile. (You can pile onto or cover with plastic sheeting). ▪ Monitor. Remove any re-sprouting material. <hr/> <p>During and following flowering</p> <p>Do nothing until the following year or remove flowering heads and bag and let rot.</p> <p>Small infestation</p> <ul style="list-style-type: none"> ▪ Pull or cut plant and leave on site with roots exposed. <p>Large infestation</p> <ul style="list-style-type: none"> ▪ Pull or cut plant and pile remaining material. (You can pile onto plastic or cover with plastic sheeting). ▪ Monitor. Remove any re-sprouting material.
<p>common reed (<i>Phragmites australis</i>)</p> <p>Japanese knotweed (<i>Polygonum cuspidatum</i>)</p> <p>Bohemian knotweed (<i>Polygonum x bohemicum</i>)</p>	<p>Fruits, Seeds, Plant Fragments</p> <p>Primary means of spread in these species is by plant parts. Although all care should be given to preventing the dispersal of seed during control activities, the presence of seed doesn't materially influence disposal activities.</p>	<p>Small infestation</p> <ul style="list-style-type: none"> ▪ Bag all plant material and let rot. ▪ Never pile and use resulting material as compost. ▪ Burn. <p>Large infestation</p> <ul style="list-style-type: none"> ▪ Remove material to unsuitable habitat (dry, hot and sunny or dry and shaded location) and scatter or pile. ▪ Monitor and remove any sprouting material. ▪ Pile, let dry, and burn.

January 2010

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APPENDIX B



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Regular Inspection and Maintenance Guidance for The Subsurface Gravel Wetland Stormwater Management Device

Regular inspection and maintenance is critical to the effective operation of Subsurface Gravel Wetland (SGW) systems. It is the responsibility of the owner to maintain the SGW in accordance with the minimum design standards. This page provides guidance on maintenance activities that are typically required for these systems, along with the suggested frequency for each activity. Individual systems may have more, or less, frequent maintenance needs, depending on a variety of factors including but not limited to: the occurrence of large storm events, overly wet or dry periods, regional hydrologic conditions, and the upstream land use.

ACTIVITIES

The most common maintenance activity is the removal of sediment and organic debris from the system and bypass structures. Visual inspections are routine for system maintenance. This includes looking for standing water, accumulated leaves, holes in the soil media, signs of plant distress, and debris and sediment accumulation in the system. Vegetation coverage is integral to the performance of the system. A SGW system is a subsurface horizontal filtration system and does not rely on surface soil infiltration capacity for treatment. As such, surface infiltration rates are expected to be low and not a criterion for cleaning. Rather, stormwater access to subsurface treatment is by way of a hydraulic inlet. It is important to ensure these inlets are performing properly.

ACTIVITY	FREQUENCY
CLOGGING AND SYSTEM PERFORMANCE	
Inspect inlets and outlets to ensure good condition and no evidence of deterioration. Check to see if high-flow bypass is functioning. Remedy: Repair or replace any damaged structural parts, inlets and outlets. Clear or remove debris or restrictions.	Annually, more frequently in the first year of operation
Check for internal erosion, evidence of short circuiting, and animal burrows. Remedy: Soil erosion from short-circuiting or animal burrows should be repaired when they occur.	
Check that the system is fully draining within a 24 - 48 hour period after rain events Remedy: Repair or restore hydraulic inlet or outlet function.	
VEGETATION	
Check for robust vegetation coverage throughout the system and dead or dying plants. Remedy: Vegetation should cover > 75% of the system and should be reseeded and cared for as needed.	Annually or as needed
Cut and remove vegetation from the Gravel Wetland System and forebay in order to maintain nitrogen removal performance. Remedy: The vegetation should be cut and removed from the system to prevent nitrogen from cycling back into the system.	Once every 3 years



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CHECKLIST FOR INSPECTION OF SUBSURFACE GRAVEL WETLAND SYSTEMS

Location:
 Inspector:
 Date:
 Time:
 Site Conditions:
 Days Since Last Rain Event:

Inspection Items	Satisfactory (S) or Unsatisfactory (U)	Comments/Corrective Action
1. Initial Inspection After Planting		
Plants are stable, roots not exposed	S U	
Surface is at design level, no evidence of preferential flow/shoving	S U	
Inlet and outlet/bypass are functional	S U	
2. Operation (1 time/year minimum, Spring/Fall)		
Flow is unobstructed in openings (grates, orifices, etc)	S U	
Structures are operational with no evidence of deterioration	S U	
3. Standing Water (1 time/year minimum)		
No evidence of standing water after 24-48 hours since rainfall	S U	
4. Vegetation Condition and Coverage		
Vegetation condition good with good coverage (typically > 75%)	S U	
5. Vegetation removal (once every 3 years)		
Prune dead, diseased, or decaying plants	S U	
6. Other Issues		
Note any additional issues not previously covered.	S U	
Corrective Action Needed		Due Date
1.		
2.		
3.		
Inspector Signature		Date



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